CITY OF FERNDALE

Public Works Department

2095 Main Street

Ferndale, Washington

98248

WASTEWATER FACILITIES PLAN

MAYOR:
Jon Mutchler

CITY ADMINISTRATOR:
Greg Young

CITY COUNCIL:
Rebecca Xczar
Greg Hansen
Keith Olson
Teresa Taylor
Cathy Watson
Carol Bersch
Brent Goodrich

Prepared By:
WILSON ENGINEERING, LLC
805 Dupont Street, Suite #7
Bellingham, Washington 98225
(360) 733-6100

August 2016

CITY OF FERNDALE

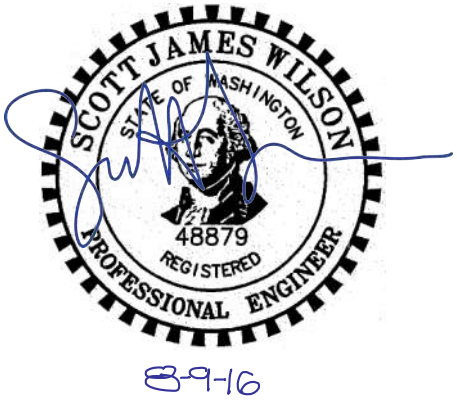
WASTEWATER FACILITIES PLAN

Prepared for:

City of Ferndale

By:

Wilson Engineering, LLC



8-9-16

8-9-16

August 2016

Table of Contents

List of Tables

List of Figures

List of Appendices

A. 2012 Clarification Study
B. WA0022454 NPDES Ferndale WWTP Final Permit – Issued July 15, 2014
C. WAC Codes Chapter 173-240
D. Summary of Wastewater Grant and Loan Programs
E. Map Exhibits – Vicinity Map, Zoning, Comp Plan Land Use
F. Proposed Treatment Site Plan
G. Ferndale WWTP Initial Floodplain Assessment (NHC, Oct. 28, 2015)
H. Expanded Permitting Description & Requirements

Executive Summary

Background

This report evaluates the City's wastewater facility needs based on projected residential population growth and commercial and industrial demands on the treatment system through 2036. The purpose of this Facilities Plan is to provide a recommended plan for required improvements to the existing wastewater treatment facility to address aging equipment, future flow and loading capacity, and current standards for redundancy and reliability.

The City of Ferndale WWTP serves a population of approximately 13,249 (2015, State of Washington Office of Financial Management). The WWTP was originally constructed in 1969, with major upgrades in 1996 and 1998. The existing capacity of the wastewater treatment plant is 3.23 MGD. The existing treatment process consists of mechanical screening, a dual-power multi-cellular (DPMC) aerated lagoon system, effluent filter disk system, chlorination/dechlorination for disinfection, effluent pump station, and outfall piping to the Nooksack River.

Regulatory Requirements

As a municipal wastewater treatment facility, the City of Ferndale's WWTP is regulated by the NPDES issued by the Department of Ecology. The City's current NPDES permit (Appendix B), No. WA-002245-4, was issued on July 15, 2014 and expires July 31, 2019. Since influent flows and loadings to the existing treatment plant have exceeded 85% of the design criteria in the last 4 years a Facility Plan is required. This Facility Plan includes an evaluation of the WWTP existing conditions and provides recommendations for improving and maintaining adequate capacity to ensure long-term NPDES permit compliance.

Additional regulatory requirements may govern the construction and operation of the proposed improvements. These regulations include: City of Ferndale Codes, DOE Stormwater Regulations, SEPA/NEPA, HPA, State of Washington Biosolids Regulations, Cultural / Agricultural Assessments, and Shoreline Permits if applicable.

Flow and Loadings

Existing and projected flows and loadings to the wastewater facility are described and analyzed in Chapter 3. The existing and future flows and loadings to the wastewater treatment facility were studied through a 20-year planning period (2036).

Existing influent flows are around 2.0 MGD (Annual Average). The monthly average influent wastewater flows have varied from 1.02 MGD to 2.78 MGD. Average influent CBOD levels have been 3,108 lbs/day (Average Daily) over the last nine years. Average influent TSS levels have been 3,147 lbs/day (Average Daily) over the last nine years.

Influent flows and loadings have been below permit limits, but reached 85% of permit limits on occasion in the last 4 years.

Projected flows and loadings were determined based on yearly growth of existing flows and loadings as well as population growth expected over the next 20 years (2036). A population of

19,591 is projected for year 2036. Projected Peak Month Flow in 2036 is estimated to be 4.1 MGD. Projected Peak Day Flow in 2036 is estimated to be 11.1 MGD.

Evaluation of Existing Facilities

The existing wastewater treatment plant has hit 85% of permit loading limits on multiple occasions over the last two years. In addition, the existing DPAL treatment plant process is only able to meet effluent limits for the permitted influent flows and loadings through the addition of chemicals. With the projected population growth and subsequent increase in influent flows, BOD, and TSS, the existing wastewater treatment process will require significant upgrades to meet anticipated water quality standards.

In addition, various components of the existing treatment facilities will require capacity and process upgrades to meet current standards for wastewater treatment. Significant existing systems which will require replacement or upgrades include: Mechanical screening, effluent filter system, and disinfection system.

Treatment Process Alternatives & Recommendation

Six treatment processes and configurations were evaluated as potential solutions for the Ferndale WWTP. These process alternatives include:

1. Sequencing Batch Reactor (SBR)
2. Oxidation Ditch
3. Extended Aeration
4. Conventional Activated Sludge, Biotreater
5. Expansion of Existing DPAL Lagoons
6. MBR Treatment

After a thorough study of the potential alternatives the Extended Aeration process was determined to be the best solution for the City of Ferndale based on its ability to treat the expected flows and loadings to the anticipated level of treatment necessary for discharge to the Nooksack River, as well as its low capital and operations costs, layout of existing facilities, and demand on operations staff.

Additional improvements are recommended in Chapter 6. Significant recommended improvements include the addition of a second mechanical screen, dual aerated grit chambers, dual clarifiers, UV disinfection, and repurposing of the existing West Lagoon as a Biosolids Stablization Basin.

1.0 - BACKGROUND INFORMATION

Purpose

This Facilities Plan for the City of Ferndale (City) has been prepared at the request of the Director of Public Works and in accordance with the Washington State Department of Ecology (DOE) requirements as presented in WAC 173-240-060. WAC 173-240 is attached in Appendix C for reference.

The purpose of this Facilities Plan is to provide a recommended plan for required improvements to the existing wastewater treatment facility to address aging equipment, future flow and loading capacity, and current standards for redundancy and reliability. This report evaluates the City's wastewater facility needs based on projected residential population growth and commercial and industrial demands on the treatment system through 2036.

The authorized representative for the City of Ferndale, Washington is listed below.

Kevin Renz
Public Works Director
City of Ferndale
Ferndale, WA 98234
360-685-2376

Background

The City of Ferndale WWTP serves a population of approximately 13,249 (2015, State of Washington Office of Financial Management). The wastewater flow to the WWTP is primarily domestic sewage from residential, institutional, and commercial businesses. There are also some small sources of industrial wastewater and the City accepts some trucked landfill leachate. The WWTP does not accept septage.

The WWTP was originally constructed in 1969 with a design capacity of 0.50 MGD. It was subsequently expanded in 1984 and 1992 to accommodate a design flow of 1.72 MGD. The WWTP was upgraded with the "Phase I" and "Phase II" Improvements during 1996 and 1998, respectively. These upgrades increased the capacity to the currently permitted peak month flow of 3.23 MGD. In the 1996 Sewer Plan, this capacity was projected to be adequate through 2003, when the population would have reached 12,400 (based on 7% annual growth) and all industrial areas built out. However, growth in population and in industrial development has been less than half of the projected amount. The 3.23 MGD capacity is still adequate in 2016. In the 1996 Sewer Plan, this capacity was projected to be adequate through 2015, when the population would have reached 27,800 (based on 7% annual growth for 20 years). These growth rates have not been realized (the population growth has been only about 3 percent since the last upgrade and industrial flows have not increased substantially).

Prior to the Phase I improvements, the WWTP consisted of four partial-mix aerated lagoons, the first two operating in series and the final two operating in parallel, followed by a polishing pond and chlorination facilities. Partial-mix lagoons provide both treatment and settling in the same basin.

A small aerated pretreatment lagoon was constructed to receive leachate hauled from the Cedarville landfill and other sources. The leachate is aerated and then mingled with the main waste stream for full treatment.

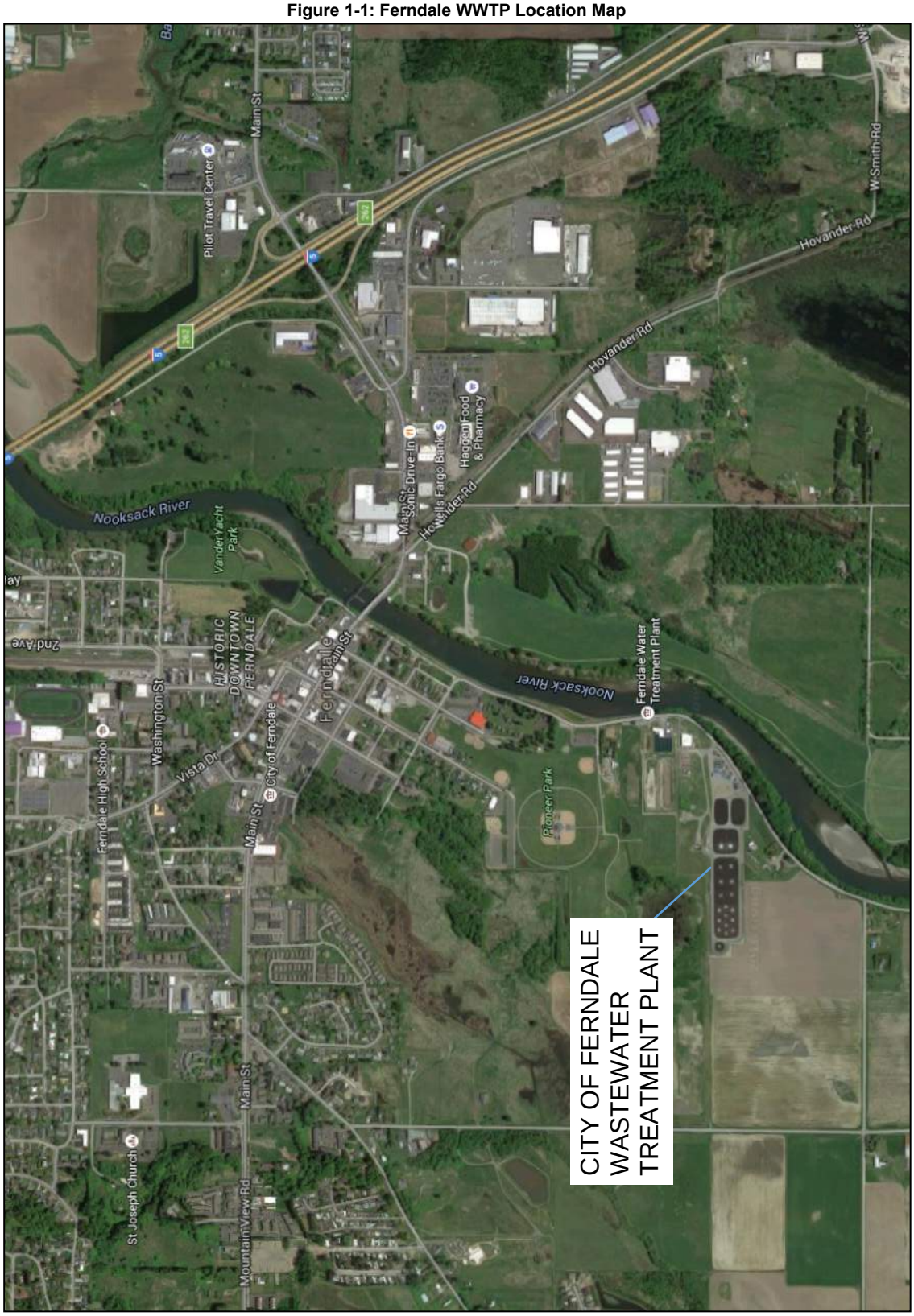
In the Phase I upgrade, the largest lagoon (West Lagoon) was lined and converted to the current dual-power multi-cellular (DPMC) aerated lagoon system, which increased treatment capacity of the WWTP to approximately 3.23 MGD (peak month). The lagoon upgrade and other new facilities (filter system, chlorination/dechlorination, effluent pump station, pipeline, and outfall) were included in Phase I of the WWTP upgrade and expansion improvements. Phase II improvements included the headworks facilities and additional effluent pumping capacity.

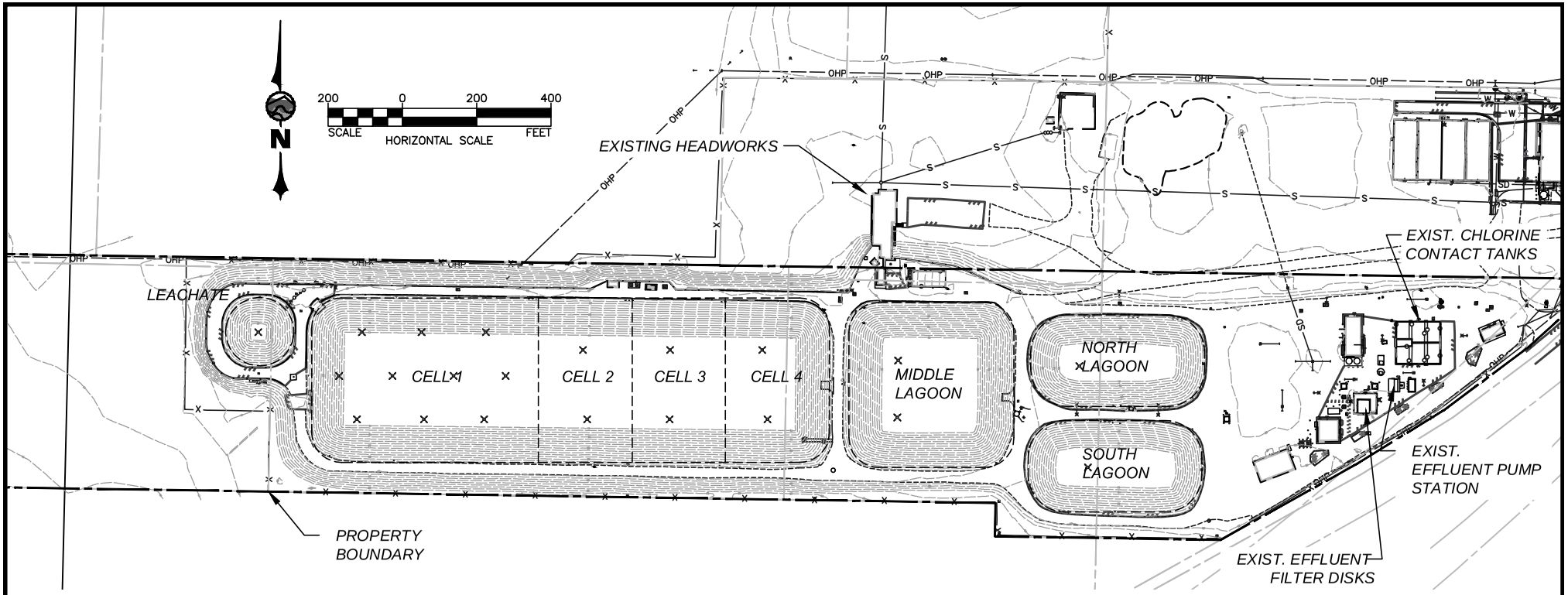
When the City upgraded its wastewater plant in 1996, completing construction in 1998, the treatment process “Dual Power Aerated Lagoon” was considered developmental technology by DOE. A dual power aerated lagoon process is a multi-cell lagoon system with a single completely mixed first cell followed by a series of equal volume partially mixed cells. The first lagoon or cell has high powered aeration to keep solids fully mixed in suspension. Subsequent cells have lower powered aeration and are partially mixed to allow settling of sludge.

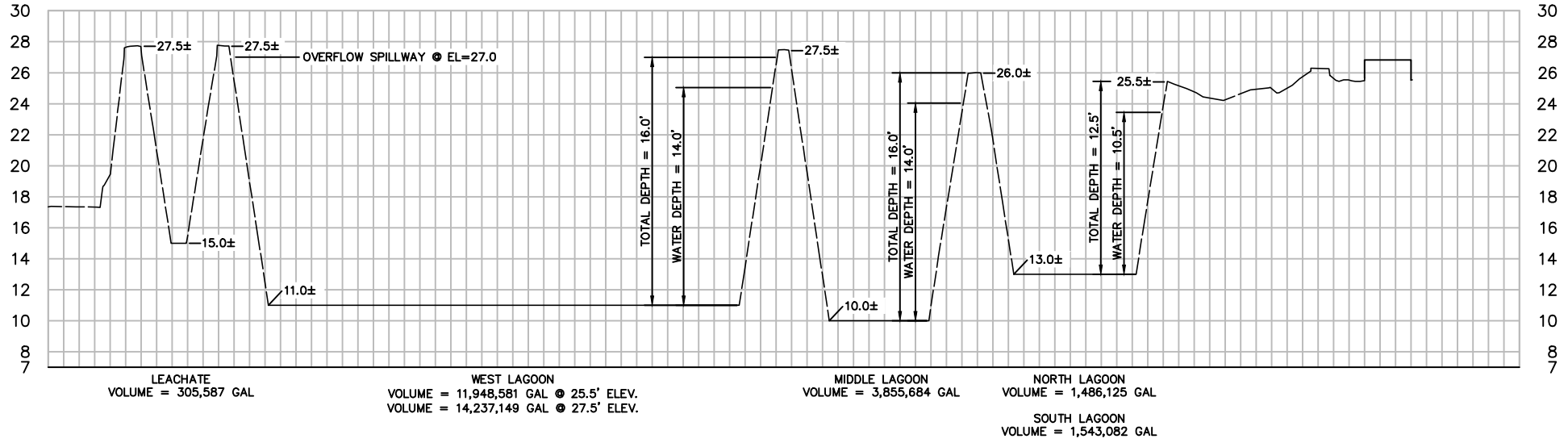
The WWTP is located in Whatcom County. A location map is shown in Figure 1-1.

A map of the existing site plan is shown in Figure 1-2.

Figure 1-1: Ferndale WWTP Location Map







Wilson
SURVEY/ENGINEERING
WILSON ENGINEERING, LLC
805 DUPONT STREET
BELLINGHAM, WA 98225
(360) 733-6100 • FAX (360) 647-9061
www.wilsonengineering.com

CITY OF FERNDALE

FERNDALE WASHINGTON

WWTP FACILITIES PLAN
FIGURE 1-2: EXISTING WWTP SITE PLAN

DATE 3-15-16
SCALE AS SHOWN
JOB NO. 2014-36

FIG. 1-2

Demography and Land Use

General City Boundary Information

The City of Ferndale boundary includes areas in northwestern Whatcom County along the Nooksack River and Interstate-5. The extents of the City's existing boundaries are shown on Exhibit A. The City boundaries encompass a total area of approximately 4,300 acres. An additional 1,200 acres are identified as Urban Growth Area (UGA). The City's population is estimated at 11,210 (2016). For the purposes of consistency with population projections within the both the City of Ferndale and Whatcom County Comprehensive Plans, a 2036 population projection of 19,591 (including both the Ferndale City limits and unincorporated Urban Growth Area) has been used in this study based on a growth rate of 3.0 percent. The horizon year for this study runs to 2036, at which time the population would be approximately 19,591 (growth rate of 3.54 percent). The community consists of a mix of residential, commercial, and industrial land uses.

The City Comprehensive Plan land use and zoning maps that are presented in Appendix E are up-to-date as of the publication of this plan and are included in this plan for convenience only. The official Comprehensive Plan Map and the official City of Ferndale Zoning Map are maintained by the City's Community Development Department and current versions are available from them.

Existing Sewer Service Areas

The City of Ferndale's sewer service area includes the area located within the City limits and two small areas outside of the City limits. The areas outside of the City limits are the Bellaire Estates subdivision located on the north side of Smith Road, and the area at the intersection of Smith Road and Northwest Avenue. These areas were connected to the City's sewer system in 1985 and 1994, prior to the establishment of the final Urban Growth Area boundaries in 1997. As the two areas are outside the current limits of the Ferndale Urban Growth Area and Urban Reserve, the City has no plans to expand sewer service beyond the areas already served with the exception of areas already annexed.

Proposed Sewer Service Areas

The City of Ferndale municipal code prohibits the extension of public sewer connections outside of the City limits of Ferndale, including the unincorporated Urban Growth Area, with the exception of emergencies (City Code 13.38.070). Areas must complete the annexation process before they can be served by City sewer. The areas anticipated for future sewer service have been identified and included in the City's Urban Growth Areas. These areas are identified in the City Comprehensive Plan land use and zoning maps in place at the time of adoption of this plan and are shown in Appendix E.

Scope of Plan

This document is organized into the following chapters:

Chapter 1: Background Information. This chapter contains background of the project, purpose, and scope of the report.

Chapter 2: Regulatory Requirements. The purpose of this section is to identify the federal, state, and local regulations that affect the planning and design of facility improvements.

Chapter 3: Flows and Loadings. This section describes and analyzes the existing and future flows and loadings to the wastewater treatment facility through a 20-year planning period (2036).

Chapter 4: Wastewater Treatment Facility Evaluation. The purpose of this section is to evaluate the existing WWTP and its components with respect to capacity, reliability, and redundancy.

Chapter 5: Wastewater Treatment Alternatives. The purpose of this section is to identify and describe the treatment alternatives to the existing facilities.

Chapter 6: Recommended Improvements. The purpose of this section is to identify and describe the recommended improvements to the existing facilities.

Chapter 7: Financial Information. The purpose of this section is to identify and describe the construction and operation costs associated with the existing and recommended facility improvements.

Chapter 8: Water Reclamation and Reuse Evaluation. The purpose of this section is to evaluate water reclamation and reuse potential, requirements and alternatives for the City of Ferndale WWTP.

2.0 - REGULATORY REQUIREMENTS

The purpose of this section is to identify the federal, state, and local regulations that affect the planning and design of facility improvements. The City of Ferndale's existing WWTP and outfall are located in Washington State and are therefore regulated by the Department of Ecology.

Federal Clean Water Act – NPDES

The National Pollutant Discharge Elimination System (NPDES) is part of the Clean Water Act. Most NPDES permits have a five-year life span, and they place limits on the quantity and quality of discharged pollutants. As a municipal wastewater treatment facility, the City of Ferndale's WWTP is regulated by the NPDES issued by the Department of Ecology. The City's current NPDES permit (Appendix B), No. WA-002245-4, was issued on July 15, 2014 and expires July 31, 2019.

The NPDES permit requires a facility plan when flows or waste loads entering the WWTP exceed 85% of design criteria or the projected plant flow or loading would reach design capacity within five years. Loads have exceeded 85% of the design criteria in the last 2 years. This Facility Plan includes an evaluation of the WWTP existing conditions and provides recommendations for improving and maintaining adequate capacity to ensure long-term NPDES permit compliance. The current NPDES permit facility loading design criteria is:

Maximum Month Design Flow (MMDF)	3.23 MGD
$CBOD_5$ Influent Loading for Maximum Month	4490 lb/day
TSS Influent Loading for Maximum Month	5388 lb/day

State of Washington Biosolids Regulations – WAC 173-308

Under WAC 173-308 and the statewide general permit, the City of Ferndale applies biosolids on city-owned agricultural property immediately adjacent to (northwest of) the wastewater treatment plant. The application site is on 20 acres of farmland. The actual area of biosolids application is less than 14 acres, with the remaining area forming the vegetated buffers adjacent to property lines, surface water, residences, and wells. Additional biosolids not land applied are sent to the Tjoelker Farm beneficial use site.

Biosolids at the treatment facility are collected, treated, and stored at the bottom of the partial-mix aerated treatment lagoon cells. Biosolids are Class B (not treated to remove all pathogens). The existing biosolids production rate has ranged from 110 to 140 dry tons per year in the last five years. Table 2-1 shows the current Biosolids Production Rates.

Table 2-1: City of Ferndale - Biosolids Production Rates

Year	Biosolids Production (Dry Tons/Year)
2006	143
2007	100
2008	98.37
2009	90.58
2010	140.81
2011	110.54
2012	109.71
2013	115.61
2014	138.78
2015	115.00

During the construction of the new facilities existing biosolids will be removed from the West, Middle, North, and South lagoons. These biosolids will be land applied and hauled to the Tjoelker Farms beneficial use site.

National Environmental Policy Act (NEPA)

The National Environmental Policy Act (NEPA) requires assessing the environmental impacts of actions affecting federal lands, considering those impacts while making decisions, and disclosing those impacts to the public. Because the proposed sewer system will not be located on federally owned land, or utilize federal funds, an environmental review is not required by NEPA.

State Environmental Policy Act (SEPA)

The State Environmental Policy Act (SEPA), as presented in WAC 197-11-960, requires all governmental agencies to ensure that applicable environmental concerns are addressed in the process of project planning and documentation. Projects that have potential environmental impacts must complete a SEPA Checklist to satisfy planning and disclosure requirements. The City of Ferndale is a SEPA lead agency for projects occurring within City limits. It is anticipated that a SEPA Checklist will be required to be submitted for review by the City. The checklist will be submitted during the design phase of the project in conjunction with the sewer comprehensive plan. Per phone conversations with Jori Burnett, City of Ferndale Planning Department, in the spring of 20016 he indicated that the assessment of potential project impacts to the floodplain could be presented as an expanded SEPA discussion.

Archaeological and Cultural Resources Survey

In November 2005, the Governor of Washington signed Executive Order 05-05 which requires state agencies to review capital construction projects for potential impacts to cultural resources. This review is to be done in conjunction with the Department of Archaeological and Historic Preservation (DAHP) and any affected Tribes. It is anticipated that an archaeological and cultural resources review will be completed during the design phase of the WWTP improvements project. During design, the City of Ferndale will contract with a state approved archaeologist to perform

the survey and to consult with the DAHP and affected Tribes. The archaeologist's report will include survey findings as well as any recommended mitigations such as construction monitoring.

Shoreline Permitting in the State of Washington

The Shoreline Management Program manages shorelines through planning for and supporting all reasonable and appropriate uses of shoreline areas. The Washington State Shoreline Management Act of 1971 (SMA) defines shorelines as including the following:

- Lakes of 20 acres or greater, including reservoirs
- Streams with a mean annual flow greater than 20 cubic feet per second
- Marine waters
- Areas within 200 feet landward of the Ordinary High Water Mark (OHWM) surface waters described above
- Marshes, bogs, swamps and river deltas associated with the surface waters described above

Shoreline permits are required from the local jurisdiction for any sizable development or activity within the shoreline area. The City of Ferndale Community Development Department administers the shoreline master program for projects located within City limits. A portion of the improvements outlined in this Facility Plan is located within the 200 feet of the Nooksack River OHWM. The permitting process will occur during design of the WWTP improvements.

Hydraulic Project Approval (HPA)

The Washington Department of Fish and Wildlife administers the Hydraulic Project Approval process for projects that use, divert, obstruct or change the nature of flow or bed of any freshwater or marine water of the State of Washington. Hydraulic Project applications must include plans and specifications for the proposed action near or below the ordinary high water mark (OHWM). Hydraulic Project applications are submitted using the Joint Aquatic Resources Permit Application (JARPA) form. An electronic application system is offered by WDFW. An HPA permit is not anticipated for this project.

See Appendix G for Floodplain Evaluation.

Stormwater Permitting in the State of Washington

As part of the federal Clean Water Act, the Department of Ecology administers the State of Washington's Construction Stormwater General Permit. Stormwater is considered a point source of water pollution and therefore an NPDES permit is required. The State of Washington has developed a General Permit for Construction Stormwater.

Stormwater permit coverage is required if the project disturbs more than one-acre of land and the possibility exists of stormwater runoff entering waters of the state or conveyance systems that deliver stormwater to waters of the state.

It is anticipated that the construction of the improvements to the WWTP will disturb more than one-acre of land. As well, due to the proximity to the Nooksack River and the topography of the site, the project has the potential of conveying construction stormwater to these waters. A

Construction Stormwater General Permit will be obtained for the project. Due to the lengthy process for permit approval it is anticipated that the City of Ferndale will initially obtain the permit and transfer ownership to the Contractor prior to the start of construction.

In addition, after construction it is likely that all minimum requirements of the 2012 Stormwater Manual (which will likely be adopted by the City before construction begins) will be required.

City of Ferndale Codes

The City of Ferndale's treatment facility is located entirely within its incorporated limits. It is anticipated that the following permits will be required by the City of Ferndale:

- Building Permit (to include plumbing and electrical)
- Land Disturbance Permit
- Shoreline Permit
- SEPA Checklist

Regulatory Summary

A summary of the regulatory requirements for improvements to the City of Ferndale WWTP is presented in Table 2-2. An expanded description of permitting requirements is presented in Appendix H.

Table 2-2: Summary of Regulatory Requirements

Permit/Report	Agency	Comments
NPDES Permit	EPA	Expires 7/31/2019.
Biosolids Permit	Ecology	Will be completed by City of Ferndale during design phase.
NEPA	Council on Environmental Quality (CEQ) - Federal	No work proposed for federal land. Thus, no NEPA review required.
SEPA	City of Ferndale	To be submitted during design phase.
Cultural/Archaeological Survey	DAHP	To be completed during design phase.
Shoreline Permit	City of Ferndale	To be submitted during design phase.
HPA	WDFW	Not required for project.
Construction Stormwater Permit	Ecology	To be submitted during design phase.
Building, Electrical and Plumbing Permits	City of Ferndale	To be submitted during design phase.

3.0 - FLOWS AND LOADINGS

This section describes and analyzes the existing and future flows and loadings to the wastewater treatment facility through a 20-year planning period (2036). Quantifying the existing loading to the WWTP is necessary to determine the level at which future flows and loadings will be used to size design upgrades to the WWTP that will be required to meet the demands of future growth and regulatory requirements.

Existing Wastewater Flows

All service connections in the City's sewer system, with a few exceptions, are un-metered. Wastewater flow is continuously measured at the WWTP headworks (influent) and at the WWTP chlorine contact basin (effluent). A relatively small quantity of dilute industrial wastewater is discharged directly to the leachate lagoon. The WWTP headworks was constructed in 1998. It included two Parshall flumes for influent flow measurement. However, the Parshall flumes did not function correctly and the City deemed the influent flow measurement data as unusable. The Parshall flumes were replaced with two V-notch weirs (completed January 2011), which now provide accurate influent flow data. Therefore, flow data for years prior to 2011 consist only of effluent flows. It should be noted that because of the large freeboard volume of the lagoons, the *effluent peak flows* may be lower (or higher) than *influent peak flows* depending on how the system is operated. Influent flow data includes filter backwash flows – influent flow rate is consistently higher than effluent flow rate (by an average of 0.2 MGD or about 11%).

Annual Average

Table 3-1 presents the annual average wastewater flows as recorded at the City WWTP effluent during the years 2007 through 2015. Also presented in Table 3-1 are estimated population and the calculated annual average per capita flow rates.

Table 3-1: Ferndale WWTP Annual Average Flow

Year	Flow (MGD)	Population	Per Capita (GPCD)
2007	1.53	10,540	145
2008	1.49	10,800	138
2009	1.58	11,080	143
2010	1.60	11,441	140
2011	1.73	11,813	146
2012	1.97	12,198	162
2013	1.90	12,595	151
2014	2.02	13,005	155
2015	1.62	13,249	122
Average =	1.72	11,858	145

Monthly Average

Table 3-1 presents monthly average flow measured at the WWTP effluent for the years 2007 through 2015. The monthly average wastewater flows vary from 1.02 MGD to 2.78 MGD.

Table 3-1: Ferndale WWTP Monthly Average Flow

Month/ Year	Flow (MGD)								
	2007	2008	2009	2010	2011	2012	2013	2014	2015
Jan	2.41	1.83	2.57	2.08	2.18	2.16	2.57	2.18	2.67
Feb	1.95	1.78	1.57	1.75	2.14	2.31	2.10	2.18	2.09
Mar	2.45	1.63	1.77	1.71	1.94	2.45	2.53	2.75	1.97
Apr	1.57	1.53	1.67	1.79	2.35	2.16	2.16	2.05	1.66
May	1.33	1.40	1.58	1.51	2.12	1.70	1.75	2.02	1.30
Jun	1.16	1.27	1.14	1.57	1.52	1.68	1.65	1.61	1.15
Jul	1.07	1.06	1.05	1.14	1.33	1.59	1.48	1.49	1.06
Aug	1.03	1.18	1.06	1.06	1.26	1.40	1.42	1.49	1.06
Sep	1.02	1.15	1.12	1.43	1.47	1.30	1.47	1.51	1.19
Oct	1.25	1.18	1.42	1.37	1.27	1.68	1.56	1.89	1.25
Nov	1.26	1.90	2.22	1.66	1.56	2.45	2.00	2.40	1.78
Dec	1.88	1.91	1.83	2.18	1.65	2.78	2.16	2.63	2.20
Annual Average =	1.53	1.49	1.58	1.60	1.73	1.97	1.90	2.02	1.62

Peak Month, Peak Day and Peak Hour

Table 2 summarizes peak month and peak day flows as recorded at the WWTP effluent for the years 2007 through 2015. The average annual peak month flow for the period is 2.44 MGD and the average annual peak day flow is 4.72 MGD. There is no apparent temporal trend to the peak month and peak day flows over the period of data presented. Peak instantaneous flows to the wastewater treatment plant during larger rain events ranged from 5 MGD to 7 MGD during 2011-2015. Peak instantaneous influent flows were not measured prior to 2011.

Table 2-3: Ferndale WWTP Peak Month and Peak Day Flows

Year	Peak Month Flow (MGD)	Month	Peak Day Flow (MGD)	Month
2007	2.45	Mar	4.33	Mar
2008	1.91	Dec	3.22	Nov
2009	2.57	Jan	7.27	Jan
2010	2.18	Dec	6.64	Dec
2011	2.35	Apr	3.61	Apr
2012	2.78	Dec	3.75	Dec
2013	2.57	Jan	5.14	Jan
2014	2.75	Mar	3.77	Mar
2015	2.67	Jan	4.77	Jan
Average =	2.47	Average =	4.72	
Maximum =	2.78	Maximum =	7.27	
Percent of Limit =	86%		--	
Permit Limit =	3.23		--	

Existing Wastewater Loadings (CBOD, TSS, TKN, Ammonia)

The WWTP's influent wastewater quality is characterized below in terms of 5-day Carbonaceous Biochemical Oxygen Demand (CBOD) and Total Suspended Solids (TSS) (Table 3-3). CBOD and TSS are the primary concern due to their influence on sizing and selection of wastewater treatment facilities. Additional wastewater quality characteristics discussed briefly are Fats, Oils, and Grease (FOG), Total Kjeldahl Nitrogen (TKN) and Ammonia.

Table 3-3: Ferndale WWTP Influent CBOD and TSS Loading

Year	Average Daily CBOD (lb/day)	Peak Month CBOD (lb/day)	Average Daily TSS (lb/day)	Peak Month TSS (lb/day)
2007	2,693	3,356	2,652	4,115
2008	2,734	3,695	2,564	3,414
2009	3,003	3,917	2,864	3,812
2010	2,990	3,432	3,450	4,591
2011	3,365	3,809	3,207	3,938
2012	3,150	3,613	3,375	4,246
2013	3,089	3,518	3,410	3,790
2014	3,535	4,018	3,639	4,054
2015	3,414	3,422	3,163	3,754
Average =	3,108	3,642	3,147	3,968
Maximum =	3,535	4,018	3,639	4,591
Percent of Limit =	68%	89%	79%	85%
Permit Limit =	4,490	4,490	5,388	5,388

Peak month influent CBOD loading is currently about 3,850 lb/day or about 86% of the permit limit. Peak month influent TSS loading is currently about 4,250 lb/day or about 79% of the permit limit.

Fats, oils, and grease (FOG) loadings are controlled by ordinance and are not problematic, except for infrequent slug loads.

Peak month influent TKN and ammonia loading are currently about 900 lb/day and 670 lb/day, respectively. The WWTP oxidizes virtually all ammonia during May-October via nitrification. However, the WWTP cannot remove ammonia during the cooler months. During the remaining months of the year, nitrification ceases and ammonia is removed only partially by uptake, settling, and volatilization. During the cooler months, the outfall mixing zone is sufficient to meet receiving water quality standards at the current design flow. If cold season ammonia removal is ever to be required, then either an additional treatment process will need to be added or the treatment process changed to activated sludge. In addition, if the WWTP capacity is upgraded in the future to a higher flow capacity, then an ammonia limit may be enforced (due to a reduced mixing zone dilution factor). The proposed treatment solution presented in Chapter 6 would address this potential permit limit.

Future Projected Wastewater Flows

Wastewater flow is projected to increase at 3 percent per year through 2020 and at 3.53 percent through 2036 (this is higher than the population growth rate due to higher expected increases in commercial/industrial). These are conservative flow estimates (conservative being high in this case) based on the assumption that per capita rates of water consumption and I & I will not decrease. Table 3-4 displays the projected average and peak flows to the WWTP from the collection system.

Table 3-4: Ferndale WWTP Projected Flows

	2015	3 years 2019	8 years 2024	18 years 2034	20 years 2036
ERUs	5,413	6,522	7,263	8,947	9,316
Projected Population	13,249	14,084	15,578	18,885	19,591
Projected Average Daily Flow (MGD)	2.00	2.23	2.48	3.05	3.18
Residential (MGD)	*1.11*	*1.23*	*1.36*	*1.65*	*1.71*
Comm./Indust./Instit. (MGD)	*0.17*	*0.20*	*0.23*	*0.31*	*0.33*
Infiltration and Inflow (MGD)	*0.72*	*0.80*	*0.89*	*1.10*	*1.14*
Projected Peak Month Flow (MGD)	2.6	2.9	3.2	4.0	4.1
Projected Peak Day Flow (MGD)	7.0	7.8	8.7	10.7	11.1
Projected Peak Hour Flow (MGD)	9.4	10.5	11.6	14.3	14.9

Peak month flow is projected to increase to the permit limit of 3.23 MGD by the year 2025 (see Figure 3-1). Therefore, per the permit requirement, planning for increasing WWTP capacity or

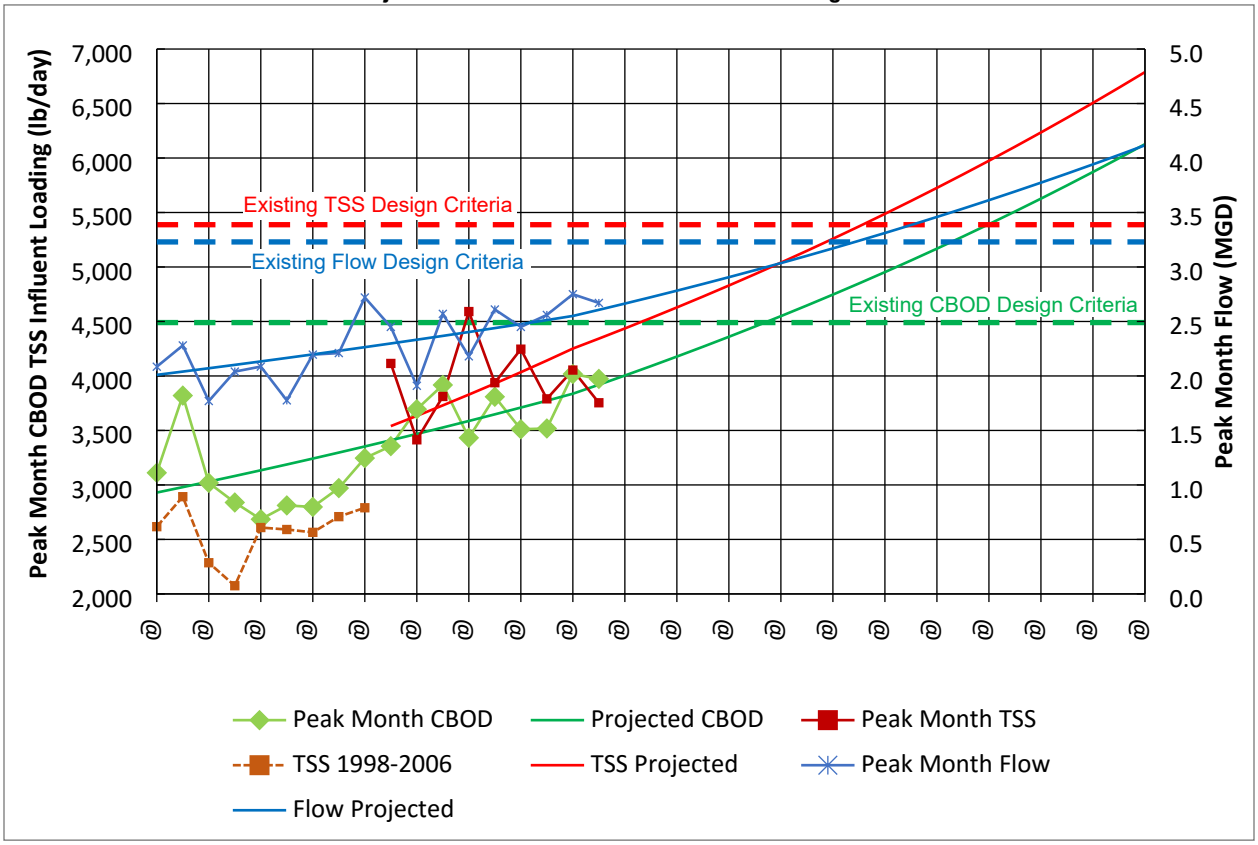
rerating capacity ***for flow*** began in 2015. Of course, this threshold could be reached sooner or later depending on many factors (I & I control being a major factor).

ERUs (Equivalent Residential Units) are calculated as shown in the example below for 2015 (Table 3-5). An Equivalent Residential Unit is equal to the average flow from a single family residence. For other connection types, the number of ERUs is calculated by multiplying the ratio of flow from that type to the flow from the average single family residence. The ratio for apartment units is 0.667. The ratio for all other connection types averages 2.9, although the actual number of ERUs per connection is calculated based on metered volume of water used.

Table 3-5: Year 2015 ERUs

Connection Type	No. of Connections	ERU per Connection	ERUs
Full time single family residential	3,836	1	3,836
Full time residential apartment	1,200	0.667	800
Commercial/Institutional	268	2.9	777
Total			5,413

Figure 3-1: Existing Peak Month Influent Loading and Flow 1998-2015.
Projected Peak Month Influent Flow and Loading 2015-2036.



Future Projected Wastewater Loadings (CBOD, TSS)

Influent loadings of CBOD and TSS are expected to increase proportionally with increase in flow. Table 3-6 displays the projected loadings to the WWTP compared to the permit limits. Peak month CBOD is projected to increase to the permit limit of 4,690 lb/day by the year 2021. Peak month TSS is projected to increase to the permit limit of 5,388 lb/day by the year 2025. Therefore, per the permit requirement, planning for increasing WWTP capacity or rerating capacity for CBOD and TSS began in 2015 (i.e., five years prior to reaching capacity).

This Facility Plan details all of the alternatives and the selected approach to upgrading the WWTP. The planned date for completion of the WWTP upgrade is 2019.

In looking at Figure 3-1, it is plain to see that there was a sudden increase in TSS loading beginning in 2007. The explanation for this is, due at least in part to operational changes – the use of the filter system was increased dramatically at this time. The filter capacity was also doubled in 2008. Therefore, the amount of solids recycled back to the headworks was substantially increased, which artificially elevated the influent TSS loading and probably CBOD to a lesser extent. For example, in December 2010, the TSS loading was 4,514 lb/day and the TSS concentration was 284 mg/L. If 10 mg/L of coagulant are added and 30 mg/L of TSS removed, then 40 mg/L are returned to the headworks. In this example, the influent TSS load is erroneously measured as 16 percent higher than the actual load. Therefore, it is recommended that, for the

WWTP upgrade, the backwash water be rerouted such that it bypasses the flow measurement weirs and the influent composite sampler.

Table 3-6: Ferndale WWTP Projected Loadings

	Permit Limits	Existing 2015	3 ysears 2019	8 years 2024	18 years 2034	20 years 2036
Connections (ERUs)	--	5,413	6,522	7,263	8,947	9,316
Population Estimate	--	13,249	14,274	15,668	18,875	19,591
Projected Average CBOD (lb/day)	--	3,500	3,917	4,362	5,373	5,594
Projected Peak Month CBOD (lb/day)	4,490	3,850	4,309	4,798	5,910	6,154
Projected Average TSS (lb/day)	--	3,600	4,029	4,486	5,526	5,754
Projected Peak Month TSS (lb/day)	5,388	4,250	4,756	5,296	6,524	6,793

4.0 - WASTEWATER TREATMENT FACILITY EVALUATION

The purpose of this section is to evaluate the existing WWTP and its components with respect to capacity, reliability, and redundancy.

Wastewater Treatment Plant Performance

Treatment Process

A schematic diagram and hydraulic profile of the existing WWTP process is included in Figures 4-1 and 4-2. Wastewater influent enters the facility and is lifted to the top of the headworks by one or two Archimedes screw pumps (3 pumps total). The influent pump capacity is designed for 35 MGD (2 pumps) of flow with one pump as backup. This is far in excess of existing peak flows (less than 10 MGD). The influent raw wastewater flows by gravity through a mechanical screen (some or all flow may also be directed through a manual bar screen that is parallel to the mechanical screen) and through one or two V-notch weirs, which are used to measure influent flow rate. Wastewater then flows by gravity 800 feet through parallel 30-inch and 24-inch pipes to the dual-powered aerated lagoon (DPAL).

The first cell (Cell 1) of the DPAL has ten 15-HP mechanical surface aerators, which completely mix the wastewater and provide near complete oxidation of the organic load (i.e., the influent CBOD and, in summer, NBOD). The oxidized wastewater then flows in series through three partial-mix cells (Cells 2, 3, and 4), which are separated by hydraulic curtains and are equipped with two 7.5-HP mechanical surface aerators each (6 total). Suspended solids settle out in the partial-mix cells and are further digested before removal by dredging at one to two year intervals.

The DPAL can be temporarily bypassed for maintenance (during the dry season), if necessary, by directing flow to the other three lagoons for treatment (Middle and South/North Lagoons). The Middle Lagoon is complete-mix with four 25-HP mechanical surface aerators and the North and South Lagoons are partial-mix each with two 5-HP mechanical surface aerators.

By design, clarified wastewater flows out of the DPAL via an adjustable circular weir and through a 30-inch pipe either to the filter structure for further suspended solids removal or directly to disinfection via the filter bypass structure. In actual operation, DPAL treated wastewater discharges to the Middle Lagoon and then to the North/South Lagoons for additional treatment prior to either filtering or disinfection. The DPAL does not consistently remove enough TSS to prevent overloading of the filter system, thus necessitating use of the Middle and South/North Lagoons.

All or some of the flow can be routed through the chemical addition vaults, where alum and/or polymer can be added, and then to the filter system. The filter system consists of 22 submerged cloth disk filters, which provide a nominal 10-micron filtration. Filter backwash flow (equal to approximately 2-5 percent of filter influent flow) is pumped back to the headworks for treatment. During influent sample collection, this filter backwash is included in the sample collection and the flow measurement. Therefore, influent flow measurements and TSS and CBOD loading measurements are overestimated.

The last treatment step consists of disinfection. The clarified and filtered water flows through the chlorine-mixing vault for addition of chlorine (chlorine from gas cylinders). The chlorinated wastewater flows through the chlorine contact basin, which has a design peak month flow contact

time of 119 minutes. Disinfected effluent is dechlorinated with sulfur dioxide, which is dosed using inline oxidation reduction potential (ORP) as the feedback control parameter. Effluent flow rate is continuously gauged at the V-notch weir in the chlorine contact basin.

Effluent normally discharges via gravity to the Nooksack River. A lift station boosts the effluent head in the event of either high WWTP flows or high river level. Effluent discharges through a 1500-lineal foot, 30-inch pipeline to the Nooksack River. The outfall consists of a single 30-inch diameter pipe, which is submerged and located at the toe of the riverbank.

Existing Staffing

The WWTP is staffed from 7 AM to 4 PM seven days a week with two of three certified operators and with 24-hour call-out. The lead operator is Group III, and the other operators are Group II and Group I. The WWTP must have at least a Group II operator in reasonable charge of daily operation.

Discharge Outfall

Secondary treated and disinfected effluent is discharged from the facility via a submerged single port outfall into the Nooksack River. The permitted mixing zone extends 300 feet downstream from the outfall. The permitted mixing zone allows for the following dilution factors (DF) when calculating effluent limits:

Acute Aquatic Life Criteria: DF = 4
Chronic Aquatic Life Criteria: DF = 29

Solid Wastes

The treatment facilities remove solids during the treatment of the wastewater at the headworks (grit and screenings), in addition to incidental solids (rags, scum, and other debris) removed as part of the routine maintenance of the equipment. Grit, rags, scum, and screenings are drained and disposed of as solid waste at the local landfill. Class B biosolids are treated by aerobic and anaerobic digestion within the partial-mix cells. Biosolids are land applied under a permit from the Whatcom County Health Department and per the General Permit for Biosolids Management (DOE). Ferndale removes Class B biosolids from the partial-mix cells on an annual basis and disposes of the majority of the biosolids by subsurface injection into a nearby field owned by the City. Biosolids in excess of the field's agronomic capacity are hauled to a privately owned and permitted land application site.

Design Criteria

Under WAC 173-220-150 (1)(g), influent flows and waste loadings must not exceed approved design criteria (4-1).

Table 4-1: Design Criteria for Ferndale Wastewater Treatment Plant

Parameter	Design Quantity
Maximum Month Design Flow (MMDF)	3.23 MGD
Monthly Average Dry Weather Flow	1.95 MGD
Peak Hour Design Flow (PHDF)	28.0 MGD
Carbonaceous Biochemical Oxygen Demand (CBOD)	4,490 lb/day
Biochemical Oxygen Demand (BOD)*	5,388 lb/day*
Total Suspended Solids (TSS)	5,388 lb/day

* Not a Permit Criterion

Current Wastewater flows to the treatment plant are approximately:

Dry Weather:	1.5 MGD
Average Annual:	2.0 MGD (2.02 MGD max value recorded)
Peak month:	2.65 MGD (2.78 MGD max value recorded)

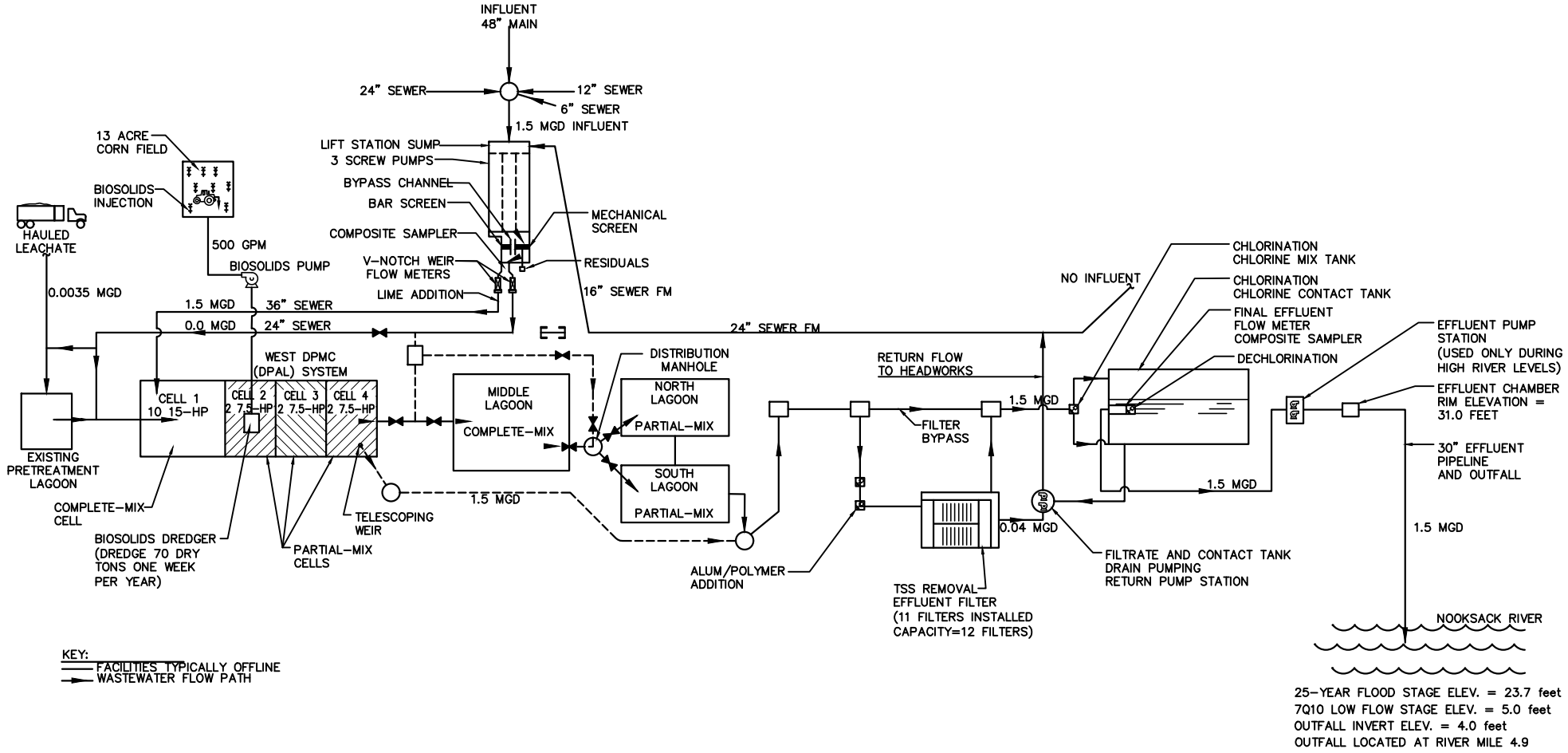
Therefore, the treatment plant is currently operating below design capacity. However, based on the flows and loads projected in Chapter 3, the existing wastewater facilities will reach current design criteria limits as soon as the year 2022 or sooner.

Industrial Wastewater Producing Facilities

The WWTP receives wastewater from two permitted industrial contributors: RECOMP and Olivine Corporation municipal solid waste incinerator. The flow from the two sources is considered relatively minor in quantity and quality, is not discussed in detail, and does not require special analysis. There are many other small industrial dischargers in the service area, but none are classified as Significant Industrial Users (i.e., discharging over 25,000 GPD).

RECOMP of Washington is a twenty-acre site located along Slater Road in the southern portion of the City sewer service area and east of the Nooksack River. RECOMP of Washington is a municipal solid waste transfer and recycling station and also discharges leachate to the sewer from a closed ash monofill (from past solid waste incineration). The leachate is held briefly in a lined, aerated lagoon before it is pumped to the City's sewer system. The WWTP also receives landfill leachate trucked to the plant from Olivine Corporation's closed ash monofill. No other industrial sources are regulated by discharge permits.

Landfill leachate from Olivine Corporation is periodically hauled via tanker to the WWTP for disposal. Olivine Corporation is the owner of a closed municipal solid waste incinerator ash monofill.



Wilson
SURVEY/ENGINEERING
WILSON ENGINEERING, LLC
805 DUPONT STREET
BELLINGHAM, WA 98225
(360) 733-6100 • FAX (360) 647-9061
www.wilsonengineering.com

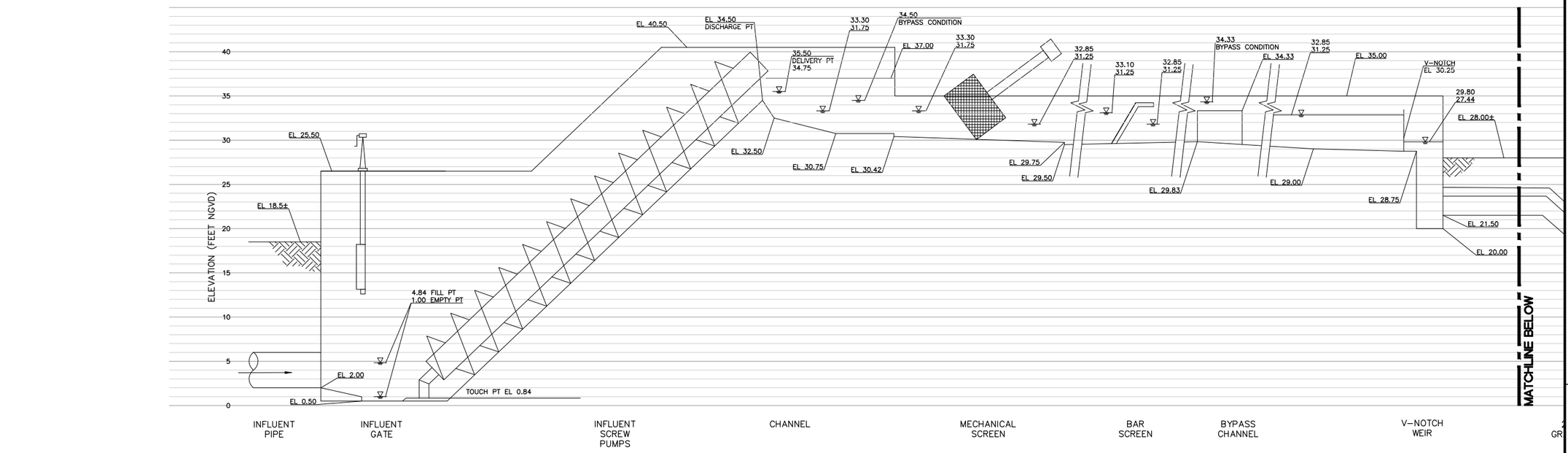
CITY OF FERNDALE

FERNDALE WASHINGTON

WWTP FACILITIES PLAN
FIGURE 4-1: EXISTING WWTP FLOW SCHEMATIC

DATE 3-15-16
SCALE AS SHOWN
JOB NO. 2014-36

FIG. 4-1



NOTES:

WILSON ENGINEERING, LLC
805 DUPONT STREET
BELLINGHAM, WA 98225
(360) 733-6100 • FAX (360) 647-9061
www.wilsonengineering.com
Wilson
SURVEY/ENGINEERING

DESIGNED BY | DRAWN BY | CHECKED BY

CITY OF FERNDALE
FERNDALE WASHINGTON
WASTEWATER TREATMENT PLANT
FIGURE 4-2: EXISTING WWTP HYDRAULIC PROFILE

DATE	SCALE	JOB NUMBER
3-15-16	AS SHOWN	2014-036

SHEET FIG 4-2 | PAGE 1 OF 1

Facility Capacity

Table 4-3 below shows the capacity of the major components of the existing WWTP. Based on these capacities and the projected peak flows, the table also shows the components which require capacity upgrades.

Table 4-3: Existing WWTP Component Hydraulic Capacity

Component (No.)	Existing Capacity	Status
Influent Pumps (3)	52.5 MGD (17.5 MGD each)	Exceeds projected flows
Backup Influent Trailer Pump	3.0 to 5.4 MGD 3.6 MGD Design	Backup Only
Mechanical Screen (1)	18 MGD	Exceeds projected flows, redundancy recommended.
Bar Screen (1)	18 MGD	Exceeds projected flows
Influent Flow Measurement (2)	18.2 MGD (9.1 MGD each)	Exceeds projected flows
Influent pipes: 30-inch/24-inch	22 MGD/12 MGD	Exceeds projected flows
DPAL (Dual-Powered Aerated Lagoon)	3.23 MGD (Peak Month)	Upgrade Recommended
	11.0 MGD (Peak Day)	Exceeds projected flows
	28. 0 MGD (Peak Hour)	Exceeds projected flows
	12.6 MGD (Peak Hour Effluent)	Upgrade Recommended
Filter System (22 Disk Filters)		
Hydraulic Loading	4.29 MGD (Average)	Exceeds projected flows
	8.53 MGD (Peak)	Upgrade Recommended
Solids Loading	2,163 lb/day (Average)	
	4,253 lb/day (Peak)	
Backwash Return Flow Pump	0.86 MGD (600 GPM)	
Chlorine Contact Tanks (2) (includes dechlorination)	6.37 MGD (Peak Mo)	Exceeds projected flows
	16.2 MGD (Peak Hr)	Exceeds projected flows
Effluent Flow Measurement (1)	15.8 MGD	Exceeds projected flows
Effluent Pump Station (4 pumps)	Firm cap. 12.6 MGD (3 pumps) 16.8 MGD (4 pumps)	Exceeds projected flows, redundancy recommended.
Effluent Pipeline: 30-inch	16.2 MGD	Exceeds projected flows

Headworks Evaluation

The headworks components are considered to be the 3 influent screw pumps, backup influent pump, mechanical screen, manual bar screen, and influent flow measurement.

Influent Screw Pumps

The three existing influent screw pumps have a total capacity of 52.5 MGD or 17.5 MGD each. This allows for the entire projected peak hourly flow to be handled by one single screw pump and gives triple redundancy for the pump system. The existing pumps are well maintained and in fair condition. It is recommended that the interior screw pump channels be painted with an epoxy system to extend the life of the concrete channels and protect against the corrosive environment of the raw wastewater. It is also recommended that the existing influent screw pumps be integrated with the SCADA system and new plant generator. The existing pumps are connected to the existing WWTP generator backup system, however there have been problems starting pumps when on backup power in recent years, and the system has proven to be unreliable. This has required the installation of a backup gas powered trailer pump to handle influent pumping when power is lost. This backup trailer pump is not capable of handling peak flows and should be replaced with an adequately sized and reliable dedicated headworks generator backup power system. An electrical evaluation of the headworks system is recommended during the design phase of the new wastewater treatment plant.

Backup Influent Trailer Pump

A gas powered backup influent trailer pump was installed in 2015. This pump was designed to handle 3.6 MGD, and has a variable speed drive which can throttle flow rates between 3.0 and 5.4 MGD (depending on wet well water elevation). This backup pump was installed due to the influent screw pumps not operating reliably when connected to generator backup power. Since the backup trailer pump cannot meet peak flows and requires manual operation, it is recommended that the existing influent screw pumps electrical, starter, and generator system be upgraded to provide a higher level of reliability. This would allow the backup trailer pump to act as a backup to the generator system or used as an emergency pump elsewhere in the City. No improvements are recommended to the backup influent trailer pump.

Mechanical Screening

The existing mechanical screen was installed in 2013. The screen is a Lakeside Raptor mechanical screen with 3/8inch openings and a maximum hydraulic capacity of 18 MGD. The existing screen is well maintained and in good condition and will meet the projected peak flows with the existing screen size. However, the proposed Extended Aeration treatment process requires a maximum screen opening of 6 mm (0.24 inches). Therefore, it is recommended that the screen itself be replaced with a 6 mm maximum opening screen. In addition, it is also recommended that a second screen be installed for redundancy in a new channel adjacent to the existing screen. Currently if the existing screen needs to be taken offline for maintenance, wastewater will be directed to a manual 3/8-inch bar screen. A second mechanical screen will allow for additional redundancy if either screen needs to be taken offline. It is recommended that both screens be integrated with the SCADA system for the plant and connected to backup generator power for operation during loss of utility power.

Influent Flow Measurement: The influent flow is measured at the headworks with two v-notch weirs located after mechanical screening. These weirs can handle 9.1 MGD each or 18.2 MGD total. The hydraulic capacity of these weirs is well below the projected peak flows of this facilities plan, however, the weirs have been found to trap and fill with sediment. It is recommended that the existing weirs are removed, and new "open style" flow meters are installed and integrated with the SCADA system during construction of the new treatment plant.

Influent Piping

Two gravity pipes, 24 inch and 36 inch, connect the existing headworks to the DPAL system. Existing influent piping capacity equals approximately 48 MGD with both in operation. The existing influent piping is more than adequate for current and future peak flows. However, the proposed configuration for the new treatment plant piping would change this piping from influent piping to possible process piping or abandonment. It is recommended that these existing pipes be video inspected to determine their condition prior to construction of the proposed new facilities.

Existing Treatment System Evaluation

The existing treatment system is considered to be the Dual Powered Aerated Lagoons, the Disk Filter System, and the Chlorine Contact Tanks.

Treatment Plant Performance

The treatment plant is only able to meet effluent limits for the permitted influent flows and loadings through the addition of chemicals. Per design, the partial-mix lagoons are expected to produce effluent with a TSS less than 30 mg/L. The filter unit provides additional treatment as needed to ensure meeting the 30 mg/L discharge limit. However, this level of performance by the partial-mix lagoons is achieved only infrequently. Additional TSS removal is required. The Middle Lagoon and the North/South Lagoons are needed to provide the additional clarification needed. If the Middle Lagoon and the North/South Lagoons are bypassed, the high TSS from the partial-mix lagoons overloads the filter unit and meeting the 30 mg/L limit becomes difficult and excessive filter backwashing becomes necessary.

The aerobic treatment process in the complete-mix lagoon does well in removing soluble BOD, but does not form a floc that settles well. The floc can be characterized as either dispersed growth in which microorganisms do not form flocs but are dispersed, forming only small clumps or as pin floc (or pinpoint floc) which is small, compact, weak, roughly spherical flocs, the larger of which settle rapidly. Smaller aggregates settle slowly. Pin floc has a low sludge volume index (SVI) and a cloudy, turbid effluent.

As a filter aid, the operators have used Cesco Protect 7025 (aluminum chlorohydrate/proprietary polymer blend). However, using this as a filter aid requires a large quantity of the chemical and overtaxes the filters. Staff have found that adding the chemical to the lagoons helps to settle the TSS before it arrives at the filter unit and it enhances filtration as well.

The chemical addition dosing rate is approximately 30 mg/L (although it may be more or less depending on need). At the 2016 annual average daily flow of 2.0 MGD, the chemical usage is 91 tons/year or 500 lb/day. The annual cost is about $128,000/year or $350/day at $0.70/lb.

Approximately one-third to one-half of the aluminum chlorohydrate/proprietary polymer blend becomes biosolids which must be land applied on site or hauled to a land application site (30-45 tons per year). The added cost for this is $23,000 to $35,000 per year.

In addition, the performance of the existing plant will need to be improved to meet future anticipated effluent limits such as Total Nitrogen and Ammonia.

Effluent Disk Filter System

The existing Effluent Disk Filter System has 22 disks in fair condition. These disks have a hydraulic capacity of 4.39 MGD average flow and 8.53 MGD peak flow. The peak flow capacity is not adequate for the projected peak flows of 14.9 MGD. With the proposed treatment plant process these disk filters will be taken offline and replaced with an extended aeration activated sludge plant. It is recommended that the existing effluent filter basins be taken offline or reconfigured as a storage basin for onsite plant reuse water.

Chlorine Disinfection Contact Tanks

The existing Chlorine Contact System and Tanks are in fair condition and have the capacity to meet future average and peak flows. The system can handle 6.37 MGD peak month flow and 16.2 MGD peak hourly flow. However, the system is nearing 20 years old and requires constant operator attention. In addition, working with hazardous chemicals such as Chlorine and Sulfer Dioxide present safety concerns for the plant operators and public. It is recommended that the Chlorine disinfection system be replaced with a modern UV disinfection system. In the proposed plant upgrades, it is recommended that part of the existing chlorine contact tanks be converted to a UV disinfection channel, the remaining tanks would be decommissioned and filled.

Plant Piping Capacity

Existing piping on site ranges from 6 inches to 36 inches in diameter and anywhere from 2 to 40 years old. The majority of the piping was installed during the 1996 and 1998 Phase 1 and 2 upgrades, but some piping from the original 1974 plant are still in use. In most cases, the existing piping exceeds the projected peak flow of 14.9 MGD, however, given the age of most pipes and the plant configuration changes, the majority of pipes are recommended to be abandoned. For some pipes that may be repurposed, it is recommended that these pipes be inspected with video to verify condition.

Effluent Pump Station

Under normal conditions flow bypasses the effluent pump station through a 30” PVC pipe to the effluent chamber. This pipe has a capacity of roughly 13.2 MGD. If river flood levels reach above elevation 17.00, water will back up into the effluent chamber and a flap gate will prevent backflow into the pump station. The top elevation of the effluent chamber is 31’ which is approximately 5 feet above the 100-year flood elevation (26.0’). The capacity of the bypass pipe is less than future projected peak flows, however high flood elevations over 17.00’ occur rarely and the existing pump station pumps have the capacity to handle the entire peak flow with four pumps running. The existing effluent pump station has 4 pumps each capable of approximately 4.2 MGD. At this rate, all four pumps can handle 16.8 MGD which exceeds our projected peak hourly flow of 14.9

MGD. Since all four pumps would be required under peak flow conditions, a fifth pump is recommended as a backup.

Receiving Waters

Effluent normally discharges via gravity to the Nooksack River at approximately mile 4.9. The outfall elevation is 4.0 ft. The Nooksack River flows through the City of Ferndale and occasionally experiences severe flooding. A flood insurance rate map, FIRM Map #53073C1180D, was prepared by FEMA effective 2004. This map is attached in Appendix G and contains flood boundary and floodway limits for 100-year floodplain. As shown in this map, the Ferndale WWTP is located in Zone AE and within the floodplain. The outfall is shown on the FIRM map with a 100-yr flood elevation of approximately 22.5'.

The Nooksack River is listed on the Department of Ecology's 303(d) and 305(b) Integrated Report. Water quality parameters of concern include temperature, dissolved oxygen, bacteria, ammonia, and pH (per DOE's 2012 Water Quality Assessment data).

A lift station boosts the effluent head in the event of either high WWTP flows or high river level. Effluent discharges through a 1500-lineal foot, 30-inch pipeline to the Nooksack River. The outfall consists of a single 30-inch diameter pipe, which is submerged and located at the toe of the riverbank.

The permitted mixing zone extends 300 feet downstream from the outfall. The permitted mixing zone allows for the following dilution factors (DF) when calculating effluent limits:

Acute Aquatic Life Criteria: DF = 4
Chronic Aquatic Life Criteria: DF = 29

Inflow / Infiltration Studies

Statistical evaluation of the City's I & I indicates an approximately 2% per annum increase in I & I, which is less than or equal to the population growth rate. The City's National Pollution Discharge Permit (NPDES) permit for discharging to the Nooksack River requires that a remedial action program take place if I & I increased by more than 15% over a one-year period. In June 1996, Ferndale conducted an infiltration and inflow inspection and evaluation on 6,130 lineal feet of piping and 28 manholes. A 1998 report titled, "Phase I Investigation and Sewer System Improvements Report," summarized the results of the inspection and provided an analysis of needs and recommended improvements. The City made major improvements to the system in 1998, including a 3,200-lineal foot primary interceptor (30-inch to 48-inch), as well as 500 lineal feet of secondary interceptor (24-inch to 30-inch). The City later completed the Phase I rehabilitation program including replacement of 2,700 lineal feet of 8-inch to 10-inch pipe and manholes on sewer main on 3rd Street and between Malloy Road and the railroad and replacement of 800 lineal of 10-inch pipe and manholes on Vista Drive. The City also repaired immediately critical sections of the collection system to a functioning condition.

The 1998 report made several other recommendations, most of which have been implemented. The sewer system was recently inventoried (including surveying of manhole coordinates and inside manhole measurements) and a GIS database and map created. The recommendation for sewer system flow modeling and calibration has been implemented during the completion of this

Comprehensive Sewer Plan. One of the recommendations - implementation of a regular program of sewer line video inspection has been implemented

The most recent I & I report prepared in September 2008 shows that I & I is seasonal (during wet months), and is increasing at only 2% per annum, which is less than the annual growth rate. EPA's criteria for non-excessive infiltration is defined as flow less than an average of 120 gallons per capita during dry periods. Non-excessive inflow is defined by EPA as a wet weather flow of less than 275 gallons per capita. Even with the 2% increase, the City is still within the listed EPA guidelines according to the September 2008 I & I assessment.

City sewer flow monitoring was conducted from April 27 – May 26, 2010 at six locations. The time frame (May) of the flow monitoring was representative of the average flow conditions for the year. The sewer flow monitoring was repeated again from January 12 – February 7, 2010 at the same six locations. The time frame (January) of the flow monitoring is representative of the seasonal peak flow conditions for the year. The six locations monitored are listed in Exhibit I - Hydraulic Analysis. Preliminary results of recent sewer flow monitoring give more inference into the volume of infiltration and inflow. During January 2011, the nighttime flow rate ranged from 500 GPM to 700 GPM during periods of limited rain and up to 1600 GPM during heavy rain. This indicates that seasonal peak infiltration rate is about 600 GPM (equivalent to 77 gpcd) and that peak infiltration and inflow is about 1600 GPM (equivalent to 200 gpcd). In comparison, dry weather wastewater flow is about 75 gpcd.

As part of the manhole and infrastructure data collection, the manholes were visibly inspected and any condition issues were noted. This data collection has led to qualitatively and often quantitatively identifying manholes with significant infiltration, so that rehabilitation can be included in the Sewer Capital Improvement Plan (e.g., CIP: annual Sewer I&I Projects starting in 2013; Annual Sewer Slipline Project starting in 2015; specific pipe replacement projects).

Structural Evaluation of Existing Structures

Headworks

The main structural components of the headworks are the influent channel, the three influent screw pumps and their curved reinforced concrete channels, and the channel that they discharge into. The headworks is generally in very good structural condition. The concrete walls show only minor cracking, normal in extent and width for concrete structures. The headworks can be expanded with the addition of another mechanical screw by expanding the structure to the east, and the current structure is in good condition to facilitate such an expansion.

Figure 4-3: Screw Pump Channels

It is recommended that the screw pumps are removed for maintenance (to clean them and apply corrosion resistant coating) during which time their channels can be further investigated and repaired. There are likely to be abraded

areas of concrete under the screw pumps, as the screws pound and rub the concrete when their bearings are worn. In addition, at the edge of each channel, distinct cracks can be seen that indicate the reinforcing steel below is corroding, cracking the concrete above. Left without repair, eventually the concrete will spall away and the bars will be exposed to deteriorate rapidly. Repair is recommended during maintenance of the existing screw pumps.

It is also recommended that screw pump bearings, grease pumps, and all grease lines be replaced during the headworks improvements.

The estimated cost of repairs is unknown until the extent of damage is ascertained, however it is relatively minor versus the cost of expanding the headworks including recoating the existing screws.

The good condition of the structure means the wing walls between the screws could be used to support a davit crane capable of removing the motors and gearboxes for maintenance work.

Emergency Generator and Chemical Storage Buildings

These buildings (the generator building is shown below) are in excellent condition. They are obviously well maintained, and of a high quality of construction.

Figure 4-4: Existing Generator Building

Chlorine Disinfection Contact Tanks and other structures

The disinfection contact tank may be taken out of service if UV disinfection is adopted. However, the tank structure could be used as a foundation for a building above. It is in very good condition, with very few and very small cracks. As a foundation structure without contact with raw wastewater, it could be expected to last in excess of 60 years.

Other smaller structures near the disinfection contact tanks have been excellently maintained, with concrete paint applied to reduce corrosion. These structures are expected to last well past the 20 year life of this facility plan.

5.0 - WASTEWATER TREATMENT ALTERNATIVES

The purpose of this section is to identify and describe the improvement alternatives to the existing facilities. The goal of this evaluation is to select an alternative that is cost effective, reliable and low maintenance, fits within site constraints, and has effective treatment and capacity for current and future flows and loadings.

Facility Loadings

The capacity of the existing WWTP is a primary reason improvements are needed. The current permitted Max. Month Design Flow (MMDF) is 3.23 MGD. This flow is projected to be reached in 2024 and design criteria loading limits will be reached in 2022. With no existing equalization storage options, the plant will need to be expanded to allow for expected growth.

In addition, influent $CBOD_5$ and TSS are expected to exceed permit limits in less than 10 years. Design Criteria for facility improvements, current permitted effluent limits, and current and projected facility loadings are presented Tables 5-1 through 5-4 below.

Table 5-1: Current Permitted Effluent Limits

Current Permitted Facility Load Limits	
Maximum Month Design Flow (MMDF)	3.23 MGD
$CBOD_5$ Influent Loading for Maximum Month	4490 lb/day
TSS Influent Loading for Maximum Month	5388 lb/day

Table 5-2: Existing Influent Flows and Loadings

	Flow	BOD		CBOD		TSS		Ammonia		Alkalinity		TKN	
	(MGD)	(lb/day)	(mg/L)	(lb/day)	(mg/L)	(lb/day)	(mg/L)	(lb/day)	(mg/L)	(lb/day)	(mg/L)	(lb/day)	(mg/L)
ADF	2.0	3,500	210	3,500	210	3,600	216	500	30	6,672	400	834	50
MMWWF	2.6	3,850	178	3,850	178	4,250	196	585	27	7,806	360	976	45
Max Day	7.0	3,850	66	3,850	66	4,250	73	585	10	7,806	134	976	17
PHF	9.4	3,850	49	3,850	49	4,250	54	585	7	7,806	100	976	12

Table 5-3: Future Influent Design Flows and Loadings

	Flow	BOD		CBOD		TSS		Ammonia		Alkalinity		TKN	
	(MGD)	(lb/day)	(mg/L)	(lb/day)	(mg/L)	(lb/day)	(mg/L)	(lb/day)	(mg/L)	(lb/day)	(mg/L)	(lb/day)	(mg/L)
ADF	3.2	5,594	211	5,594	211	5,754	217	796	30	10,608	400	1,326	50
MMWWF	4.1	6,154	180	6,154	180	6,793	199	923	27	12,310	360	1,539	45
Max Day	11.1	6,154	66	6,154	66	6,793	73	923	10	12,310	133	1,539	17
PHF	14.9	6,154	50	6,154	50	6,793	55	923	7	12,310	99	1,539	12

Table 5-4: Additional Effluent Design Criteria

Parameter	Limit	Condition	Notes
pH range	6-9	Min-Max (Std. Units)	
Ammonia	1.0 mg/L	Maximum	Configure New Facility so this limit can be achieved, if needed, for future permit requirements.
Total Nitrogen	8.0 mg/L	Maximum	Configure New Facility so this limit can be achieved, if needed, for future permit requirements.
Fecal Coliform	28/100 mL	Monthly Geometric Mean	
Fecal Coliform	400/100 mL	Weekly Geometric Mean	
BOD	25 mg/L	Ave Monthly (85% Removal)	
	40 mg/L	Ave Weekly	
TSS	15 mg/L	Ave Monthly (85% Removal)	Configure New Facility so this limit can be achieved, if needed, for future permit requirements.
	20 mg/L	Ave Weekly	
Design Population	19,591		

Treatment Alternatives

Six treatment alternatives have been evaluated in this facilities plan based on Cost Effectiveness (Construction and Operations), Treatment Effectiveness, Operations and Maintenance Demands, and Site Layout.

The six treatment alternatives evaluated are:

1. Sequencing Batch Reactor
2. Oxidation Ditch
3. Extended Aeration
4. Conventional Activated Sludge, Biotreater
5. Expansion of Existing DPAL Lagoons
6. MBR Treatment

Alternative treatment facility locations were not considered due to high anticipated costs of relocating, existing collection system configuration, and lack of appropriate land.

Alternative 1 - Sequencing Batch Reactor

SBR Process Description

A Sequencing Batch Reactor or SBR is a type of activated sludge process in which the entire process occurs in a single reactor basin. The treatment process occurs over a series of stages, Fill, React, Settle, Decant, and Idle.

During the Fill stage, screened influent enters the basin and is added to the existing biomass remaining from the previous cycle. This stage may be mixed or aerated depending on treatment needs.

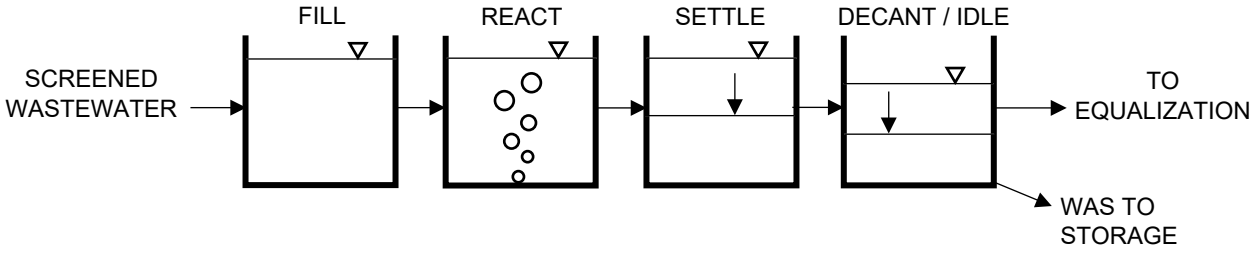
In the React stage, no additional wastewater enters the basin and the wastewater is aerated for a period of time required depending on the desired effluent quality. Most of the CBOD is removed during this stage. Mixing and Aeration can be turned on or off in the Fill and React stages depending on Nitrification, Denitrification, or Phosphorus removal requirements.

In the Settle stage, activated sludge settles from the treated effluent without inflow or outflow. No mixing or aeration occurs during this stage. This stage is followed by the Decant stage where clear supernatant is removed for disinfection.

The final stage is the Idle stage. This stage is used depending on the system objectives. An idle stage is not necessary, but may be used for sludge wasting.

The proposed SBR process would include four SBR basins and one Post-Equalization basin. The four basin design allows for more flexibility and control of the process and the ability to handle high flows without the need for a pre-equalization basin. With four basins, each would basin would potentially be at a different stage of the SBR process. The four basins would each be 80-ft x 80-ft, 23 feet deep with 21 feet of freeboard, and have a volume of approximately 1 million gallons. The Post-Equalization basin allows for flow control of the SBR effluent prior to disinfection. The Post-Equalization basin would be approximately 80-ft x 30-ft, with a side water depth of 13.2 feet.

Figure 5-1: SBR Process Diagram



SBR Cost Effectiveness (Construction / Operations & Maintenance)

The SBR system can be installed in earthen lined basins eliminating the need for expensive concrete or steel basins. The SBR system does not require a clarifier for solids separation which would eliminate additional concrete costs. These features keep the overall capital costs for an SBR system relatively low compared to other technologies, however the sophistication of an SBR

system would require extra costs for pumping, control valves, monitoring systems, and SCADA features. Earthwork costs are higher for the SBR due to excavation and backfill required for four deep basins.

The estimated capital costs for an SBR system were determined to be approximately $17.9 Million. This construction cost is low relative to the other alternatives, second only to the extended aeration option. However, the SBR would have considerably higher operations and maintenance costs due to the complexity of an SBR plant and higher aeration requirements. SBR plants require more operator attention to manage the stages of each basin and adapt to peak flows, as a results operations labor hours per week is increased including weekend hours. Additionally, the SBR alternative includes four 100-HP blowers, four 40-HP aerators, two 15-HP blowers for the post-equalization basin, and four 30-HP transfer pumps. The power required for this equipment results in higher yearly operations costs.

SBR Treatment Effectiveness

The performance of the SBR system is similar to that of a conventional activated sludge system. Depending on the control strategy the BOD removal efficiency is generally 85 to 95 percent. SBR manufacturers will typically guarantee effluent less than 10 mg/L for BOD and TSS and 5-8 mg/L for Total Nitrogen. With the Ovivo SBR studied for this report, the Effluent BOD/TSS/TN was projected to be 25/30/8. Phosphorus removal is also possible down to 1 – 2 mg/L depending on the control strategy. These values are appropriate for the City of Ferndale's projected effluent requirements, however the SBR system is susceptible to disruption by peak flows. Given the high inflow and infiltration flows (I&I) found in the Ferndale sewer system, the SBR option could prove difficult to effectively meet effluent requirements.

SBR Operations & Maintenance

With a typical SBR, equipment such as clarifiers, anoxic basins mixers, recirculation pumps, and RAS pumps are not necessary as the treatment occurs in a single reactor basin minimizing operation and maintenance requirements. However, given the design flows and loadings expected for the City of Ferndale facility, four SBR basins will be required which would require additional O & M requirements to maintain each basins mixers, aeration, and valving equipment.

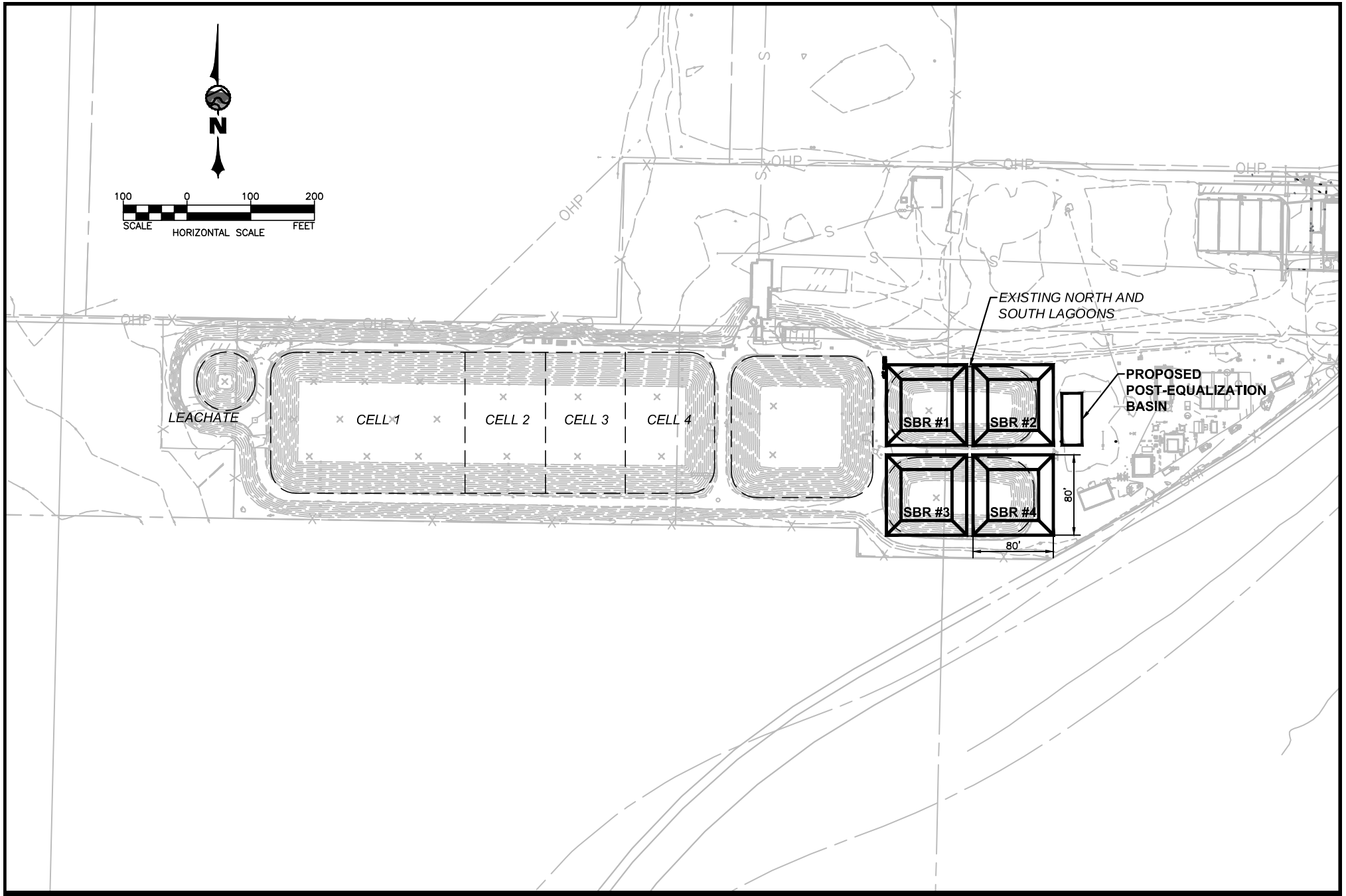
The brains of an SBR are in the automatic controls, valves, and switches which will require more attention and higher maintenance skills than other processes. The sophisticated nature of a four basin SBR would likely result in more items that can fail or require maintenance.

Additional operator attention would be required 24/7 to monitor the stages of each basins process and adapt for peak flows. This could result in additional operators and weekend hours needed to monitor the plant.

SBR Site Layout

Figure 5-2 below shows the proposed layout of an SBR system on the existing site. The proposed layout would utilize the existing North and South lagoons. These two lagoons would be converted to four Sequencing Batch Reactor basins each 126-ft x 126-ft and 23-ft deep with 1:1 side slopes. The basins would be separated by a distance adequate for a maintenance vehicle to pass between. A concrete post-equalization basin, 80-ft long, 30-ft wide, and 23-ft deep would be installed east of the lagoons. This configuration would allow the existing lagoons (Cells 1-4 & Middle Lagoon) to be converted to long term sludge storage basins.

The site layout for the SBR option fits well on the existing site. The proposed configuration shown allows for the existing west lagoon and middle lagoon to be converted to biosolids storage basins or equalization. The disadvantage of the SBR site layout however, is the increased earthwork needed for construction of the four SBR basins and the addition of the post-equalization basin in the maintenance area. Other components such as headworks, site piping, and disinfection would be the same as other options and take advantage of existing facilities.



Wilson
SURVEY/ENGINEERING
WILSON ENGINEERING, LLC
805 DUPONT STREET
BELLINGHAM, WA 98225
(360) 733-6100 • FAX (360) 647-9061
www.wilsonengineering.com

CITY OF FERNDALE

FERNDALE WASHINGTON

WWTP FACILITIES PLAN
FIGURE 5-2: SBR ALTERNATIVE

DATE 3-15-16
SCALE AS SHOWN
JOB NO. 2014-36

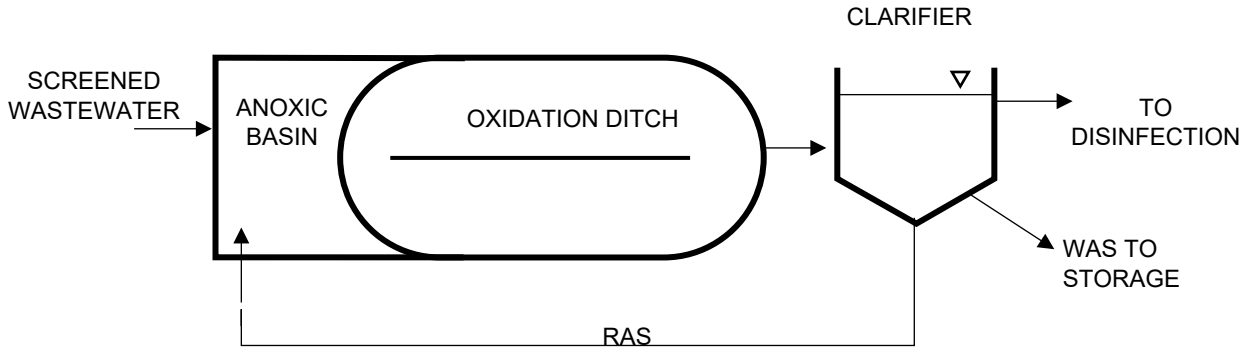
FIG. 5-2

Alternative 2 –Oxidation Ditch

Oxidation Ditch Process Description

The Oxidation Ditch system is a type of activated sludge biological treatment process that uses long solids retention times (SRTs) to remove organics. The long SRT allow the system to be more forgiving to shock loads or hydraulic surges. After grit removal and screening, wastewater enters the anoxic zone at the front end of the plant. In the anoxic zone, wastewater is mixed with Return Activated Sludge (RAS) from the clarifier as well as mixed liquor from the aeration zone. This process is known as the Modified Ludzack-Ettinger (MLE) process which achieves higher levels of denitrification. After the anoxic zone, wastewater flows to the aeration zone for biodegradation and continued mixing of the activated sludge. Aeration and Mixing is performed by surface aerators at either end of the race track configured basin. After aeration, wastewater is sent to an external clarifier for solids separation. In the clarifier, clear effluent flows from the surface over weirs to disinfection. Sludge is drained from the bottom of the clarifier as Waste Activated Sludge (WAS) to the proposed long term stabilization basins. Return Activated Sludge is recycled to the front end anoxic basin. For the proposed alternative, two identical Oxidation Ditch systems would be installed for redundancy and flexibility.

Figure 5-3: Oxidation Ditch Process Diagram



Oxidation Ditch Cost Effectiveness (Construction / Operations & Maintenance)

The estimated capital costs for construction of this alternative are estimated to be $21.1 million. The oxidation ditch alternative has the lowest equipment costs of all the options, however the total construction cost is higher than other treatment alternatives primarily due to the additional concrete required for the two oxidation ditch basins and earthwork necessary to support these basins. This option also requires two 100-ft clarifiers after the oxidation ditch which will increase the concrete and earthwork further.

The operations and maintenance costs are higher than our recommended alternative (Alternative 3 – Extended Aeration), due primarily to the additional operator attention required to manage peak flows and loadings. The oxidation ditch alternative is less forgiving to these peak flows and therefore requires additional supervision. The biosolids production is also expected to be higher with the oxidation ditch alternative than the extended aeration alternative. This will result in increased biosolids handling costs per year and less storage volume.

Oxidation Ditch Treatment Effectiveness

Oxidation Ditches are successful at Nitrification and Denitrification and typically achieve BOD, TSS, and Ammonia Nitrogen removal of greater than 90 percent. The Oxidation Ditch process analyzed for this report is guaranteed to achieve BOD less than 10, TSS less than 15, Ammonia less than 1, and Total Nitrogen less than 7. These amounts are comparable to the other activated sludge alternatives proposed. During normal flows the oxidation ditch process is simple to operate and effluent limits are reliably met. However, compared to the Extended Aeration process the oxidation ditch option is less forgiving to shock loads and peak flows which may disrupt the treatment process.

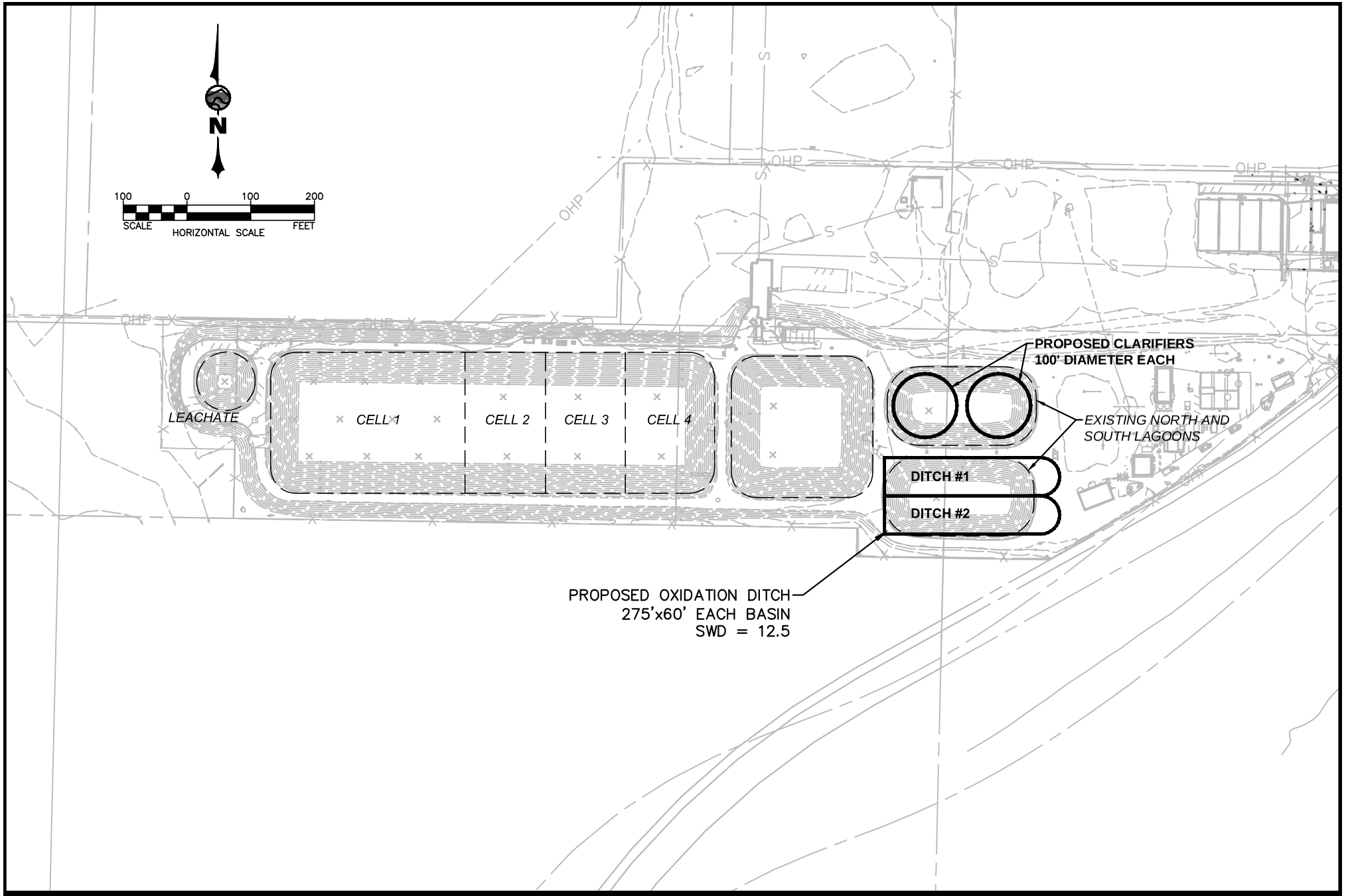
Oxidation Ditch Operations & Maintenance

The operations and maintenance of an Oxidation Ditch system is one of the simplest of the alternatives proposed, second only to the Extended Aeration option. The surface aerators achieve both aeration and mixing, so maintenance of additional pumps, mixers and diffusers are not needed. The aerators would require standard motor maintenance on a regular basis.

Because of the high suspended solids from oxidation ditches, an external clarifier is needed. The clarifier will require daily maintenance on the motor, hosing basins, and keeping weirs clean. The oxidation ditch basins will also need to be drained and cleaned yearly. This cleaning is necessary and requires an entire ditch be taken offline.

Oxidation Ditch Site Layout

Figure 5-4 below shows the proposed layout of an Oxidation Ditch system on the existing site. The proposed layout would utilize the existing North and South lagoons, however significant excavation and backfill would be required to prepare the subgrade for large concrete basins. The South lagoon would be converted to the oxidation ditch system with two concrete oxidation ditches running in parallel. The North lagoon would be converted to two 100’ diameter concrete clarifiers with the remaining lagoon being filled surrounding the clarifiers. Each Oxidation Ditch basin would be 257-ft long, 60-ft wide, and 17-ft tall. This configuration would have an advantage as it would allow the existing lagoons (West Lagoon & Middle Lagoon) to be converted to long term sludge storage basins or equalization basins.



Wilson
SURVEY/ENGINEERING
WILSON ENGINEERING, LLC
805 DUPONT STREET
BELLINGHAM, WA 98225
(360) 733-6100 • FAX (360) 647-9061
www.wilsonengineering.com

CITY OF FERNDALE

FERNDALE WASHINGTON

WWTP FACILITIES PLAN
FIGURE 5-4: OXIDATION DITCH ALTERNATIVE

DATE 3-15-16
SCALE AS SHOWN
JOB NO. 2014-36

FIG. 5-4

Alternative 3 – Extended Aeration Process

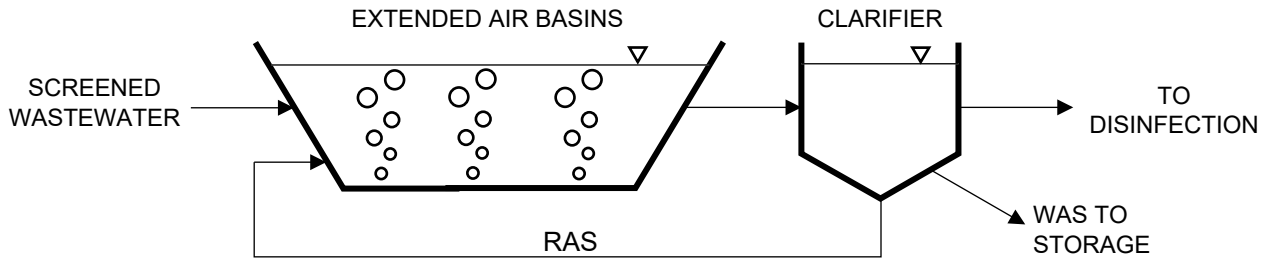
Extended Aeration Process Description

The Extended Aeration (Extended Air) process uses a long sludge age, activated sludge process to create a very cost effective treatment solution. For this facility plan we will refer to the process as Extended Aeration, however the process is much more than just extended aeration. The process is conventional activated sludge process with extended aeration for biological nutrient removal, but is also defined by a long sludge age and a common aeration & anoxic basin controlled by aeration cycling. There are two manufacturers of an Extended Aeration Activated Sludge process, Parkson Biolac and Bioworks. Often this process has been called the Biolac process as Parkson held the patent on the technology in the United States until 2013.

After grit removal and screening, wastewater enters one of the Extended Air basins. The system uses a fine bubble aeration system connected to floating and movable air headers. This aeration system can be installed in the existing north and south basins, eliminating the need for concrete basins. The basins will need to be graded to meet the required depth and side slopes, plus relined to meet current DOE regulations. For biological nitrification and denitrification the aeration system can be configured to cycle and alternate aeration to achieve oxic and anoxic zones within the basin.

Clarification is also required after the Extended Air system to separate solids. After the Extended Air basins, wastewater will be pumped to one of two external circular clarifiers. Effluent flows from the surface of the clarifier over weirs to disinfection. Sludge is drained from the bottom of the clarifier as Waste Activated Sludge (WAS) to the proposed Biosolids Stabilization Basins and Return Activated Sludge (RAS) is recycled to the front end of the Extended Air basins.

Figure 5-5: Extended Aeration Process Diagram



Extended Aeration Cost Effectiveness (Construction / Operations & Maintenance)

The estimated capital costs for construction of this system are estimated to be $17.85 Million. This estimate includes a 9% inflation between 2016 and 2019 when construction is estimated to be complete, sales tax of 8.7%, as well as a contingency of 15%. A detailed cost estimated is presented in Chapter 7.

After an initial construction cost comparison for the treatment alternatives, the Extended Air system was determined to be the most cost effective solution. The primary costs for the extended

aeration system are the aeration equipment costs and the concrete costs for the two proposed clarifiers. However, because the Extended Air option can utilize existing basins, additional concrete costs are not needed and the basins only requiring grading and relining with double liners and a leak detection system to meet Department of Ecology regulations. Other costs such as earthwork, yard piping, electrical components, and operations building costs are similar and in most cases lower than the other treatment alternatives.

The operations and maintenance costs presented in Chapter 7 show that the Extended Air option is also very economical to maintain. The most significant advantage of the Extended Air option is its ability to handle peak flows and shock loads. This allows less operator attention and controls or automatic valving. The Extended Air system also produces less biosolids than the other treatment options, thus reducing biosolids handling costs.

Overall the extended aeration option proved to be the most economical alternative for construction and operations costs.

Extended Aeration Treatment Effectiveness

The Extended Air system comes with a process effluent guarantee to produce effluent less than 10mg/L BOD, 15 mg/L TSS, 1 mg/L Ammonia, and 8 mg/L Total Nitrogen. These values are similar to the other activated sludge systems proposed. For biological nutrient removal the system can be configured to cycle aeration zones allowing for anoxic and oxic zones which result in nitrification and denitrification. A primary advantage of this process is a long HRT/SRT (sludge age) which allows the system to be more forgiving to shock loads or hydraulic surges, eliminating the need for constant operator attention.

Parkson and Bioworks have hundreds of installations throughout the U.S. and Europe, many with very similar design criteria to the City of Ferndale. The technology has proved to be very effective at treating to the existing effluent limits we are expecting for the City of Ferndale and future limits likely imposed.

Due to high suspended solids in the Extended Air process, solids separation through a clarifier is required after the primary treatment. The circular clarifiers proposed are a proven technology to remove suspended solids effectively. Both Biolac and Bioworks have the option of an integral rectangular clarifier rather than a separate external circular clarifier. However, the proven efficiency of a circular clarifier makes this the recommended choice for the City.

Extended Aeration Operations & Maintenance

The operations and maintenance of the Extended Air process requires occasional maintenance of the aeration system. Suspended diffusers will require occasional cleaning and replacement of diffuser sleeves. These diffusers can be raised to the surface from shore for maintenance or repair. Operators would access the diffusers from a stable twin-hulled boat once or twice per year. The aeration system can be removed without dewatering the basin, thereby providing mechanical reliability.

The system also includes multiple automatic valves and blowers which would need to be maintained or replaced on occasion. Blower maintenance consists of regular engine oil changes and belt replacements.

The clarifiers proposed with this alternative will require regular cleaning of the basin and weirs.

Overall the Extended Air system is simple to operate and maintain. The long sludge age of this technology allows less attention compared to the other alternatives. Peak flows and shock loads are easily absorbed by the system allowing less labor required for successful operation.

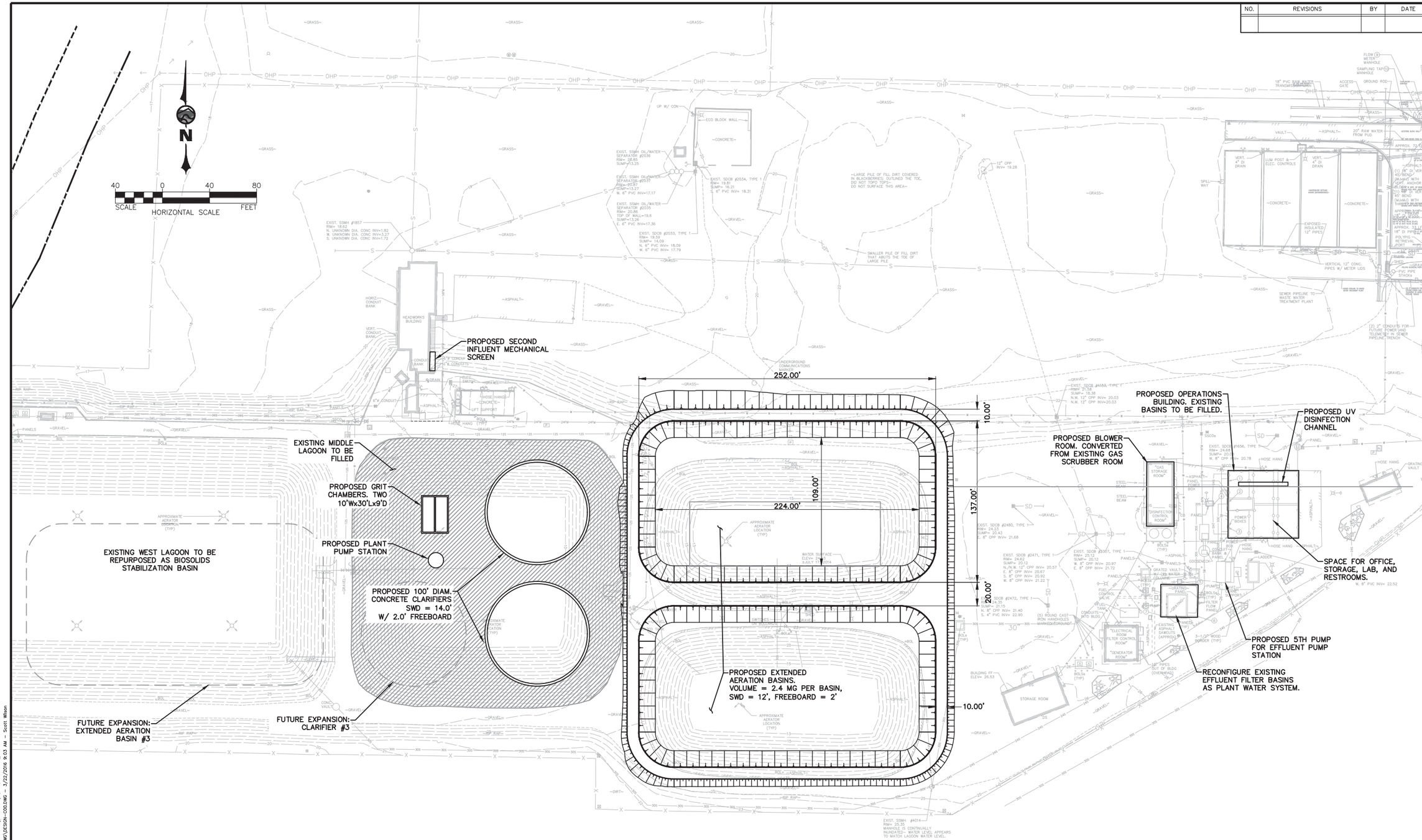
Extended Aeration Site Layout

Figure 5-6 shows the proposed layout of the Extended Air System. The proposed layout would convert the existing north and south lagoons into Extended Air basins. The existing lagoons would be expanded to a volume of 2.12 million gallons each, with top dimensions of 242-ft by 132-ft, 14-ft SWD, 2-FT of freeboard, and 1.5:1 side slopes. The proposed basins would be double lined with HDPE liners, sloped for drainage, and include a leak detection system.

The proposed layout would also include two 100' diameter circular concrete clarifiers. These clarifiers would be located in the existing middle lagoon to minimize grading.

With this layout the existing DPAL system (West Lagoon) would be converted to a Biosolids Storage Basin. Other components such as headworks and disinfection would utilize existing facilities.

NO.	REVISIONS	BY	DATE



WILSON ENGINEERING, LLC
805 DUPONT STREET
BELLINGHAM, WA 98225
(360) 733-6100 • FAX (360) 647-9061
www.wilsonengineering.com
Wilson SURVEY/ENGINEERING

DESIGNED BY	DRAWN BY	CHECKED BY
SJW/JGC	SJW	

CITY OF FERNDALE
WASHINGTON

WASTEWATER FACILITIES PLAN
FIGURE 5-6 PROPOSED EXT. AIR SITE PLAN

SHEET	DATE	SCALE	JOB NUMBER
5-6	3-15-2016	AS SHOWN	2014-036

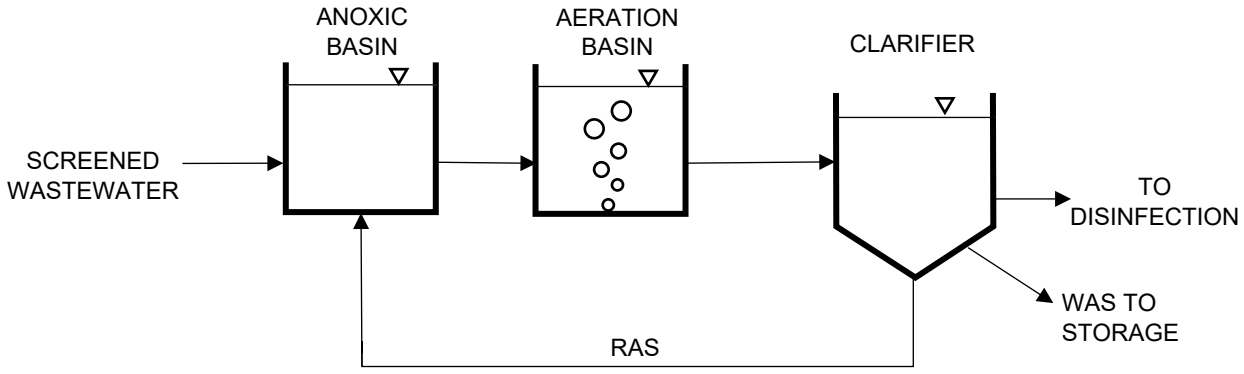
PAGE 1 OF 1

Alternative 4 – Biotreater Process

Biotreater Process Description

The Biotreater system consists of an activated sludge biological treatment and clarification system configured in circular concrete or steel basins. After grit removal and screening, wastewater enters the anoxic zone in the outer ring of the plant. In the anoxic zone, wastewater is mixed with Return Activated Sludge (RAS) from the clarifier as well as mixed liquor from the aeration zone. This process is known as the Modified Ludzack-Ettinger (MLE) process which achieves higher levels of denitrification. After the anoxic zone, wastewater flows to the aeration zone for biodegradation and continued mixing of the activated sludge. Aeration is performed by coarse bubble diffusers on the basin floor. After aeration, suspended solids are separated from effluent in the center clarifier. Clear effluent flows from the surface of the clarifier over weirs to disinfection. Sludge is drained from the bottom of the clarifier as Waste Activated Sludge (WAS) to the proposed long term stabilization basins. Return Activated Sludge is recycled to the front end anoxic basin. For the proposed alternative two identical Biotreater systems would be installed to achieve greater redundancy and flexibility.

Figure 5-7: Biotreater Process Diagram



Biotreater Cost Effectiveness (Construction / Operations & Maintenance)

The estimated construction costs for this option were determined to be approximately $22.5 million. Other than an MBR system, this option has the highest estimated construction costs. The reason for the high costs is due to the quantity of concrete required for two Biotreater systems. The concrete costs alone were estimated to be approximately 6 million dollars.

For the operations and maintenance costs the biotreater option has a high yearly cost of operating. The most significant operation cost is the power required to run the blowers for aeration. The system would require four 125 HP blowers running constantly.

Both construction and operations costs make the biotreater option prohibitive when compared with the other alternatives presented.

Biotreater Treatment Effectiveness

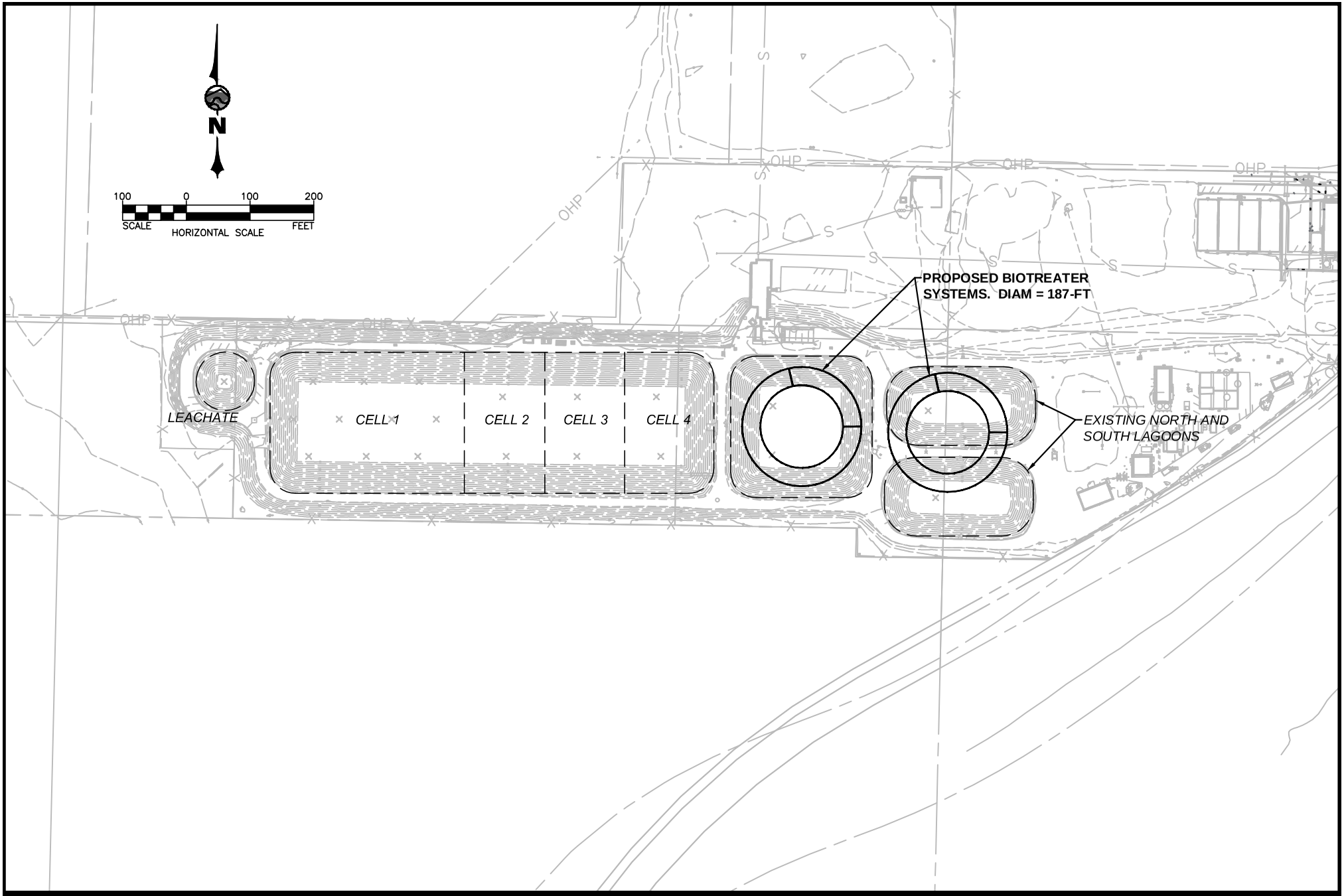
The Biotreater system effluent is estimated to be less than 15 mg/L BOD, 15 mg/L TSS, and 1 mg/L Ammonia. The process has a long HRT/SRT which allows the system to be more forgiving to shock loads or hydraulic surges. Adjustment of feed forward pumps, RAS rate, WAS rate, and aeration will be the critical controls to producing quality effluent.

Biotreater Operations & Maintenance

The Biotreater system will require routine maintenance, inspection, and cleaning of its major components. Similar to the Oxidation Ditch and Extended Air systems, the clarifiers will require cleaning of the clarifier basin, weirs and launders and require inspection and maintenance of the clarifier drive motor. In addition, the Biotreater system will require occasional cleaning of diffusers in the aeration basin. These diffusers can be disconnected via an access platform above the aeration basin and removed for cleaning. In the anoxic basin, mixers will require occasional cleaning and maintenance. Each mixer will have a dedicated crane for easy removal. The system will also include feed forward pumps between basins, RAS pumps, WAS pumps, flow meters, electronic WAS valves, and blowers all requiring routine servicing.

Biotreater Site Layout

The image below shows the proposed layout of two Biotreater systems on the existing site. The proposed layout would utilize the existing North and South lagoons and Middle lagoons. The majority of the middle lagoon would be converted to one concrete Biotreater system with the surrounding lagoon filled in. For the second Biotreater, the majority of the North lagoon would be used and a partial amount of the South lagoon. This configuration would allow only the existing west lagoon (Cells 1-4) to be converted to long term sludge storage basins.



Wilson
SURVEY/ENGINEERING
WILSON ENGINEERING, LLC
805 DUPONT STREET
BELLINGHAM, WA 98225
(360) 733-6100 • FAX (360) 647-9061
www.wilsonengineering.com

CITY OF FERNDALE

FERNDALE WASHINGTON

WWTP FACILITIES PLAN
FIGURE 5-8: BIOTREATER ALTERNATIVE

DATE 3-15-16
SCALE AS SHOWN
JOB NO. 2014-36

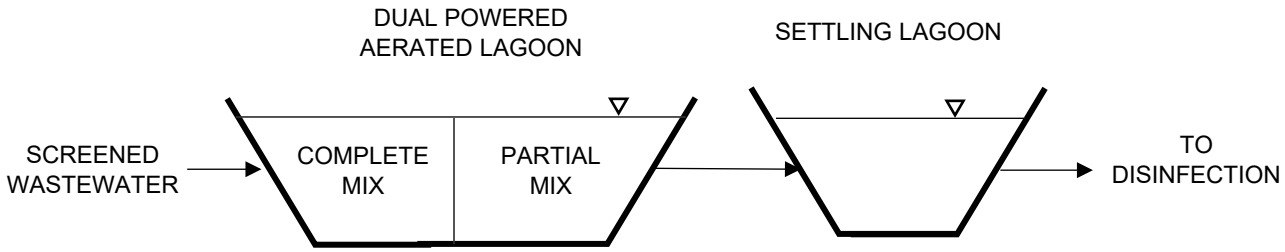
FIG. 5-8

Alternative 5 – DPAL Expansion

DPAL Expansion Process Description

The DPAL system consists of an aeration basin in which all solids are maintained in suspension (completely-mixed), followed by settling and sludge storage basins which are aerated at a level that permits the settleable solids to settle (partially-mixed).

Figure 5-9: DPAL Expansion Process Diagram



DPAL Treatment Effectiveness

The treatment effectiveness of the DPAL system is not adequate for the life of this facility plan. This option would require heavy use of chemical flocculants and filtration to meet treatment requirements. This treatment system does not remove ammonia during the cool weather season and would therefore be inadequate when ammonia limits are tightened. Similarly, if nutrient removal limits are added, this treatment solution would not be sufficient. After discussions with the Department of Ecology, it was noted that coastal waterways (i.e. Bellingham Bay) are clearly impacted by human development and stricter Ammonia and Total Nitrogen limits will be added to nearby outfalls during new permit cycles. The existing plant has poor removal of suspended solids and requires the addition of chemicals to meet TSS requirements. An expansion of the DPAL system would likely require the same chemical addition to assist with achieving TSS limits.

DPAL Operations & Maintenance

The operations & maintenance requirements of an expanded DPAL system would be similar to the ongoing requirements of the existing plant. Chemical addition would likely be required with the DPAL expansion to meet the TSS limits. Existing and new surface aerators would require routine maintenance.

DPAL Expansion Site Layout

The proposed expansion of the existing DPAL system would consists of adding an additional lagoon to the west of existing cells 1-4 on City property. The new lagoon would measure approximately 430-ft x 225-ft. The basin would be double lined with HPDE liner, sloped for drainage, and include a leak detection system. A raised berm wide enough for maintenance access would surround the lagoon. Since the entire WWTP site lies within the effective FEMA floodplain any grading or improvements in the floodplain must not

raise the flood elevation. Therefore, this alternative is determined to not be feasible given the large amount of fill required to raise to create an additional lagoon. See Appendix G for Floodplain Evaluation.

Alternative 6 – MBR Treatment

Membrane bioreactors (MBR's) do share many of the plant operational features associated with conventional activated sludge plants. These include high mixed liquor suspended solids (MLSS) concentrations and high solids residence times (SRTs). The difference, however, is that in the case of MBRs, these operational parameters are higher than the typical ranges used in conventional activated sludge systems. The ability of an MBR to operate at higher concentrations allows for a smaller treatment basin footprint when compared to conventional activated sludge footprints.

MBRs are able to operate with higher SRTs and MLSS concentrations due to their means of separating solids from treated effluent. The MBR utilizes micro or ultra-filtration to extract effluent directly from the bioreactor through a membrane with pore sizes ranging from 0.04 to 0.4 micrometers. As a result, a MBR provides secondary and tertiary treatment in a combined process. Another result is that a MBR can efficiently operate over a wide range of SRTs and MLSS concentrations. This helps simplify operation of the biological treatment process. However, treatment staff must learn how to monitor and manage a comparatively complex array of operational parameters related to the membranes. This includes the membrane flux rate, transmembrane pressure, air scouring, mixed liquor recycle rates, and periodic membrane cleaning. Management of these operational parameters is typically automated. Still, a knowledgeable operator is required to recognize and promptly correct problems when they occur. The operator interaction with the plant is typically more frequent than with an MBR.

An MBR treatment process was determined not feasible for the City of Ferndale after initial construction cost estimates. The MBR treatment option would be over $14.5 million dollars more to construct than the proposed Extended Aeration process. As a result, no further evaluation of the MBR process was completed.

6.0 - RECOMMENDED IMPROVEMENTS

The purpose of this section is to identify and describe the recommended improvements to the existing wastewater treatment facilities. Improvements of this section will consist of site improvements and selection of the recommended treatment alternative. The goal of treatment alternative evaluation is to select an alternative that is cost effective, reliable, low maintenance, fits within site constraints, and has effective treatment and capacity for current and future flows and loadings.

Recommended Treatment Alternative

Description of System

Based on the evaluation of each treatment process alternatives, the lagoon extended-aeration process is recommended as the best option for the City of Ferndale. The process is fundamentally an extended-aeration activated sludge process and thus is effective with varying flow and waste loads. The process contains typical characteristics of extended-aeration systems, including long hydraulic and solids retention times, high microorganism concentration, and low food:microorganism ratio (F/M). Primary clarification is unnecessary and would not be utilized. The system which is proposed for Ferndale can achieve denitrification by biological means; the treatment scheme is similar to the modified MLE-type of activated sludge process and thus features an anaerobic zone within the aeration basin by cycling aeration.

The process will utilize the existing North and South earthen basin lagoons with two external clarifiers for secondary clarification. A double liner of 100-mil HDPE or similar material, and a leak detection system, will be provided above the earthen basin in order to meet Ecology requirements for groundwater protection without constructing an adjacent monitoring well system. Figure 6-1 shows a flow diagram of the proposed treatment process.

After screening and grit removal, influent flow will be routed to the extended aeration basins where fine bubble diffuser assemblies are suspended above the basin floor by floating aeration chains. Fine bubble membrane diffusers are attached to the aeration chains; they are moved across the basin by air released from the diffusers. The moving diffuser assemblies provide efficient mixing of lagoon contents as well as high oxygen transfer. The action of air delivery and moving diffuser assemblies creates alternating multiple aerobic and anoxic zones. Air delivery will be controlled by PLC programming and flow-paced with blowers powered by variable-frequency drives. Mixed-liquor dissolved oxygen concentration (DO) will be monitored and compared to a threshold value.

Solids in effluent from the extended aeration basin are settled in one of two external clarifiers. Biomass is separated from the mixed liquor in the clarifier. A floating flocculating rake mechanism travels around the length of the clarifier to aid in solids settling and distribution. Settled sludge is collected in the bottom of the clarifier by a stationary suction pipe and pumped by RAS pumps which discharge to the extended aeration basin. Sludge from the clarifier (RAS) will be recycled via the RAS piping system to the extended aeration basins. Biomass wasting is controlled by an automated valve. The clarifiers will be constructed of concrete. A long term biosolids storage basin will be constructed for treatment and storage of sludge that is collected from the clarifier, as discussed below. Effluent flows over a fixed overflow weir. Floating materials and debris are removed using a rotating scum removal system.

Clarified wastewater then enters the UV system for disinfection. The UV system will be comprehensive featuring three independent UV banks, each with 10 modules of 8 UV lamps. The lamp assemblies will be contained within an outdoor concrete channel. Transition boxes at both ends of the channel will connect to influent and effluent piping. A weir will be contained within the channel in order to maintain submergence of lamps at all times. Automated features will include shutoff of one bank when flowrate drops, and real-time measurement of UV intensity with corresponding alarm.

Future Expansion

The extended aeration treatment system has been sized and will be designed to easily handle the projected flows and loadings presented in Chapter 5. This includes peak hourly flows of 14.9 MGD. However, if future expansion becomes necessary, the treatment plant has space for expansion by adding a third extended aeration basin and clarifier. The third clarifier would be placed in space allocated in the existing middle lagoon west of the proposed clarifiers. The third extended aeration basin would need to be placed in the Biosolids Stabilization Basin, what is now the West lagoon. Using space in the BSB would reduce storage volume and likely force the City to consider adding a sludge dewatering & thickening system to handle Biosolids.

Design Calculations

The following calculations were used to determine the necessary sizing of two extended aeration basins. The calculations below are based on Future Max. Month flows and loadings. After multiple iterations and based on site restrictions, bottom of pond dimensions were determined to be 210'x90'. The volume of each basin was calculated based on a side water depth of 12 feet and side slopes of 1.5:1.

Variables and known values,

$$Q = Max\ Month\ Flow\ Rate, 4.1\ MGD$$

$$Basin\ Volume = 296{,}399.24\ ft^3$$

$$BOD_{in} = 180\frac{mg}{L}, Max.\ Month$$

$$TKN_{in} = 45\ \frac{mg}{L}, Max.\ Month$$

Hydraulic Residence Time, HRT

$$HRT = \frac{V}{Q}$$

$$HRT = \frac{2 * 296{,}399.24\ ft^3}{4.1\ MGD * 10^6 * 0.13368\frac{gal}{ft^3}}$$

$$HRT = \ 1.08\ days$$

$$Where,$$

$$V = Total\ Volume, ft^3$$

$$Q = Flow\ Rate, ft^3/day$$

BOD Loading Rate (per Basin), BOD_{Load}

$$BOD_{Load} = BOD_{in} * \%Removal * Q$$

$$Where,$$

$$BOD_{in} = 180\ \frac{mg}{L}$$

$$\%Removal = 100\%$$

$$Q = Flow\ Rate, MGD$$

$$BOD_{Load} = 180\frac{mg}{L} * 1.0 * \frac{4.1\ MGD}{2} * 8.34\frac{lbs}{gal}$$

$$BOD_{Load} = 3077.46\frac{lbs}{day}$$

BOD Volumetric Loading Rate (per Basin), $BOD_{Vol\ Load}$

$$BOD_{Vol\ Load} = \frac{BOD_{Load}}{V}$$

$$Where,$$

$$V = Basin\ Volume, ft^3$$

$$BOD_{Load} = 3077.46\frac{lbs}{day}$$

$$BOD_{Vol\ Load} = \frac{3077.46\frac{lbs}{day}}{296{,}399.24\ ft^3} * 1000$$

$$BOD_{Vol\ Load} = 10.38\frac{lb}{1000 ft^3}$$

TKN Loading Rate (per Basin), TKN_{Load}

$$TKN_{Load} = TKN_{in} * \%Removal * Q$$

$$Where,$$

$$TKN_{in} = 45\,\frac{mg}{L}$$

$$\%Removal = 100\%$$

$$Q = Flow\ Rate, MGD$$

$$TKN_{Load} = 45\frac{mg}{L} * 1.0 * \frac{4.1\ MGD}{2} * 8.34\frac{lbs}{gal}$$

$$TKN_{Load} = 769.37\frac{lb}{day}$$

Calculations for additional flows and loadings and are presented in table 6-1.

WWTP Sizing and Layout

Aeration basin sizing is shown in the calculations above. Sizing the extended aeration basins is based on the BOD Volumetric Loading Rate. The target BOD Volumetric Loading rate is around 10 lb/1000ft^3, according to Parkson Corporation. In addition, minimum $BOD_{VolLoad}$ should be no less than 4 lb/1000ft^3 and maximum $BOD_{VolLoad}$ should be no more than 14 lb/1000ft^3. Table 6-1 below shows the $BOD_{VolLoad}$ for various design flow rates.

Table 6-1: $BOD_{VolLoad}$ for two basins:

	Flow (MGD)	**BOD Loading** (mg/L)	**$BOD_{Volload}$** (lbs/1000ft^3)
Existing Ave Day	2.0	210	5.91
Projected Ave. Day	3.2	211	9.50
Projected Max Month	4.1	180	10.38
Projected Max Day	11.1	66	10.31

The existing North and South lagoons will be utilized for the extended aeration basins. These basins will be regraded with 1.5:1 sides slopes and an overall depth of 14-ft. The basins will have 2-ft of freeboard to comply with DOE regulations, therefore the side water depth will be 12-ft. Bottom dimensions will be 210-ft x 90-ft and top dimensions will be 252-ft x 132-ft. Basins will be separated by a 12-ft access road and have a top elevation of 26.00. Total volume of each basin will be approximately 2.7 million gallons.

Secondary Clarification

Two 100-ft secondary clarifiers will be installed after the extended aeration basins. The clarifiers will have complete redundancy at Projected Peak Day flows. Biomass is separated from the mixed liquor in the clarifier. A floating flocculating rake mechanism travels around the length of the clarifier to aid in solids settling and distribution. Settled sludge is collected in the bottom of the clarifier by a stationary suction pipe and pumped by RAS pumps which discharge to the extended aeration basin. Sludge from the clarifier (RAS) will be recycled via the RAS piping system to the extended aeration basins. Biomass wasting is controlled by an automated valve. The clarifiers will be constructed of concrete, have a top elevation of 26.0, and a side water depth of 12-14.0-ft.

Per the Department of Ecology guidelines, settling tanks shall be sized mainly on the basis of surface overflow rate. Surface overflow rates shall be between 400-600 (gpd/sf) under Average Design Flow and 1,200-1,500 (gpd/sf) under Peak Design Flow.

Clarifier Sizing Calculations

The following calculations were used to determine the size of the proposed clarifiers.

Surface Overflow Rate (per Clarifier, projected Avg. Day Flow to Single Clarifer), SOR

$$SOR_{Ave\ Day} = \frac{Q}{\frac{\pi}{4} * D^2}$$

$$Where,$$

$$Q = Flow\ Rate, \frac{gal}{day}$$

$$D = Clarifier\ Diamater, ft$$

$$SOR = \frac{3.2\ MGD * \ 10^6}{\frac{\pi}{4} * 100\ ft^2}$$

$$SOR = 407.44\ gpd/sf$$

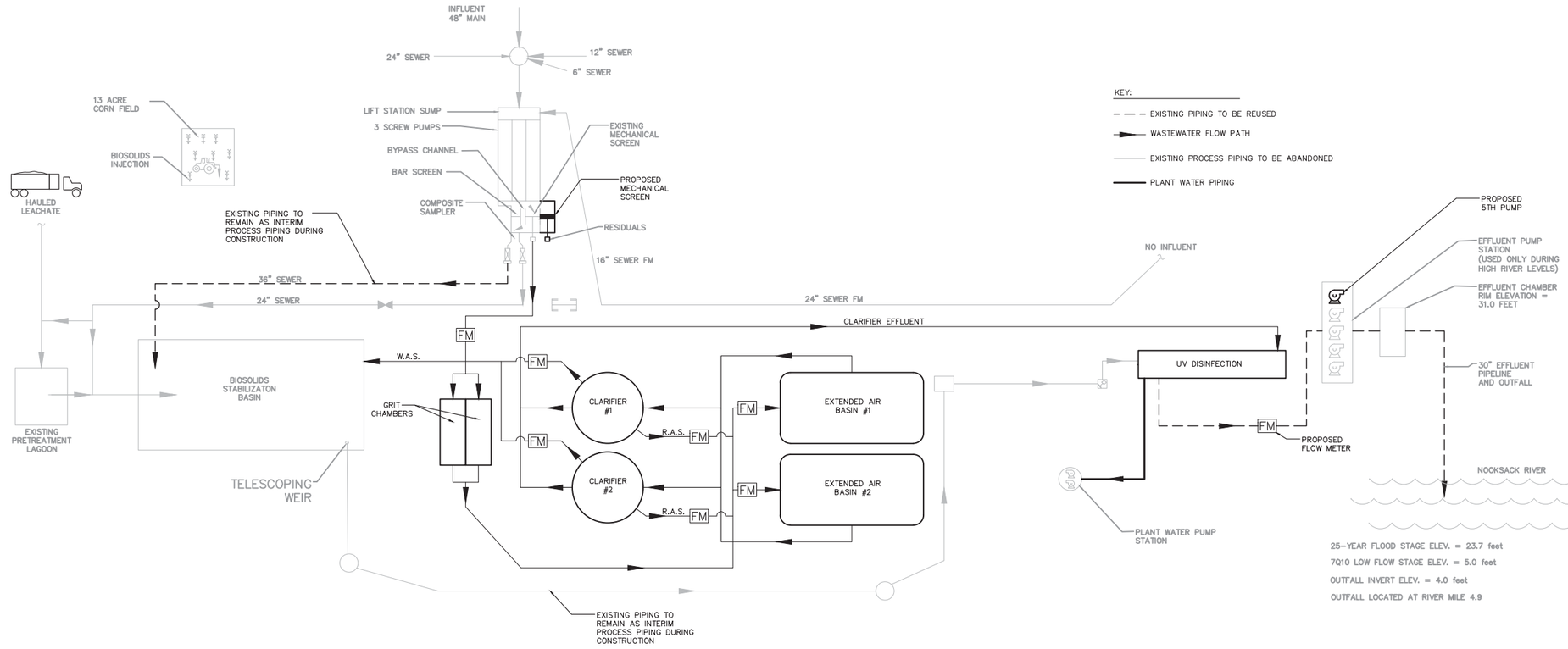
$$SOR_{Peak\ Day} = \frac{Q}{\frac{\pi}{4} * D^2}$$

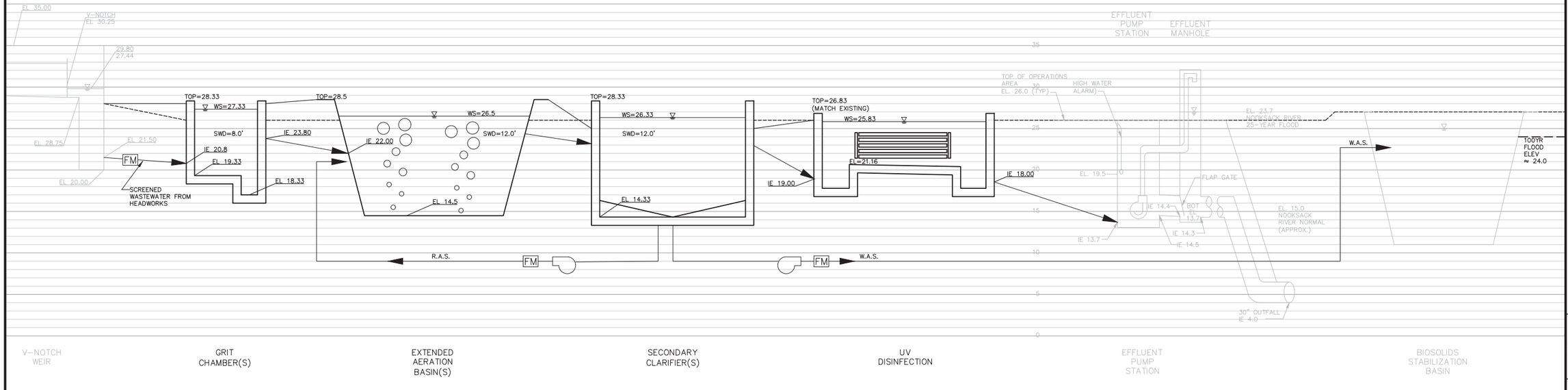
$$SOR = \frac{11.1\ MGD * \ 10^6}{\frac{\pi}{4} * 100\ ft^2}$$

$$SOR = 1413.30\ gpd/sf$$

Redundancy

The recommended treatment plant improvements will meet all reliability and redundancy requirements for a Class II WWTP as defined by Ecology. The proposed treatment system will provide multiple parallel trains of unit processes, as required by Ecology for systems which peak hourly flowrate will be three times the average annual flowrate.





WILSON ENGINEERING, LLC
805 DUPONT STREET
BELLINGHAM, WA 98225
(360) 733-6100 • FAX (360) 647-9061
www.wilsonengineering.com
Wilson
SURVEY/ENGINEERING

DESIGNED BY | DRAWN BY | CHECKED BY

CITY OF FERNDALE
FERNDALE WASHINGTON
WASTEWATER TREATMENT PLANT
FIGURE 6-1: WWTP IMPROVEMENTS FLOW SCHEMATIC & HYDRAULIC PROFILE

DATE 3-15-16 | SCALE AS SHOWN | JOB NUMBER 2014-036

SHEET FIG 6-1 | PAGE 1 OF 1

Recommended Site Improvements

Based on flow and load capacities, future effluent limits, and operation and maintenance needs, the following improvements are being recommended for the City of Ferndale's WWTP.

Headworks Improvements

Grit Removal

Grit removal is recommended prior to the proposed extended aeration treatment plant. Grit removal will be important for the proposed treatment plant to reduce grit deposits in the aeration basins and pipelines and protect equipment from abrasion. Given the low elevation of influent wastewater piping, two aerated grit removal chambers are being recommended after the headworks facilities. Grit chambers would have interior dimensions of approximately 10-feet wide by 30-feet long and 8-feet side water depth. These dimensions give each chamber a detention time of 4.7 minutes at projected max day flows (11.1 MGD). Two grit chambers allows for redundancy so one chamber can be taken offline for maintenance. Dedicated blowers would supply coarse bubble diffusers in each grit chamber with enough airflow to circulate and deposit grit at the bottom of the basin. Grit would be removed periodically either by vactor truck or gravity flow to the biosolids stabilization basins. This Grit Basin could be bypassed if necessary.

Grit Chamber Sizing

The following calculations were used to determine the necessary sizing of two grit chambers assuming a detention time goal of 3 minutes at Future Peak Hourly Flow, 14.9 MGD. Two grit chambers are being design for redundancy.

$$V = \frac{Q_{Peak} * T}{2}$$

$$V = \frac{14.9\ MGD * 3\ Minutes}{2}$$

$$V = \frac{14.9\ MGD * 10^6 * \frac{3\ Minutes}{60\ minutes/24\ hours}}{2}$$

$$V = 15{,}520\ gallons$$

$$Where,$$
$$V = Minimum\ Volume\ Required\ per\ Basin$$
$$Q = Projected\ Peak\ Hourly\ Flow, 14.9\ MGD$$
$$T = Detention\ Time$$

The grit chamber basins were sized with a Width to Depth goal of at least 1.2:1 and a Length to Width goal of at least 3:1. Based on this design criteria basin dimensions were determined to be,

Length=30', Width=10', and a Side Water Depth of 8'. This results in a volume per basin of 17,953 Gallons. Based on this volume the following calculations were used to determine the detention time at Future Max Day Flow, 11.1 MGD.

$$T = \frac{V}{Q/2}$$

$$T = \frac{17{,}953\ gal}{11.1\ MGD/2}$$

$$T = \frac{17{,}953\ gal}{\frac{11.1\ MGD * 10^6}{2}} * 60\ minutes * 24\ hours$$

$$T = 4.68\ minutes$$

$$Where,$$
$$T = Detention\ Time$$
$$V = Volume\ per\ Basin$$
$$Q = Projected\ Max\ Day\ Flow, 14.9\ MGD$$

Detention times were calculated for additional flow rates and are presented in table 6-2.

Table 6-2: Calculated Detention Times for Design Flow Rates

Flow	Detention Time (2 basins)	Detention Time (1 Basin)
2.0	25.9	12.9
3.2	16.2	8.1
4.1	12.6	6.3
11.1	4.7	NA
14.9	3.5	NA

Mechanical Screening

The existing mechanical screen was installed in 2013 and has a maximum hydraulic capacity of 18 MGD. The existing screen is in good condition and will meet the projected peak flows with the existing screen size. The spacing of the existing screen is 3/8 inch which will work for the proposed treatment system. However, the Extended Aeration treatment process recommends a screen opening of 6 mm (0.24 inches). Therefore, it is recommended that the existing screen be replaced and a second screen with 6mm spacing be installed to improve screening and for redundancy. The new screen would be installed in a new concrete channel adjacent to the existing screen. A second mechanical screen will allow for additional redundancy if either screen needs to be taken offline.

It is recommended that both screens be integrated with the SCADA system for the plant and connected to backup generator power in case of power loss.

Headworks Screw Pumps

The existing screw pumps are in fair condition and have the capacity to meet future flow conditions. It is recommended that the influent screws and channels be painted with an epoxy system to extend the life of the screw pump and concrete channels and protect against the corrosive environment of the raw wastewater. It is also recommended that the existing influent screw pumps be integrated with the SCADA system and new generator backup system. The existing pumps are connected with a generator backup, however there have been problems initiating pumps under backup power in recent years and the system has proven to be unreliable. This has required the installation of a backup gas powered trailer pump to handle influent pumping when power is lost. This backup trailer pump is not capable of handling peak flows and should be replaced with a fully functioning dedicated generator backup power system. This generator backup system would be in addition to the overall plant generator backup system. An electrical evaluation of the headworks system is recommended during the design phase of the new wastewater treatment plant.

Additional improvements recommended for the headworks include a platform over the top of the influent screw pumps for maintenance access and safety and a davit or bridge crane for lifting influent screw motors. Currently it is very challenging and dangerous for operators to work on and maintain the influent screw pumps. The recommended platform and crane will provide easy access and support for this maintenance.

It is also recommended that screw pump bearings, grease pumps, and all grease lines be replaced during the headworks improvements.

Pump Stations

Plant Drain Pump Stations

A plant drain pump station is recommended on site to collect drainage from new basins and structures. For the recommended treatment alternative, the pump station would allow grit chambers, clarifiers, aeration basins, control buildings, pump vaults and bathrooms to be drained and pumped to the grit basins for treatment through the plant or pumping to the biosolids storage basin. The pump station should be a duplex pump station

It is recommended that the plant drain pump station be integrated with the plant SCADA system and connected to backup generator power for operation during loss of utility power.

Effluent Pump Station

The effluent pump station is normally bypassed through a 30” PVC pipe to the effluent chamber. This pipe has a capacity of roughly 13.2 MGD which is just under the 14.9 MGD peak hourly flows. However, the backed up headwater elevation during 14.9 MGD peak hourly flows will not be significant. Therefore, replacement of the existing bypass pipe is not needed.

High flood elevations over 17.00’ closes the bypass pipe flap gate, which results in a water level rise in the effluent pump station. The pumps have the capacity to handle the entire peak flow with four pumps running. At this rate, all four pumps can handle 16.8 MGD which exceeds our

projected peak hourly flow of 14.9 MGD. Since all four pumps would be required under peak flow conditions, a fifth pump is recommended as a backup. The effluent pump station was originally configured to handle 5 pumps, so minimal modification will be necessary to install the new pump. It is recommended that the pump be able to handle at least 4.2 MGD.

Additional recommended improvements to the effluent pump station include painting of existing piping and replacement of bypass flap gate.

Flow Measurement

A new influent flow measurement system is recommended to replace the existing v-notch weirs at the headworks. The existing weirs have historically been a maintenance issue and not a reliable source of flow measurement. It is recommended that a new mag meter or Parshall flume with open channel ultrasonic flow meter be installed on the influent gravity piping after the headworks but before the proposed grit chambers. This new flow meter will be connected to the existing SCADA system for data logging and also used for process control.

Additional mag meters are recommended for the following locations:

1. After headworks & prior to grit chambers
2. Immediately before extended aeration basin #1
3. Immediately before extended aeration basin #2
4. RAS meter from each clarifier
5. WAS meter from each clarifier
6. After UV disinfection

Disinfection

Due to increased health concerns of chlorine disinfection, the costs for chlorination and dechlorination chemicals and operations has increased dramatically. And, due to the space required at the Ferndale WWTP for chlorination equipment, it is recommended that the disinfection method be converted to UV Disinfection. With this recommendation the space from the existing chlorine contact basins could be converted to UV disinfection channels.

Disinfection is provided to achieve disinfection standards. Ultraviolet disinfection is selected as it is effective and has low O&M requirements and less health concerns.

Ferndale's current disinfection process uses chlorine gas, which is heavily regulated due to its hazardous material classification. The General Sewer Plan discusses these regulations and determined that the chlorine contact basins will require expanding within the planning period to accommodate the increasing flow rates. The Plan recommended that Ferndale implement ultra-violet light (UV) disinfection to avoid the need to expand the chlorine contact basin and to avoid the continued handling of hazardous materials (i.e. chlorine gas and sulfur dioxide gas).

There are two types of UV systems available: open-channel and in-line. The in-line system provides disinfection in a closed pipe while the open-channel system is in a small trough. Both systems work by inactivating the bacteria in the secondary effluent with UV radiation. The major advantage to UV, other than no chemicals, is the short hydraulic retention time required. This

decreased retention time, in comparison to the chlorine contact tanks requires a small footprint. Both in-line and open-channel will require roughly the same space for installation and maintenance and can be placed within the existing chlorine contact tanks or an alternate location in that vicinity. It is recommended that the UV disinfection system be configured with 3-4 UV banks, 3 duty and 1 redundant under peak design flows.

Piping for the UV system will include new gravity pipe from the proposed WWTP clarifiers. The UV system will be placed in a concrete channel approximately 42' long, 40" wide, and 62" deep. Equipment and final layout decisions will be made during the final design.

Blower Room

The existing treatment facility is outfitted with a chlorine gas scrubber for emergencies when working with the chlorine gases used for disinfection. With the proposed recommendations to replace chlorine disinfection with UV disinfection, the gas scrubber will become obsolete. Therefore, it is recommended that the existing chlorine gas scrubber be taken offline and the existing room be converted to a blower control room. The extended aeration system requires approximately five 75 HP blowers to provide the necessary aeration to the proposed basins. These blowers will be sized to meet all aeration needs with four blowers, the fifth blower will be redundant. The aeration system will also be configured so that two 75 HP blowers are dedicated to each aeration basin and an additional 75 HP blower is available as a spare.

PLC Control and SCADA System

The existing WWTP PLC control and SCADA system should be expanded to include all of the proposed WWTP improvements. This includes alarms, monitoring information, and supervisory control of all automatic valves, gates, pumps, blowers, clarifier motors, etc. The system will allow control and monitoring of the treatment process including the RAS system and WAS wasting system. The system will receive process signals from control panels throughout the plant and display this information at the SCADA computer in the Operations Building. Alarms from the new systems will be added to the existing SCADA system dial-out system for notification of alarms and failures.

The existing SCADA system is Rockwell FactoryTalk View SE and is currently up to date and maintained by the City's control system programmer.

The WWTP's PLC control system was recently upgraded in 2014. The upgrades included new backpanels and control components in the existing enclosures at six (6) locations around the plant, and new power monitors in the ATS's. The PLC upgrades included replacement of the existing Siemens PLCs in the panels with the new City standard, Rockwell/Allen Bradley ControlLogix platform. In the areas of WWTP improvements, the existing control panels will be evaluated for suitability for re-use. When new panels will be required, they will be specified to include the same PLC hardware and components for compatibility with existing systems. Where existing panels are removed, the panel components may be re-used for spare parts.

The upgrade also included new UPS systems in each control panel. The UPS systems are intended to power the control panels for enough time to switch to the plants backup generator power. Where extended power backup is necessary, the control systems should designed with 24VDC battery systems for extended backup time.

Power / Electrical Components

The upgraded treatment plant and equipment will require backup generator power and full integration with the existing PLC control and SCADA system.

The following electrical and control system improvements are recommended for the wastewater facility:

1. Evaluate existing Automatic Transfer Switches (ATS's): There are three existing ATS's that provide backup generator power to the existing power distribution panels and MCC's throughout the facility. The existing ATS's have proven to be unreliable and have experienced failures in recent years. The electrical ratings and operational functions should be evaluated for suitability with the upgraded facility, and may require complete replacement of some or all of the ATS's.
2. Evaluate existing generator: The existing 1000 kW/1250 kVA standby diesel generator has been well maintained and is in good operational condition. However the generator sizing and capacity should be re-evaluated with the upgraded WWTP electrical loads and ATS's to verify adequate capacity to start and run all of the required equipment during loss of utility power . It is recommended that the generator meets the sizing and fuel capacity requirements to operate the plant under full load for a minimum of 24 hours
3. Evaluate existing transformers: The existing Puget Sound Energy (PSE) 12.4 kV electrical power feeds five 12.47-480Y/277Vtransformers around the WWTP and water filtration facility. There have been problems over recent years with the 12.47 kV switches over recent years. The condition and suitability of the existing switches should be evaluated during the design for upgrade or replacement.
4. Site Lighting: Replace or retrofit existing HID style site lighting with new energy efficient LED lighting. Install new LED site lighting around new proposed process equipment areas.
5. Headworks Backup Power: The power distribution at the headworks should be evaluated to verify sizing to start and run the required number of screw pumps. Due to the critical nature of this location, a dedicated headworks portable generator receptacle and Manual Transfer Switch should be considered to provide an additional backup power alternative.

Operations Building

The City has identified a need for a new building to house a new WWTP laboratory, office area, and some of the proposed equipment (i.e. blowers for aeration, ultraviolet disinfection units, new controls, etc.). Features of the new operations building shall include:

1. Laboratory with the latest technology and equipment including sink, desks, vent hood, cabinets, drawers.
2. Mud room and showers.

It is noted that the existing combined lab/office area serves both water treatment and wastewater treatment needs. The preferred option is to separate the water treatment and wastewater treatment laboratory areas. It is noted that modern labs are much larger then what the City currently has, and generally provide a minimum of about 500 square feet of space.

Considering all of the new building space needs it has been determined that combining functions in a common building will be more cost effective and less disruptive of the plant operations.

The cost of a complete operations building including lab and offices would be between $750,000-$1,000,000 dollars.

It is recommended that the new operations building be located in the location of the existing chlorine contact tanks. The proposed recommendation is to convert a portion of the existing tanks to UV disinfection channels and fill the remaining tanks with structural backfill. This area would allow a building approximately 60-ft x 58-ft.

Staffing and Testing Requirements

The WWTP is currently staffed from 7 AM to 3 PM, seven days a week with three of four certified operators and with 24-hour call-out. The lead operator is Group III, and the other operators are Group II and Group I. The WWTP must have at least a Group II operator in reasonable charge of daily operation.

After improvements, the WWTP will require additional operations staff for process control, maintenance, lab operations, biosolids handling, and general site work. Annual hours and projected staffing requirements are presented in Table 6-3 for the proposed improvements. These projected hours assume one staff is working a 5-day work week, with 29 holidays, vacation, and sick days, and 6.5 hours per day of productive work.

Table 6-3: Projected Staffing Requirements for Projected Improvements

Component		#	Annual Hours	Total Annual Hours
Process Operations				
	Biolac System		1900	1900
Maintenance		Quantity	Hours	Total
	Screens	2	65	130
	Aerated Grit Chambers	2	65	130
	Clarifiers	2	130	260
	Pumps		250	250
	Blowers	5	52	260
	UV Disinfection	4	26	104
Laboratory		Tests per Week	Hours	Total
	BOD	4	2.5	520
	TSS	4	3	624
	Fecal	2	1	104
	Ph	7	0.25	91
	Ammonia	2	2	208
	Total Nitrogen	2	2	208
General Site Work			Hours	Total
	Custodial		200	200
	Snow Removal		40	40
	Mowing		120	120
	Painting		80	80
	Rust Removal		80	80
Biosolids Handling			Hours	
	Stabilization Basin		130	130
			TOTAL HOURS	5439
Estimated Hours per Year per Staff			1500	
TOTAL STAFFING ESTIMATE (Total Hours/1500)				**3.6**

Plant Water System

A plant water system is recommended for non-potable water needs such as wash water and mechanical screen spray water. It is recommended that the existing effluent filter system be decommissioned after the new treatment plant is constructed and UV disinfection is in place. At this time the existing effluent filters will be obsolete and may be decommissioned. The existing filter system will be removed from the tanks and the existing tanks can be used for plant water storage. Portions of the existing return pump station and piping can be reconfigured for water distribution. Plant water hydrants will be located throughout the plant for easy access.

In addition, the entire plant non-potable and potable water system should be evaluated for cross contamination possibilities. Air gaps and cross contamination measures will need to be installed where required and appropriate.

Industrial Wastewater

The WWTP will continue receiving a very small amount of industrial wastewater from two permitted industrial contributors: RECOMP and Olivine Corporation municipal solid waste incinerator. This industrial wastewater will be received at the headworks receiving & drying pad and then sent to the front end of the headworks. No special provisions or pretreatment will be required for this industrial wastewater.

Biosolids Production and Handling

Description

After clarification, waste activated sludge (WAS) will be sent to the new Biosolids Stabilization Basin (BSB), converted from the existing West Lagoon. The new basin will be double lined with 100-mil HPDE liners and leak detection system. Basin decant would be recycled back to the headworks of the plant periodically. Biosolids will continue to reduce through anerobic digestion over many years. When storage space in the BSB is consumed, biosolids will be dredged and either land applied or hauled to a processing facility.

Biosolids Production

Biosolids production calculations from the proposed extended aeration treatment plant are presented below. Calculations are based on existing and future average day flows, 2.0 MGD and 3.2 MGD respectively. At startup, 330 dry tons/ year are estimated to be produced. After 20 years, when flows are projected to increase to 3.2 MGD (Average Daily Flow), 530 dry tons/year are estimated to be produced. The total volume sent to the BSB is estimated to be 7.8 MG/yr at 2.0 MGD and 12.5 MG/year at 3.2 MGD assuming 1% solids concentration.

Based on projected flows and loadings, Biosolids Production from the Plant and Net Biosolids Produced have been estimated and shown in Table 6-4. Biosolids Production from the Plant is considered the solids sent to the Biosolids Storage Basins after treatment. Net Biosolids Produced is considered the biosolids produced after 50% reduction of solids from storage in the Biosolids Stabilization Basins.

Biosolids will continue to reduce through anerobic and aerobic digestion over multiple years of storage in the BSB. After completion of the plant, biosolids will be sent to the biosolids storage basins. Biosolids will not be removed from the basins for the first 2-3 years depending on exact

storage volumes and production rates. After this time, biosolids will continue to be Class B and will be land applied or sent to Tjoelker Farm beneficial use site.

Table 6-4: Biosolids Production and Handling Costs for Existing & Design Flow Rates

Flow	Mass	Mass after 50% Reduction	Yearly Volume to Storage	Total Volume with 1% Conc.	Total Volume with 2% Conc.	Cost for Land Application	Cost for Hauling to Tjoeker Farm
2.0 MGD	330 dry/tons	165 dry/tons	7,787,770 gal	3,893,885 gal	1,946,942 gal	$178,504	$265,233
3.2 MGD	530 dry/tons	265 dry/tons	12,519,553 gal	6,259,776 gal	3,129,888 gal	$477,618	$720,554

Table 6-5: Yearly Biosolids Production Rates

Year	Projected Population	Biosolids Produced from Plant (Dry Tons / Year)	Net Biosolids Produced (Dry Tons / Year)
2019	14,274	360.01	180.01
2020	14,543	366.78	183.39
2021	14,816	373.68	186.84
2022	15,095	380.70	190.35
2023	15,378	387.86	193.93
2024	15,668	395.15	197.58
2025	15,962	402.58	201.29
2026	16,262	410.15	205.07
2027	16,568	417.86	208.93
2028	16,879	425.71	212.86
2029	17,197	433.72	216.86
2030	17,520	441.87	220.94
2031	17,849	450.18	225.09
2032	18,185	458.64	229.32
2033	18,527	467.27	233.63
2034	18,875	476.05	238.03
2035	19,230	485.00	242.50
2036	19,591	530.00	265.00

Biosolids Handling Costs

Biosolids handling costs were estimated based on biosolids production calculations below and projected population growth. A biosolids reduction of 50% was assumed after multiple years of storage in the BSB. At startup, approximately 170 dry tons per year would require dredging. Handling of the biosolids would consist of dredging from the BSB, followed by either land application on the City's existing land application site, or hauling to the Tjoeker Farm facility. Based on existing biosolids handling costs, the total projected cost to land apply 170 dry tons would be approximately $178,000. The total projected cost to haul and dispose 170 dry tons at Tjoeker Farms would be approximately $265,000. Processing fees include mobilization, engineering services, lab / permit fees, dredging, injection, hauling, and Tjoeker Farm processing fees. A combination of land application and hauling to Tjoeker Farms will be necessary based on land application requirements. Typically, 5.5 tons/acre cab be land applied based on recent

agronomic calculations. This amounts to 70 dry tons per year which can be land applied on City owned land.

However, the handling of biosolids will not be needed for approximately 4-5 years after startup of the new treatment plant when storage volume has been consumed. This time period can be increased by approximately 50%, if an additional process unit for thickening is added to the BSB. During the first 5 years the total volume of WAS sent to the BSB will be roughly 7.8 MG/year. However, roughly 75% of this flow will be decanted back to the front of the treatment plant. Therefore, the basin is projected to fill at less than 2 million gallons per year.

Land Application Site

The City's adjacent land application site provides a cost effective option for the beneficial use of biosolids. However, the site currently has capacity for only 50% (approx.) of biosolids produced. Available land application capacity will decrease to 30% (approx.) by the year 2033. If adjacent farm land should become available for the City to purchase, a cost to benefit evaluation is recommended for consideration. The projected annual cost difference between land application and hauling is approximately $87,000 in year 2019 and $243,000 in year 2036. This provides a simple calculation for determining the viability of purchasing additional adjacent farmland.

Calculations

The following calculations were used to determine the Biosolids Production based on the recommended extended aeration treatment alternative.

$$P_{x,TSS} = \frac{Heterotrophic\ Biomass}{\%\ VSS_{MLSS}} + \frac{Autotrophic\ Biomass}{\%VSS_{MLSS}} + \frac{Cell\ Debris}{\%VSS_{MLSS}} + Influent\ NonBiodegradable\ VSS + Influent\ Inorganics$$

Variables and assumed values,

$$Q = Flow\ Rate, m^3/d$$

$$\theta = Temp - acticivity\ coefficient = 1.02$$

$$T = Water\ Temp\ in\ Basin, 20° C$$

$$SRT = Solids\ Retention\ Time = 35\ days$$

$$\%VSS_{MLSS} = 70\%$$

$$BOD_{in} = 211\frac{mg}{L}$$

$$BOD_{out} = 10\frac{mg}{L}$$

$$TKN_{in} = 50\frac{mg}{L}$$

$$TKN_{out} = 3\frac{mg}{L}$$

Heterotrophic Biomass

$$k_{dH,T} = k_{dH,20} * \theta^{T-20}$$

$$P_{x,VSS,H} = \frac{Q * Y_H * (BOD_{in} - BOD_{out})}{1 + k_{dH,T}SRT}$$

$$Y_H = Yield\ Coefficient\ (Heterotrophic) = 0.65 gVSS/gBOD - d$$
$$k_{dH,20} = Endogonous\ Decay\ Coefficient\ (Heterotrophic), 20℃ = 0.1 gVSS/gBOD - d$$
$$k_{dH,T} = Endogonous\ Decay\ Coefficient\ (Heterotrophic), T℃$$

$$k_{dH,T} = k_{dH,20} * \theta^{T-20} = 0.1 gVSS/gBOD - d$$

$$P_{x,VSS,H} = \frac{6057 m^3/d * 0.65 gVSS/gBOD - d * (211 mg/L - 10 mg/L)}{1 + 0.1 gVSS/gBOD - d * 35\ days}/1000$$

$$P_{x,VSS,H} = 175.85\ kg/day$$

Autotrophic Biomass

$$k_{dA,T} = k_{dA,20} * \theta^{T-20}$$

$$P_{x,VSS,A} = \frac{Q * Y_H * (TKN_{in} - TKN_{out})}{1 + k_{dA,T}SRT}$$

$$Y_A = Yield\ Coefficient\ (Autotrophic) = 0.1 gVSS/gBOD - d$$
$$k_{dA,20} = Endogonous\ Decay\ Coefficient\ (Autotrophic), 20℃ = 0.08 gVSS/gBOD - d$$
$$k_{dA,T} = Endogonous\ Decay\ Coefficient\ (Autotrophic), T℃$$

$$k_{dA,T} = k_{dA,20} * \theta^{T-20} = 0.08 gVSS/gBOD - d$$

$$P_{x,VSS,H} = \frac{6057m^3/d * 0.1gVSS/gBOD - d * (50mg/L - 3mg/L)}{1 + 0.08gVSS/gBOD - d * 35\ days}/1000$$

$$P_{x,VSS,A} = 7.49\ kg/day$$

Cell Debris

$$P_{x,VSS,Db} = \frac{f_d * k_{dH,T} * Q * Y_H * (BOD_{in} - BOD_{out}) * SRT}{1 + k_{dH,T}SRT}$$

$$f_d = Cell\ debris\ in\ MLVSS = 0.1\ gVSS/gBOD - d$$

$$P_{x,VSS,Db} = \frac{0.1\ gVSS/gBOD - d * 0.1\ gVSS/gBOD - d * 6057m^3/d * 0.65gVSS/gBOD - d * (211mg/L - 10mg/L) * 35\ days}{1 + 0.1gVSS/gBOD - d * 35\ days}$$
/1000

$$P_{x,VSS,Db} = 61.55\ kg/day$$

Influent Non-Biodegradable VSS

$$P_{x,nb} = Q * nbVSS_{in}$$

$$nbVSS_{in} = Influent\ NonBiological\ VSS = 29.3\ mg/L$$

$$P_{x,nb} = (6057m^3/d * 29.3\frac{mg}{L})/1000$$

$$P_{x,nb} = 177.43\ kg/day$$

Influent Inorganics

$$P_{x,inerts} = Q * (TSS_{in} - VSS_{in})$$

$$P_{x,inerts} = 6057m^3/d * (217mg/L - 195.3mg/L)/1000$$

$$P_{x,inerts} = 131.43\ kg/day$$

Net Activated Sludge Produced, kg/day, $P_{x,TSS}$

$$P_{x,TSS} = \frac{Heterotrophic\ Biomass}{\%\ VSS_{MLSS}} + \frac{Autotrophic\ Biomass}{\%VSS_{MLSS}} + \frac{Cell\ Debris}{\%VSS_{MLSS}} + Influent\ NonBiodegradable\ VSS + Influent\ Inorganics$$

$$P_{x,TSS} = \frac{P_{x,VSS,H}}{\%VSS_{MLSS}} + \frac{P_{x,VSS,A}}{\%VSS_{MLSS}} + \frac{P_{x,VSS,Db}}{\%VSS_{MLSS}} + P_{x,nb} + P_{x,inerts}$$

$$P_{x,TSS} = \frac{175.85\ kg/day}{0.70} + \frac{7.49\ kg/day}{0.70} + \frac{61.55\ kg/day}{0.70} + 177.43\ kg/day + 131.43\ kg/day$$

$$P_{x,TSS} = 658.70\frac{kg}{day}$$

$$P_{x,TSS} = \frac{658.70\frac{kg}{day} * 2.22046\frac{lb}{kg} * 2\ basins}{2000\frac{lbs}{ton}} * 365\ days/year$$

$$P_{x,TSS} = 530.04\frac{tons}{year}$$

Construction Phasing

Phasing of construction will be necessary to ensure proper treatment through the existing plant. A proposed phasing schedule is outlined below.

1. Construction of Extended Aeration Basins in North and South Lagoons.
    a. During this construction wastewater will only be treated in the west and middle lagoons. The existing effluent filters and chlorine contact basins will stay online. Extra chemical addition may be necessary during this time to reduce suspended solids.
2. Construction of Clarifiers, Grit removal, and Plant Drain pump station in Middle Lagoon during summer months only.
    a. During this construction wastewater will only be treated in the west lagoon. The existing effluent filters and chlorine contact basins will stay online. Extra chemical addition will be necessary during this time to reduce suspended solids. Additional portable filtration systems may be needed also to help reduce suspended solids.
3. After construction is completed for the extended aeration basins and the clarifiers, flow will be directed to these new components. Disinfection will continue via chlorine disinfection in half of the existing contact basins. The remaining half will be dewatered to allow construction of a UV disinfection system. The effluent filter system will also be taken offline and decommissioned and converted to a plant water system. Simultaneously, biosolids will be removed from the west lagoon and construction will be started to convert the west lagoon to a biosolids stabilization basin.
    a. During construction of the biosolids stabilization basin WAS will need to be hauled offsite until the new basin is completed.
4. After completion of the UV disinfection the remaining chlorine contact basin will be decommissioned and the new operations building can be constructed. The chlorine & sulfur dioxide gas scrubber unit will be removed and replaced with blows and controls for the new aeration basins.

Remaining improvements are not process sensitive and can happen on a typical construction schedule.

7.0 - FINANCIAL INFORMATION

The purpose of this section is to identify and describe the costs of the existing wastewater treatment plant operations, the capital costs for recommended improvements to the wastewater facilities, and the projected operations and maintenance costs for the recommended improvements. Biosolids handling costs are discussed briefly with additional information in section 6.0 Recommended Improvements.

A summary of wastewater grant and loan programs is attached in Appendix D.

Construction Costs of Improvements

Treatment Alternative Estimates

A rough cost estimate was evaluated for each treatment alternative discussed in Chapter 5. These estimates are presented below in Table 7-1. The results shown in Table 7-1 were used to make an initial determination that an MBR process would not be a feasible solution for the City of Ferndale. The MBR process was significantly higher primarily due to the high equipment costs quoted by the local sales representatives. The equipment costs for the MBR system would be roughly $6 Million more than the other treatment technologies evaluated. The remaining alternatives had reasonably similar construction costs which warranted further evaluation.

Table 7-1: Ballpark Construction Estimates for Alternatives

Process Alternatives	Total Equipment Cost	Earthwork, Piping, Sitework, Ops Bldg	Concrete	HDPE Liner	Electrical / Controls	TOTAL
SBR	$3,577,000	$7,120,000	$816,429	$871,200	$2,500,000	$20,458,431
MBR	$9,441,000	$4,720,000	$4,918,000	$727,200	$2,500,000	$32,345,283
Oxidation Ditch	$2,790,000	$4,747,000	$4,884,000	$554,400	$1,500,000	$20,990,160
Biotreater Process	$3,117,000	$4,220,000	$5,965,755	$727,200	$1,500,000	$22,519,336
Extended Aeration	$3,171,000	$4,406,000	$2,379,915	$806,400	$1,500,000	$17,782,519

Table 7-2: Overall 20-Year Life Cycle Cost Estimates for Alternatives

Process Alternatives	Total Construction Cost	Annual O&M Cost	20 Year Life Cycle Cost
SBR	$20,458,431	$1,167,103	$53,926,848
MBR	$32,345,283	$1,622,728	$78,879,420
Oxidation Ditch	$20,990,160	$846,743	$45,271,782
Biotreater Process	$22,519,336	$1,241,575	$58,123,357
Extended Aeration	$17,782,519	$760,117	$39,580,003

Extended Aeration & Oxidation Ditch Detailed Estimates

After initial evaluation of treatment technologies, the Extended Aeration Process and Oxidation Ditch Process were selected as favorable alternatives. A detailed construction cost estimate for these two alternatives are presented below in Tables 7-3 and 7-4. These estimates include a 15% contingency, 3% inflation over three years, and sales tax at 8.7%. The construction cost estimate for the Extended Aeration Process was determined to be approximately $17,783,000. The construction cost estimate for the Oxidation Ditch Process was determined to be approximately $20,990,160. The difference between the two alternatives is $3,207,000. The most significant cost difference between the two alternatives is the structural concrete costs associated with the Oxidation Ditch basins which adds approximately $2.5 million dollars.

Table 7-3: Extended Aeration Construction Cost Estimate

Item No.	Item	Description	Approx. Quantity	Unit	$/Unit	Total $
a.	Mob / Demob	Assume 7% of Total	1	LS	$ 858,409	$ 858,000
b.	Excavation / Backfill	Excavation & Haul	31,193	CY	$ 20	$ 624,000
		Backfill & Compaction (Imported Fill Material)	22,378	CY	$ 20	$ 448,000
		Remove & Haul Existing Biosolids (North, South, Middle)	1	LS	$ 140,210	$ 140,210
		Remove & Haul Existing Biosolids (West)	1	LS	$ 323,778	$ 323,778
		Removal of shotcrete, liner, rip rap from lagoons	1	LS	$ 100,000	$ 100,000
c.	Equipment	Mechanical Screens	1	EA	$ 200,000	$ 200,000
		Mechanical Screens Installation 20%	1	LS	$ 40,000	$ 40,000
		Biolac / Bioworks Equipment w/ blowers	1	LS	$ 1,250,000	$ 1,250,000
		Biolac / Bioworks Equipment Installation	1	LS	$ 200,000	$ 200,000
		Clarifiers	1	LS	$ 360,000	$ 360,000
		Clarifier Installation	1	LS	$ 72,000	$ 72,000
		UV Equipment	1	LS	$ 500,000	$ 500,000
		UV Equipment Installation	1	LS	$ 75,000	$ 75,000
		Plant Drain Pump Station Equip.	1	LS	$ 100,000	$ 100,000
		Plant Drain Pump Station Installation	1	LS	$ 20,000	$ 20,000
		Influent Sampler	1	LS	$ 7,175	$ 7,000
		Effluent Sampler	1	LS	$ 7,175	$ 7,000
		Influent Flow Meter (Mag Meter)	1	LS	$ 20,000	$ 20,000
		Treated Effluent Flow Meter (Mag Meter)	1	LS	$ 20,000	$ 20,000
		Plant Water Flow Meter (Mag Meter)	1	LS	$ 10,000	$ 10,000
		Effluent Pump Station Equip	1	LS	$ 70,000	$ 70,000
		Effluent Pump Station Install	1	LS	$ 10,000	$ 10,000
		Plant Water System	1	LS	$ 200,000	$ 200,000
		Grit Chamber Diffusers / Installation	1	LS	$ 10,000	$ 10,000
d.	Concrete	Headworks	70	CY	$ 900	$ 63,000
		Grit Chambers & Flow Splitter	150	CY	$ 900	$ 135,000
		Clarifiers	2,803	CY	$ 700	$ 1,962,000
		Buildings / Foundations	200	CY	$ 600	$ 120,000
		Raven / Tnemec Lining System	1	LS	$ 100,000	$ 100,000
e.	Buildings	Control Bldg	1	LS	$ 770,000	$ 770,000
	HDPE Liner	2 Extended Air Basin and Biosolids	1	LS	$ 806,400	$ 806,000
f.	Yard Piping	Site Piping and Valving	1	LS	$ 1,000,000	$ 1,000,000
g.	Site Work	General Site Work and Restoration	1	LS	$ 1,000,000	$ 1,000,000
h.	Electrical	Controls, Wiring, Lighting, Service Equip, Feeders, Devices, Etc.	1	LS	$ 1,500,000	$ 1,500,000
Subtotal						$ 13,121,000
Inflation (9%)						$ 1,180,890
Construction Total						$ 14,301,890
Contingency (15%)						$ 16,447,174
Sales Tax (8.7%)						$ 1,430,904
Total Construction Cost						**$ 17,849,000**

Table 7-4: Oxidation Ditch Construction Cost Estimate

Item No.	Item	Description	Approx. Quantity	Unit	$/Unit	Total $
a.	Mob / Demob	Assume 7% of Total	1	LS	$ 1,013,249	$ 1,013,000
b.	Excavation / Backfill	Excavation & Haul	42,271	CY	$ 20	$ 845,000
		Backfill & Compaction (Imported Fill Material)	28,421	CY	$ 20	$ 568,000
		Remove & Haul Existing Basins (North, South, Middle)	1	LS	$ 140,210	$ 140,210
		Remove & Haul Existing Basins (West)	1	LS	$ 323,778	$ 323,778
		Removal of shotcrete, liner, rip rap from lagoons	1	LS	$ 100,000	$ 100,000
c.	Equipment	Mechanical Screens	1	EA	$ 200,000	$ 200,000
		Mechanical Screens Installation 20%	1	LS	$ 40,000	$ 40,000
		Carrousel / OxyStream	1	LS	$ 819,000	$ 819,000
		Carrousel / OxyStream Installation	1	LS	$ 200,000	$ 200,000
		Clarifiers	1	LS	$ 360,000	$ 360,000
		Clarifier Installation	1	LS	$ 72,000	$ 72,000
		UV Equipment	1	LS	$ 650,000	$ 650,000
		UV Equipment Installation	1	LS	$ 75,000	$ 75,000
		Plant Drain Pump Station Equip.	1	LS	$ 100,000	$ 100,000
		Plant Drain Pump Station Installation	1	LS	$ 20,000	$ 20,000
		Influent Sampler	1	LS	$ 7,175	$ 7,000
		Effluent Sampler	1	LS	$ 7,175	$ 7,000
		Influent Flow Meter (Mag Meter)	1	LS	$ 20,000	$ 20,000
		Treated Effluent Flow Meter (Mag Meter)	1	LS	$ 20,000	$ 20,000
		Plant Water Flow Meter (Mag Meter)	1	LS	$ 10,000	$ 10,000
		Effluent Pump Station Equip	1	LS	$ 70,000	$ 70,000
		Effluent Pump Station Install	1	LS	$ 10,000	$ 10,000
		Plant Water System	1	LS	$ 200,000	$ 200,000
		Grit Chamber Diffusers / Installation	1	LS	$ 10,000	$ 10,000
		Blowers for Grit Chamber	1	LS	$ 50,000	$ 50,000
d.	Concrete	Headworks	70	CY	$ 900	$ 63,000
		Grit Chambers & Flow Splitter	150	CY	$ 900	$ 135,000
		Clarifiers	2,803	CY	$ 700	$ 1,962,000
		Buildings / Foundations	200	CY	$ 600	$ 120,000
		Raven / Tnemec Lining System	1	LS	$ 100,000	$ 100,000
e.	Buildings	Control Bldg	1	LS	$ 770,000	$ 770,000
	HDPE Liner	Biosolids Basins	1	LS	$ 554,400	$ 554,000
f.	Yard Piping	Site Piping and Valving	1	LS	$ 1,000,000	$ 1,000,000
g.	Site Work	General Site Work and Restoration	1	LS	$ 1,000,000	$ 1,000,000
h.	Electrical	Controls, Wiring, Lighting, Service Equip, Feeders, Devices, Etc.	1	LS	$ 1,500,000	$ 1,500,000
Subtotal						$ 15,488,000
Inflation (9%)						$ 1,393,000
Construction Total						$ 16,861,920
Contingency (15%)						$ 19,414,208
Sales Tax (8.7%)						$ 1,689,036
Total Construction Cost						**$ 21,103,000**

Projected Operations and Maintenance Costs

The operations and maintenance (O&M) costs were estimated for the Extended Aeration Process and the Oxidation Ditch Process. Table 7-5 below shows a detailed estimate of the projected Extended Aeration Operations and Maintenance Costs. After evaluating the O&M cost for the two alternatives, the Extended Aeration O&M costs were determined to be roughly $116,600 dollars less per year than the Oxidation Ditch O&M costs. This difference is due to two significant factors, the additional labor hours required for operation and the increased biosolids production expected from the Oxidation Ditch process. From discussion with plant operators of similar treatment plants it was determined that the Oxidation Ditch process demanded higher attention than the Extended Aeration alternative. The Extended Aeration process is very forgiving to peak flows and shock loads, and therefore requires less supervision, especially over weekend hours when labor hours are more expensive. In addition, it is anticipated that the Extended Aeration process will provide more digestion and produce less Biosolids than the Oxidation Ditch process, which in turn will result in less Biosolids storage and handling costs.

Table 7-5: Operations & Maintenance Costs for Extended Aeration Process

Ferndale Operation	Annual Costs	
Labor	Start-up	Projected 2036
Labor ($/hour)	$ 26.86*	$ 26.86*
Hours per week (Two or Three Operators)	110	140
Operation Cost per Week ($/week)	$ 2,954.60	$ 3,760.40
Labor Cost per Year	**$ 153,639.20**	**$ 195,540.80**
Power		
1/4 TIME Total HP	15	30
Plant Drain PS HP	10	20
WAS Pumps HP	10	20
RAS Pumps HP	10	20
1/2 TIME Total HP	205	205
Blower HP (5- 60hp) or 3-150	300	300
Lagoon Aerators	10	10
Misc. Loads	100	100
Total Full Time HP	163	175
Clarifier Drives (2) HP	1	5
Grit Chamber Blower HP	10	15
Mechanical Screen HP	2	5
Screw Pumps	150	150
Total HP	383	410
UV Power (kW)	17.6	17.6
Total kW	303.32	323.46
Power Cost per Kw	$ 0.10	$ 0.15
Power Cost per Week	$ 5,095.74	$ 8,151.19
Power Cost per Year	**$ 264,978.60**	**$ 423,861.98**
Replacement Parts		
UV Bulbs	$ 16,500.00	$ 22,000.00
Diffusers / Sleeves	$ 2,000.00	$ 4,000.00
Total Replacement Parts per Year	**$ 18,500.00**	**$ 26,000.00**
Biosolids Handling		
Biosolids Cost per Year	**$ 178,000.00**	**$ 402,000.00**
Lab / Testing / Professional Services		
Misc.	$ 25,000.00	$ 35,000.00
Maintenance / Supplies and Repair		
Misc Maintenance (.5% of Total Construction Cost)	$ 120,000.00	$ 150,000.00
Total Cost per Year	**$ 760,117.80**	**$ 1,232,402.78**

*From Department of Labor and Industries

8.0 - WATER RECLAMATION AND REUSE EVALUATION

The purpose of this section is to evaluate water reclamation and reuse requirements and alternatives for the City of Ferndale WWTP. As required by RCW 90.48.112, this Report must evaluate the "opportunities for the use of reclaimed water". Reclaimed water is defined in RCW 90.46.0 1 0 as "effluent derived in any part from sewage from a wastewater treatment system that has been adequately and reliably treated, so that as a result of that treatment, it is suitable for a beneficial use or a controlled use that would not otherwise occur, and is no longer considered wastewater."

Key differences between the requirements for water reuse and those for effluent disposal are the levels of reliability required within the treatment process, distribution, and use areas. The State of Washington's reuse treatment standards call for continuous compliance, meaning that the treatment standards must be met on a constant basis or the treated water cannot be used as reclaimed water.

Allowable Uses for Reclaimed Water

The Washington State Water Reclamation and Reuse Standards describe several allowable uses for reclaimed water, including:

- Agricultural irrigation;
- Landscape irrigation;
- Impoundments and wetlands;
- Groundwater recharge;
- Streamflow augmentation;
- Industrial and commercial uses; and
- Municipal uses.

Depending upon its end use, there are four categories of reclaimed water: Class A, Class B, Class C, and Class D. Class A has the highest degree of effluent treatment. In general, when unlimited public access to the reclaimed water is involved or when irrigation of crops for human consumption is the intended end use, the criteria will require Class A reclaimed water.

Reuse Evaluation

Factors that could lead a wastewater treatment provider to pursue reclaimed water include the following:

- Regulatory Requirements. Regulatory conditions are such that making reclaimed water is a viable option compared to continuing to discharge secondary effluent.
- Water Rights. The ability to make and reuse reclaimed water could benefit the City's water rights situation.
- Environmental Benefits. There can be environmental benefits in the right circumstances to making reclaimed water versus secondary effluent.
- Cost Effectiveness. The cost to make and reuse reclaimed water is typically higher than the cost to make secondary effluent. In addition, control of the WWTP is more complex at a reclaimed water facility then a typical WWTP.

An evaluation of how each of these factors relates to the City's wastewater treatment utility is provided in the following sections.

Regulatory Requirements

Current regulatory requirements do not make reclaimed water a more viable option than continuing to make secondary effluent.

Water Rights

RCW 90.46.120 states that the owner has the exclusive right to any reclaimed water generated by the wastewater treatment facility. Consequently, reclaimed water has the potential to benefit water purveyors who are water right deficient. The City is currently not deficient with respect to its water rights.

The City of Ferndale has discovered a drawdown in their existing water supply aquifers since production wells were installed. A potential source of recharging these aquifers could be additionally treated wastewater from the new treatment plant injected to groundwater. The wastewater would require tertiary treatment and reverse osmosis treatment after the wastewater treatment plant. Tertiary treatment would consist of Hollow Fiber Membranes sized to handle 1.0 MGD of flow. This tertiary treatment would occur after UV disinfection of plant wastewater for a portion of the flow diverted, approximately 1.0 MGD. The tertiary treatment hollow fiber membrane system would require a space of approximately 220 square feet and could be located on the east end of the existing site near the water treatment plant. After tertiary treatment, water would be sent to a dedicated reverse osmosis skid for further treatment. The City has three existing RO treatment systems each able to handle 500 gpm. One of the three skids could be dedicated to final treatment before injection to the aquifer, though significant improvements would be required to prevent cross contamination of the existing water supply. The third skid was installed for future growth of the water softening system, therefore dedicating the third skid to aquifer recharging would remove the capability of expansion. 500 gpm processed by the RO skid would be equivalent to roughly 800 acre-ft/year which would be nearly the flow necessary to recharge the aquifers enough to satisfy the groundwater deficit. A larger RO skid could be purchased to handle a higher flow rate and recharge the aquifer at a higher rate. In addition to tertiary treatment and RO treatment, cross connection measures would need to be implemented to ensure no contamination of the existing water supply occurs. Water would also need to be pumped to a point that would ensure recharging of the aquifer. An exact injection point will need to be up-gradient of the City’s wells and could be many miles from the existing treatment plant.

Environmental Benefits

The City does not have any large industrial users of water. The majority of water is sold to single- and multi-family residences.

The City uses approximately 23.5MG of potable water per year in the WWTP, WTP, street sweeping and other municipal tasks. The WWTP can produce approximately 730 MG per year of reclaimed water. The City can utilize roughly 3 percent of the reclaimed water that could be produced.

The additional electricity required to produce reclaimed water could result in a negative environmental benefit. Though a thorough analysis would need to be performed.

The existing discharge to the Nooksack is diluted over 88 times by the Nooksack River during the dry season and 543 times during the wet season. The significant capital cost, on-going operational cost, and higher energy usage of an MBR facility would not be outweighed by the minor water quality improvement that the City's discharge would provide to the Nooksack River.

Cost Effectiveness

The City believes that if water reclamation and reuse is to be seriously considered, it must be cost effective and affordable for its customers. There are two substantial cost factors that make it unlikely that water reclamation would be economically attractive on its own without a substantial benefit, such as regulatory compliance, to balance its considerable costs.

The first major cost factor is that the City's secondary WWTP would require significant improvements in addition to those already outlined in Chapter 6 with regard to disinfection, filtration and SCADA monitoring and alarm systems. Additional improvements would be required to the activated sludge plant to provide the process control required to reliably produce reclaimed water. This is particularly true if use of the reclaimed water would include human contact, a condition that would require the plant to produce Class A reclaimed water. It is estimated that these capital costs would be at least $14.5 million. In addition, a reclaimed water plant would increase operation and maintenance costs by $300,000-$400,000 per year.

The second cost factor is that there is very little potential for a substantial amount of reclaimed water use by the City's public utilities and there have been no opportunities identified to sell the produced reclaimed water. The local refineries, aluminum smelting facility and Public Utility District No.1 have declined to purchase any reclaimed water. The City can not financially justify a reclaimed water system for municipal uses because most of the reclaimed water would go unused and be discharged to the Nooksack River, which as stated above would be a minor environmental benefit in comparison to the capital, operational and maintenance costs.

The City is, however, planning to install a small, on-site, system for plant water re-use that will reduce the amount of water used. The on-site plant water system will provide treated plant water for general use such as washing down equipment. The system will reuse an existing structure for processing and storage and provide plant water strictly for approved on-site uses.

Summary

After evaluating the potential for water reclamation and reuse, the City does not believe there is currently a clear regulatory, environmental, or water right benefit to water reclamation and reuse. The costs are much too great to consider water reuse as being a cost effective alternative to its current collection and treatment system. Consequently, the City does not plan to pursue the construction of water reclamation and reuse facilities at this time.

In the City of Ferndale, the reclaimed water use options to consider are irrigation and groundwater recharge. Irrigation could be generated for potential sale to nearby farmers. Groundwater

recharge could be used to supplement the aquifer needs for City wells. No industrial customers have been identified.

The downside to irrigation, is that the demand is very low during winter months. The downside to groundwater recharge is that direct injection will require tertiary treatment to meet primary and secondary drinking water standards and the use of reverse osmosis technology (per the 1997 DOE & DOH Water Reuse and Reclamation Standards).

APPENDIX A

2012 Clarification Study

Wilson
SURVEY/ENGINEERING
805 Dupont Street, Ste. #7, Bellingham, Washington 98225
Telephone: (360) 733-6100 • Facsimile: (360) 647-9061

MEMORANDUM

TO: Mike Olinger, Ferndale WWTP Superintendent

FROM: Mike Moren, P.E.

SUBJECT Improved Clarification Study – Final Jar Testing and Chemical Recommendations for Pilot Testing

JOB NO.: 2012-061

DATE: August 13, 2012

Dear Mike:

As you know, we have been performing jar testing on several chemicals (coagulants and flocculants) during the last month in order determine what chemical(s) and initial dosage we would like to use for the Improved Clarification in-plant pilot study. In late June/early July, we performed jar testing on multiple chemicals and dosages from five different chemical suppliers and came up with a single recommended chemical and dosage from each supplier. Sales representatives from two of the suppliers conducted their testing at the Ferndale WWTP, and I was present for the testing. One sales representative tested their product in their own laboratory in Bellingham, and two suppliers sent their chemicals to me to test. The wastewater samples for the first round of testing were taken from the discharge of Cell 1 just upstream of the hydraulic curtain separating Cell 1 and Cell 2 in the West Lagoon.

On Tuesday, July 31, 2012, we jar tested each of the five recommended products and dosages against each other, first at their recommended dosage based on the initial round of testing, then all at the same dosage of 30 mg/L with the exception of one product who's sales representative recommended a jar testing dosage of 500 mg/L. Three of the five recommended chemicals are liquid aluminum chlorohydrate/proprietary polymer blends, one product is a liquid polydimethyldiallylammonium chloride/polymer blend, and one is a proprietary solid (powder) and liquid product (two products that work together). Due to the inconsistencies between the owner-recommended jar test dosage and in-plant dosage for the proprietary powder and associated liquid product (jar testing dosage was about 1,000 times higher than the recommended in-plant dosage), we quickly eliminated that product as a possibility. The four remaining chemicals are as follows:

- CC 2135 (aluminum chlorohydrate/proprietary polymer blend)
- Cesco Protect 7025 (aluminum chlorohydrate/proprietary polymer blend)
- ACS-2225 (aluminum chlorohydrate/proprietary polymer blend)
- Tramfloc 552 (polydimethyldiallylammonium chloride/polymer blend)

These four chemicals produced similar results at a dosage of 30 mg/L, however some seemed to produce slightly better supernatant clarity and settling than the others. ACS-2225 and Tramfloc 552 showed the best results – best clarity of supernatant, 2-5mm floc size, about a 50 mL (per 1,000 mL) sludge blanket after about five minutes – of the four chemicals. Protect 7025 was close behind and still produced a clear supernatant. CC-2135 had a little more suspended

floc after five minutes of settling than the other three chemicals. Turbidity readings were taken of the supernatant of all four samples after 15+ minutes of settling, and the values ranged between 3 and 6 NTU's. The wastewater sample for the final round of testing was taken from near the exit of Cell 3, just upstream of the hydraulic curtain separating Cell 3 and Cell 4 in the West Lagoon.

We have obtained initial pricing for each of the five products based on anticipated annual volume used. For the initial estimated annual chemical usage, we have used a dosage of 30 mg/L and an annual average daily flow of 1.54 million gallons per day (MGD) based on the five-year average of the average annual daily flow from 2006 through 2010 (City of Ferndale Sewer Comprehensive Plan-2012, Table 2). Table 1 below summarizes the estimated annual chemical costs for each of the four chemicals:

Table 1: Initial Estimated Chemical Usage and Associated Costs

Annual Avg. Daily Flow (2006-2010): 1.54 MGD

Chemical	Initial Recommended Dosage (mg/L)	Daily Chemical Usage (lbs/day)	Approx. Chemical Cost* ($/lb)	Estimated Chemical Cost/Day ($/day)	Estimated Chemical Cost/Year ($/year)	Contact	Contact Phone Number	Contact E-mail
CC-2135	30	385	$0.91	$350.35	$127,877.75	Mark Wells	(707) 479-2894	wellspolypro@comcast.net
Cesco Protect 7025	30	385	$0.65	$250.25	$91,341.25	Dennis Tonkin	(360) 202-6204	dtonkin44@gmail.com
ACS-2225	30	385	$0.92	$354.20	$129,283.00	Andy Kubiak	(503) 866-6560	andyk@kubwater.com
Tramfloc 552	30	385	$0.99	$381.15	$139,119.75	Richard Binkowski	(800) 613-6803	water@tramfloc.com

*Costs were provided by vendor contact and are FOB Ferndale, WA, based on expected annual volume of chemical to be used.

Chemical Recommendations for Pilot Study

Although ACS-2225 and Tramfloc 552 produced the best results in the final jar test with all chemicals dosed at 30 mg/L, Cesco Protect 7025 produced good results, and the price per pound is about $0.25 cheaper than ACS-2225. **It is our recommendation to begin the in-plant pilot test with Cesco Protect 7025 at a dosage of 30 mg/L which equals about 36 gallons/day (GPD), or 1.5 gallons/hour (GPH).**

I have enclosed a revised equipment/materials list so that you can begin procuring the equipment and materials that will be needed for the pilot project. At the initial recommended dosage, a 2,800 lb tote of the chemical will last about one week (7 days). We recommend purchasing two totes of Cesco Protect 7025 initially for two weeks of chemical addition.

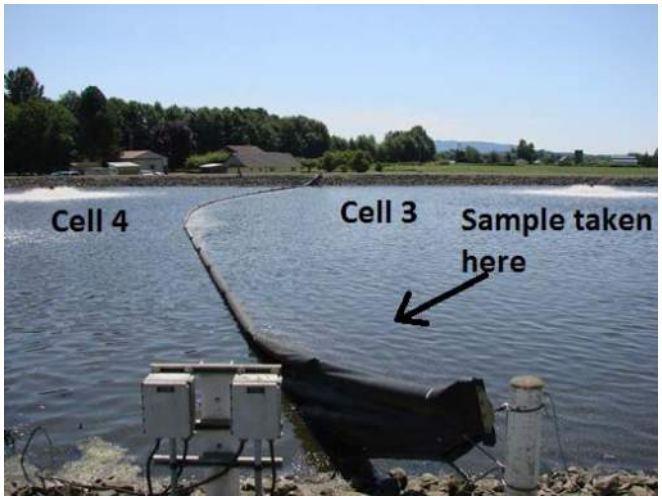
I have also enclosed a site plan showing the basic layout of the pilot. I can assist you and your staff in setting up the pilot project, making a site visit if necessary to go over piping and pump configuration. I will contact you later this week to discuss the pilot study monitoring/data collection.

Sincerely,

Mike Moren, P.E.

Enclosures

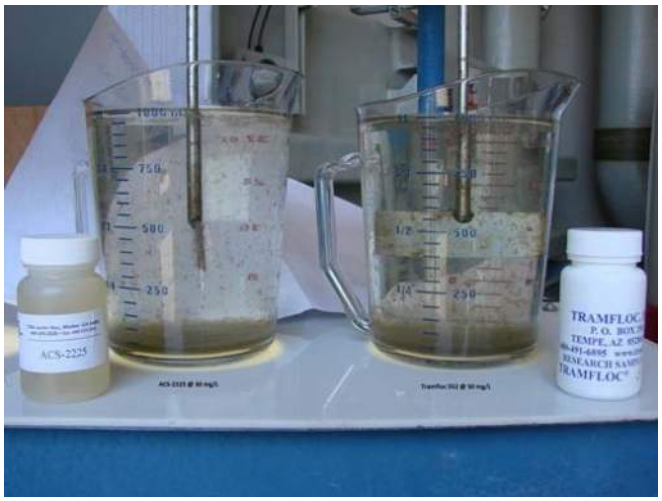
City of Ferndale, WA Wastewater Treatment Plant
Project: 2012-061 - Improved Clarification of West Lagoon
Subject: Final Jar Testing Photos of Four Chemicals Dosed at 30 mg/L Each
Testing Date: July 31, 2012; Testing By: Mike Moren, P.E., Wilson Engineering, LLC



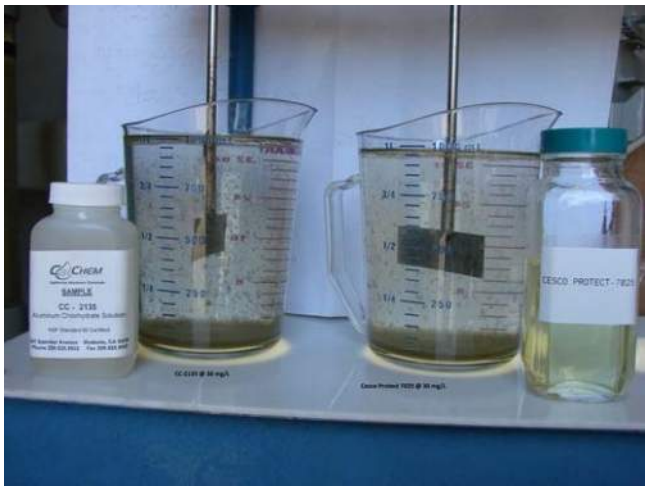
Jar testing sample location in West Lagoon


Jar Test 3, all chemicals dosed at 30 mg/L


Jar Test 3, ACS-2225 and Tramfloc 552 both at 30 mg/L


Jar Test 3: ACS-2225 and Tramfloc 552 both at 30 mg/L


Jar Test 3, CC-2135 and Protect 7025 both at 30 mg/L


Jar Test 3: CC-2135 and Protect 7025 both at 30 mg/L

Ferndale WWTP - Improved Clarification Pilot Study

Equipment/Materials List for Pilot Study

By: Mike Moren, P.E.

August 13, 2012

Item	Make	Model	Vendor	Qty.		Unit Price	Total Cost
Recirc. Pump (submersible sewage/effluent pump, 100 GPM @ 15' TDH)	Myers, or Hydromatic	MW50, or SKHS50	HD Fowler (SKHS50 is $1,321.00)	1	EA	$958.00	$958.00
Piping: 3" SCH 40 PVC			HD Fowler, HD Supply, Ferguson	350	LF	$2.01	$703.50
Piping: 3" Flex PVC			HD Fowler, HD Supply, Ferguson	50	LF		
Piping cement for PVC, for pressure applications			HD Fowler, HD Supply, Ferguson	1	EA		
Fittings: 2" SCH 40 PVC nipple (SxNPT), about 6 inches long (at pump discharge)			HD Fowler, HD Supply, Ferguson	1	EA		
Fittings: 2"x3" SCH 40 PVC reducer (SxS)			HD Fowler, HD Supply, Ferguson	1	EA		
Fittings: 3" SCH 40 PVC 90° Elbow (SxS)			HD Fowler, HD Supply, Ferguson	4	EA		
Fittings: 3" SCH 50 PVC Tee for chem injection, 3"x3"x1/2" (SxSxT) (FIPT/FNPT)			HD Fowler, HD Supply, Ferguson	1	EA		
Fittings: 3" SCH 40 or 80 PVC unions (SxS)			HD Fowler, HD Supply, Ferguson	1	EA		
Valves: 0.5"(???) SCH 40 PVC True Union Ball Valve (SxS) (at chem pump)			HD Fowler, HD Supply, Ferguson	1	EA		
Chemical Feed Pump, 1.6 GPH, 150 max psi	LMI	B11-86HV	(have on site in chemical room)	1	EA		
Chemical feed polyethylene tubing, 0.5" O.D.			(have on site?)	25	LF		
Chemical injection check valve (0.5" MIPT/MNPT)			(have on site?)	2	EA		
Conduit: 1" SCH 80 PVC pipe (as conduit for chem. Feed, power across dike)			HD Fowler, HD Supply, Ferguson	30	LF		
Misc. chemical feed fittings			(have on site?)				
1/4" S.S. cables and fasteners to suspend recirc. pump from bollards			Hardware Sales?	460	LF		
Aerator float to suspend recirc. pump			have on site	1	EA		

Total Equipment/Materials Cost: $1,661.50

MW50 SERIES

½ Horsepower
2" Solids Handling Sewage Pumps

THE MYERS MW50 SERIES SEWAGE PUMPS PROVIDE BIG PERFORMANCE IN A SMALL PACKAGE.

The enclosed two-vane impeller provides the flow and head required for residential and light commercial sewage applications, and passes a full 2" diameter solid. The MW50 is constructed of only the highest quality corrosion resistant materials – cast iron, stainless steel and engineered thermoplastics – for many years of service in harsh sewage environment. The MW50 is available in manual models for use with external controls or automatic models with piggyback mechanical float. For more information, call your Myers distributor or the Myers Ohio sales office at 419-289-6898.

ADVANTAGES BY DESIGN

TWO VANE IMPELLER DESIGN PROVIDES MAXIMUM EFFICIENCY

- Enclosed design for high efficiency pump.
- Eliminates possibility of jamming between impeller and volute.
- Passes a full 2 inch solid.
- Original performance can be restored if wear occurs by replacing volute seal ring.

DURABLE MOTOR WILL DELIVER MANY YEARS OF RELIABLE SERVICE

- Oil-filled motor for maximum heat dissipation and constant bearing lubrication.
- Permanent split capacitor motor eliminates starting switches and relays which are prone to fail.

THE MW50 IS DESIGNED FOR MANY YEARS OF MAINTENANCE FREE OPERATION

- Positive sealing, quick connect power cord and piggyback float switch make replacement simple if service is ever necessary.
- Field tested, wide angle, mercury-free mechanical float switch provides maximum draw down. (Automatic models only.)
- Long flexible Type 6 seal provides high pressure sealing with improved seal face protection by location.
- Lower ball bearing eliminates sleeve bearing wear and significantly reduces motor wear.
- Low amp draw from the efficient PSC motor means less heat build-up.

PRODUCT CAPABILITIES

Capacities To	135 gpm	510 lpm
Heads To	27 ft.	8.23 m
Solids Handling	2 in.	50.6 mm
Liquids Handling	domestic sewage and drain water	
Intermittent Liquid Temp.	140°F	60°C
Motor Electrical Data	1/2 hp, 1625 rpm, PSC 115 volt, 9.0 amp, 1Ø, 60 Hz 230 volt, 4.5 amp, 1Ø, 60 Hz	
Third Party Approval	CSA, UL	
Acceptable pH Range	6 – 9	
Specific Gravity	.9 – 1.1	
Viscosity	28-35 SSU	
Discharge, NPT	2 in.	50.8 mm
Minimum Sump Dia. Simplex Duplex	 24 in. 36 in.	 61 cm 91.4 cm

Construction Materials	
Motor Housing	cast iron, class 30, ASTM A48
Motor Bearings	ball bearing-lower, top-sleeve
Enclosed 2-Vane Impeller	engineered thermoplastic
Impeller Wear Ring	304 SST
Volute	thermoplastic
Volute Seal Ring	HUVA cup
Power, Control Cords	16/3 SJTW/SJTW-A
Mechanical Seal	Type 6 – carbon/ceramic
Fasteners	300 series SST

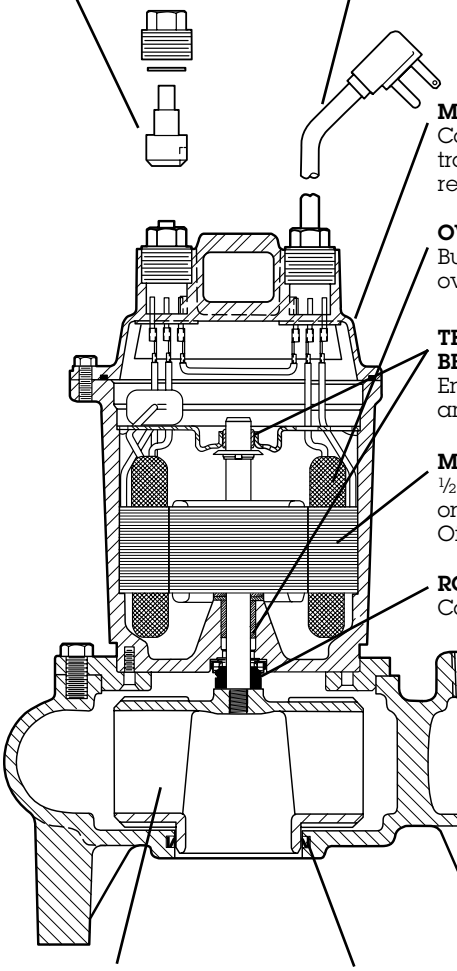
WHERE INNOVATION MEETS TRADITION

Myers®
Pentair Water

MECHANICAL FLOAT SWITCH
Mercury-free, 90° angle operation. (Piggyback models only.)

PLUG
Provides watertight seal.

POWER CORD
Quick-connect watertight fitting is replaceable from pump exterior



MOTOR HOUSING
Cast iron for efficient heat transfer and corrosion resistance.

OVERLOAD SWITCH
Built-in to protect against overload conditions.

THRUST WASHER, SLEEVE BEARINGS
Enhance smooth operation and extend pump life.

MOTOR
½ HP, 1625 RPM, 60 Hz, 115 or 230V, PSC single phase. Oil-cooled and lubricated.

ROTARY SHAFT SEAL
Carbon, ceramic faces.

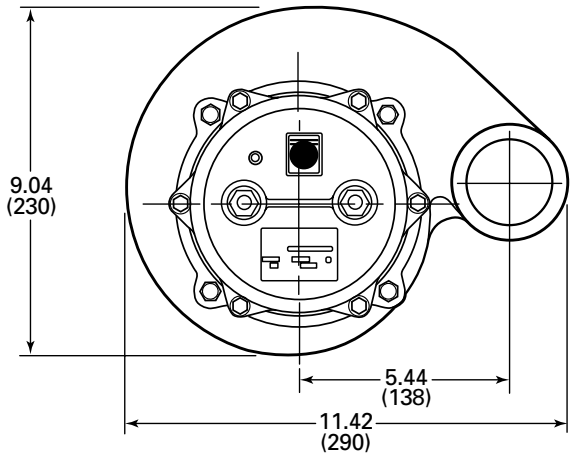
HIGH EFFICIENCY VOLUTE
Passes 2" spherical solids. 2" NPT discharge.

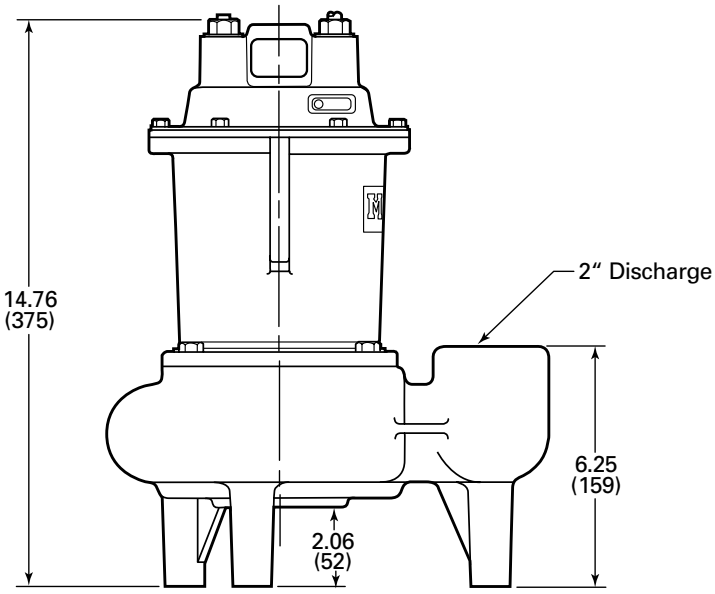
ENCLOSED TWO VANE IMPELLER
High efficiency, passes 2" spherical solids, with stainless steel wear ring. Engineered thermoplastic.

VOLUTE/IMPELLER SEAL RING
Maintains high efficiency and reduces recirculation. Replaceable.

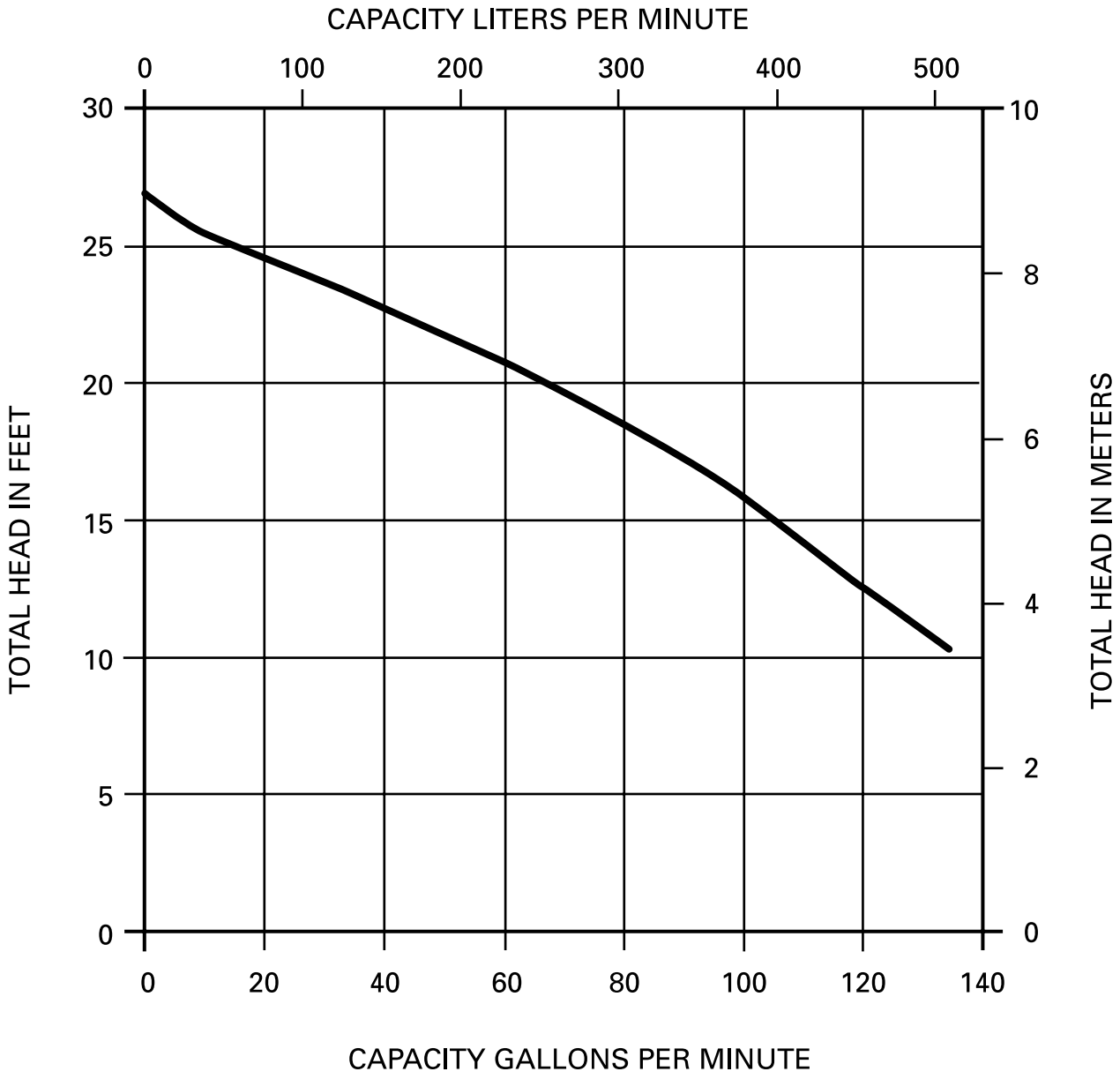
DIMENSIONS

[ ] Dimensions in mm





PUMP PERFORMANCE



MW50 SERIES

SPECIFICATIONS

SEWAGE PUMPS – Pump(s) shall be F. E. Myers MW50 series sewage pumps selected in accordance with the following design criteria:

Number of Pumps:	_____
Primary Design Flow:	_____
Primary Design Head:	_____
Minimum Shut-off Head:	27'
Motor Horsepower:	1/2
Motor Speed:	1625 RPM
Electrical:	115 Volts, 1 PH, 60 Hz or 230 Volts, 1 PH, 60 Hz

PUMP – The pump shall be designed to handle raw sewage and be capable of passing 2 inch spherical solids. The pump shall be capable of handling liquids with temperatures to 140°F intermittent.

MOTOR – The pump motor shall be of the submersible type rated 1/2 hp at 1625 RPM and shall be for _____ 115 volts or _____ 230 volts single phase, 60 cycles. Single phase motor shall be of the permanent split capacitor type with no relays or starting switches. Stator winding shall be of the open type with Class A insulation rated for 105°C maximum operating temperature. The winding housing shall be filled with clean dielectric oil to lubricate bearings and seals, and transfer heat from the windings to the outer shell. The motor winding assembly shall be pressed into the stator housing for best alignment and heat transfer.

The motor shall be capable of operating over the full range of the performance curve without overloading the motor and causing any objectionable noise or vibration. The motor shall have two bearings to support the rotor; an upper sleeve bearing to accommodate radial loads and a lower sleeve bearing with thrust pad to take thrust and radial loads.

A heat sensor thermostat and overload shall be attached to the top end of the motor windings and shall be wired in series with the windings to stop the motor if the motor winding temperature reaches 221°F. The overload thermostat shall reset automatically when the motor cools to a safe operating temperature.

POWER AND SWITCH CORD – The motor power cord shall be 20 feet SJTW type. The power cord shall be of the positive sealing, quick-disconnect type. The power cable connection shall be sealed at the motor entrance by means of a compression nut which serves to make a positive electrical connection and prevent water from entering the cable jacket and motor housing.

OPTIONAL CONTROL SWITCH – The sewage pump shall be controlled by an optional piggy-back float switch. The float switch shall be of the mechanical, non-mercury type and be capable of directly controlling the pump motor without the need for an external control panel.

SHAFT SEAL – The motor shall be protected by a rotating mechanical shaft seal. The seals shall have carbon and ceramic seal faces lapped to a tolerance of one light band. Metal parts and springs for seals shall be 300 series stainless steel.

PUMP IMPELLER – The pump impeller shall be of the two vane enclosed type. The impeller shall be constructed of engineered thermoplastic or optional bronze. A stainless steel wear ring shall be pressed onto the neck of the impeller to provide a sealing surface. A replaceable Buna-N sealing cup shall effect a seal between the volute and impeller in order to maintain high efficiency and prevent recirculation.

PUMP AND MOTOR CASTINGS – The motor housing castings shall be of high tensile strength Class 30 gray cast iron. The pump shall be painted with waterborne hybrid acrylic/alkyd paint. This custom engineered, quick dry paint shall provide superior levels of corrosion and chemical protection.

PUMP CASE – The pump case shall be a high efficiency volute design capable of passing 2 inch spherical solids. The pump volute shall be constructed of high tensile strength Class 30 gray cast iron.

FASTENERS – All exposed fasteners shall be of 300 series stainless steel.

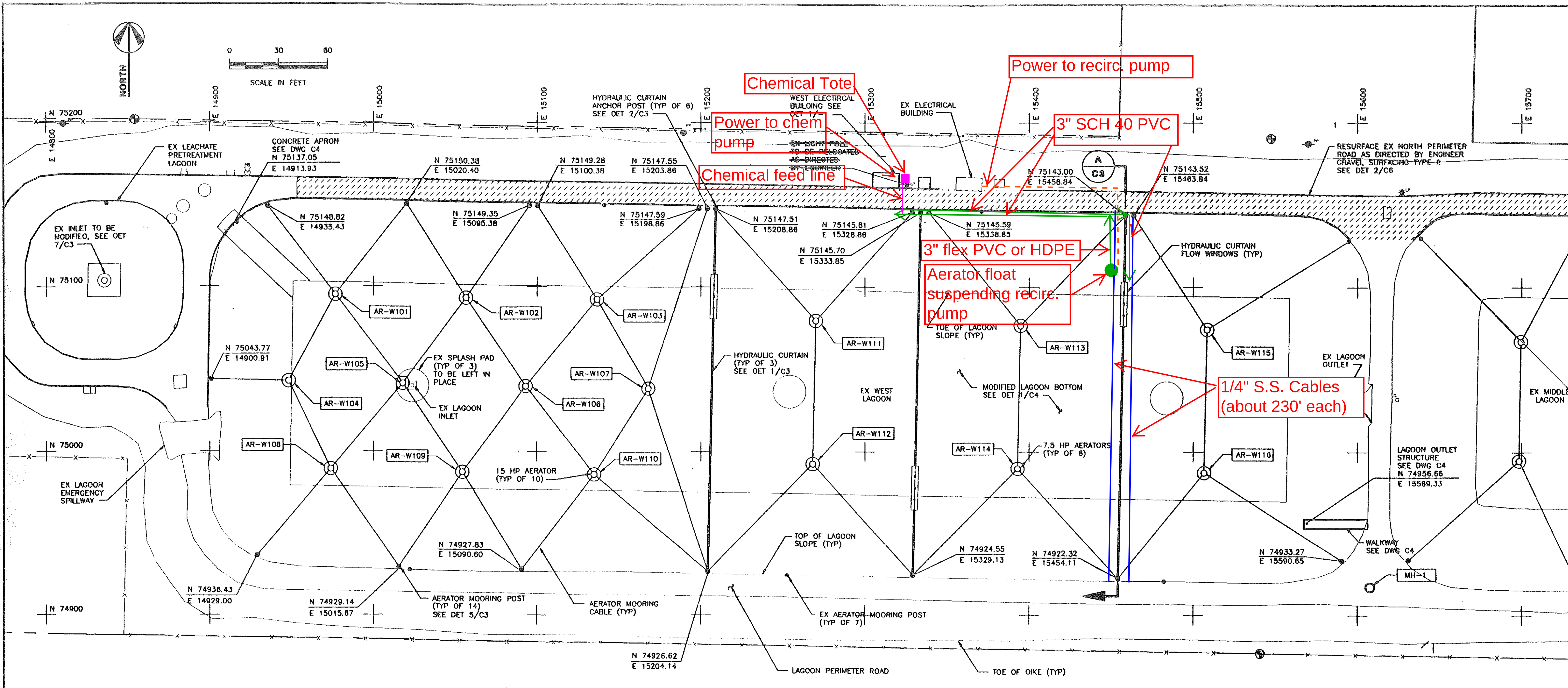
THIRD PARTY APPROVALS – The pump shall be UL and CSA listed.

K3470 4/12
Printed in U.S.A.

Pentair Water™

F. E. Myers, 1101 Myers Parkway, Ashland, Ohio 44805-1969
419/289-6898, FAX: 419/289-6658, www.femyers.com

Myers (Canada), 269 Trillium Drive, Kitchener, Ontario N2G 4W5
519/748-5470, FAX: 519/748-2553



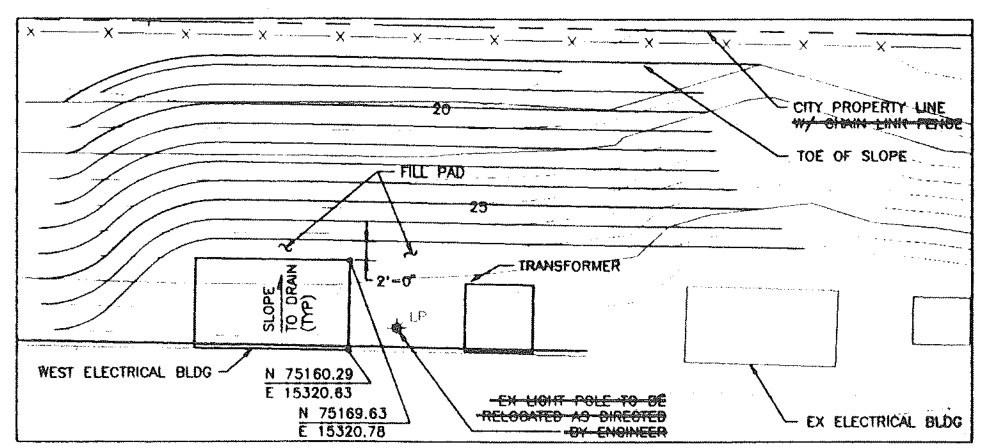
Table

AERATOR COORDINATES

AERATOR	NORTHING	EASTING
AR-W101	N 75095.08	E 14976.72
AR-W102	N 75093.35	E 15056.68
AR-W103	N 75092.31	E 15136.65
AR-W104	N 75042.76	E 14948.10
AR-W105	N 75041.28	E 15018.07
AR-W106	N 75039.66	E 15093.03
AR-W107	N 75038.06	E 15167.99
AR-W108	N 74989.32	E 14973.94
AR-W109	N 74987.58	E 15054.42
AR-W110	N 74985.88	E 15134.90
AR-W111	N 75079.39	E 15269.92
AR-W112	N 74992.41	E 15268.06
AR-W113	N 75076.72	E 15394.89
AR-W114	N 74989.74	E 15393.04
AR-W115	N 75074.29	E 15508.57
AR-W118	N 74987.31	E 15506.71

NOTES:

1. FOLLOWING SLUDGE REMOVAL AND DRAINAGE OF EXISTING LEACHATE PRETREATMENT LAGOON, INTERIOR SLOPES AND BOTTOM MUST BE WASHED DOWN TO REMOVE ANY RESIDUAL SLUDGE.
2. FOLLOWING SLUDGE REMOVAL AND DRAINAGE OF EXISTING WEST LAGOON, LAGOON BOTTOM MUST BE DRESSED AND GRADED TO UNIFORM ELEVATION AS DIRECTED BY ENGINEER.



FILL PAD FOR WEST ELECTRICAL BLDG

DETAIL 1

SCALE: 1" = 10'-0"

FILL PAD NOTES:

1. FILL PAD TO BE CONSTRUCTED USING IMPORT FILL PLACED ACCORDING TO REQUIREMENTS FOR OTHER BUILDING FOUNDATIONS.
2. EXISTING RIP-RAP BANK PROTECTION TO BE REMOVED, THEN REUSED FOR NEW FILL PAD BANK PROTECTION.
3. REFERENCE ARCHITECTURAL DRAWINGS FOR NEW BUILDING DETAILS.
4. REFERENCE ELECTRICAL DRAWINGS FOR TRANSFORMER AND ELECTRICAL EQUIPMENT INFORMATION.

MARTIN E. HARPER, STATE OF WASHINGTON, REGISTERED PROFESSIONAL ENGINEER 16015 — EXPIRES 01/25/98 — 7/22/96

CHRISTOPHER A. ..., STATE OF WASHINGTON, REGISTERED PROFESSIONAL ENGINEER 26020 — EXPIRES 05/12/97 — 7/22/96

No.	Revision	By	Date
1	ISSUED FOR CONSTRUCTION W/ALL ADDENDA	CAA	07/22/96

vasey engineering

Designed: JK/MJ | Drawn: PS | Checked: [signature] Date 7/22/96 | Approved: [signature] Date 7/22/96

Scale: AS NOTED | Date: 06/14/96

One Inch At Full Scale — If Not One Inch Scale Accordingly

City of Ferndale
Wastewater Treatment Plant Expansion
Phase 1 Improvements

WEST LAGOON MODIFICATIONS - CELL AND AERATION PLAN

Drawing C2 — Sheet 8 of 93

CAD FILE: W96330\WWTP-12.dwg PLOT DATE: 07/18/96 XREFS: WWTPBASE.dwg TIME: 2:14pm PCP FILE: VASEY PLOT SCALE: 1=1

APPENDIX B

WA0022454 NPDES Ferndale WWTP Final Permit - Issued July 15, 2014

Issuance Date: July 15 , 2014
Effective Date: August 1, 2014
Expiration Date: July 31, 2019

National Pollutant Discharge Elimination System
Waste Discharge Permit No. WA0022454

State of Washington
DEPARTMENT OF ECOLOGY
Bellingham Field Office
1440 10th Street, Suite 102
Bellingham, WA 98225-7028

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 Ferndale
2905 Main Street
Ferndale, Washington 98248

is authorized to discharge in accordance with the Special and General Conditions that follow.

Plant Location:	Receiving Water:
5405 Ferndale Road Ferndale, WA	Nooksack River
Treatment Type: Dual Powered Aerated Lagoons	

Douglas R. Allen
Manager
Bellingham Field Office
Washington State Department of Ecology

Table of Contents

Table of Contents

Summary of Permit Report Submittals

Refer to the Special and General Conditions of this permit for additional submittal requirements.

Permit Section	Submittal	Frequency	First Submittal Date
S3.A	Discharge Monitoring Report	Monthly	September 15, 2014
S3.E	Reporting Permit Violations	As necessary	
S3.E.a	Reporting Permit Violations – Immediate Reporting	As necessary	
S3.E.b	Reporting Permit Violations – 24-Hour Reporting	As necessary	
S3.E.c	Reporting Permit Violations – Report within Five Days	As necessary	
S3.E.e	Reporting Permit Violations – All Other Reporting	Monthly as necessary	
S3.F	Other Reporting	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 30, 2018
S5.F	Bypass Notification	As necessary	
S5.G	Operations and Maintenance Manual Update or Review Confirmation Letter	Annually	September 1, 2014
S6.E	List of Industrial Users	2/permit cycle	January 1, 2016 and January 1, 2018
S8	Application for Permit Renewal	1/permit cycle	July 30, 2018
S9	Outfall Evaluation	1/permit cycle	July 30, 2018
S10	Acute Toxicity Effluent Test Results - Submit with Permit Renewal Application	Once in July/Once in January	July 30, 2018
S11	Chronic Toxicity Effluent Test Results with Permit Renewal Application	Once in July/Once in January	July 30, 2018
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	
G13	Payment of Fees	As assessed	
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 the effective date of this permit, the Permittee may discharge municipal wastewater to the Nooksack River at the permitted location subject to compliance with the following limits:

Effluent Limits: Outfall 001 **Latitude: 48.8347 Longitude: -122.5981**		
Parameter	**Average Monthly [a]**	**Average Weekly [b]**
Carbonaceous Biochemical Oxygen Demand (5-day) ($CBOD_5$)	25 milligrams/liter (mg/L) **673** pounds/day (lbs/day) 85% removal of influent $CBOD_5$	40 mg/L **1077** lbs/day
Total Suspended Solids (TSS)	30 mg/L **808** lbs/day 85% removal of influent TSS	45 mg/L **1212** lbs/day
Parameter	**Minimum**	**Maximum**
pH	6.0 standard units	9.0 standard units
Parameter	**Monthly Geometric mean**	**Weekly Geometric mean**
Fecal Coliform Bacteria [c]	28 /100 mL	400 /100 mL
Parameter	**Average Monthly**	**Maximum Daily [d]**
Total Residual Chlorine	34 µg/L	76 µg/L

[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 limitation 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
[d]	Maximum daily effluent limit is the highest allowable daily discharge. The daily discharge is the average discharge of a pollutant measured during a calendar day. For pollutants with limits expressed in units of mass, calculate the daily discharge as the total mass of the pollutant discharged over the day. This does not apply to pH or temperature.

S1.B. Mixing zone authorization

Mixing zone for Outfall 001

The paragraph 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 22 feet[1] (6.7 meters). The length of the chronic mixing zone extends 302 feet (92 meters) downstream of the outfall. The mixing zone extends from the discharge port to the top of the water surface. 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 10 feet (3 meters) in any horizontal direction from the outfall. The length of the acute mixing zone extends 30 feet (9 meters) downstream of the outfall. The mixing zone extends from the discharge port to the top of the water surface. 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	4
Chronic Aquatic Life Criteria	29
Human Health Criteria - Carcinogen	29
Human Health Criteria – Non-carcinogen	29

S2. Monitoring requirements

S2.A. Monitoring schedule

The Permittee must monitor in accordance with the following schedule and the requirements specified in Appendix A.

Parameter	Units & Speciation	Minimum Sampling Frequency	Sample Type
(1) Wastewater influent			
Wastewater Influent means the raw sewage flow from the collection system into the treatment facility. Sample the wastewater entering the headworks of the treatment plant excluding any side-stream returns from inside the plant.			
Carbonaceous Biochemical Oxygen Demand ($CBOD_5$)	mg/L	2/week	24-hour composite [b]
$CBOD_5$	lbs/day	2/week	Calculated [g]
Total Suspended Solids (TSS)	mg/L	2/week	24-hour composite [b]
Total Suspended Solids (TSS)	lbs/day	2/week	Calculated [g]
Flow	MGD	Continuous [a]	Metered/recorded

[1] Widths of acute and chronic mixing taken from page 18 of 1997 Dilution Analysis-Berryman & Henigar/Vasey Engineering.

Parameter	Units & Speciation	Minimum Sampling Frequency	Sample Type
(2) Final wastewater effluent			
Final Wastewater Effluent means wastewater exiting 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 $CBOD_5$ analysis before or after the disinfection process. If taken after, the Permittee must dechlorinate and reseed the sample.			
Flow	MGD	Continuous [a]	Metered/recorded
$CBOD_5$	mg/L	2/week	24-hr composite [b]
$CBOD_5$	lbs/day	2/week	Calculated [g]
$CBOD_5$	% removal [c]	1/month	Calculated [c]
TSS	mg/L	2/week	24-hr composite [b]
TSS	lbs/day	2/week	Calculated [g]
TSS	% removal [c]	1/month	Calculated [c]
Chlorine (Total Residual)	µg/L	Daily	Grab [f]
Fecal Coliform [e]	# /100 ml SM 9222 D	2/week	Grab [f]
pH [d]	Standard Units	Daily	Grab
Temperature [h]	Degrees centigrade (°C)	Daily	Metered/recorded
(3) Whole effluent toxicity testing – final wastewater effluent			
Acute Toxicity Testing	Fathead minnow 96-hour static-renewal test/ Daphnid 48-hour static test	January 2018 and June 2018	24-hr composite [b]
Chronic Toxicity Testing	Fathead minnow survival and growth/ Water flea survival and reproduction	January 2018 and June 2018	24-hr composite [b]
(4) Permit renewal application requirements – final wastewater effluent			
The Permittee must record and report the wastewater treatment plant flow discharged on the day it collects the sample for priority pollutant testing with the discharge monitoring report.			
Temperature	Degrees Celsius	Monthly [i]	Grab
Total Ammonia	mg/L as N	Monthly [i]	24-hr composite [b]
Total Phosphorus	mg/L as P	Monthly [i]	24-hr composite [b]
Soluble Reactive Phosphorus	mg/L as P	Monthly [i]	24-hr composite [b]
Nitrate plus Nitrite Nitrogen	mg/L as N	Monthly [i]	24-hr composite [b]
Total Kjeldahl Nitrogen (TKN)	mg/L as N	Monthly [i]	24-hr composite [b]
Oil and Grease	mg/L	3/yr [i]	Grab
Total Dissolved Solids	mg/L	3/yr [i]	24-hr composite
Total Hardness	mg/L	3/yr [i]	24-hr composite
Cyanide	micrograms/liter (µg/L)	3/yr [i]	Grab
Total Phenolic Compounds	µg/L	3/yr [i]	Grab
Priority Pollutants (PP) – Total Metals	µg/L; nanograms(ng/L) for mercury	3/yr [i]	24-hr composite [b] Grab for mercury
PP – Volatile organic compounds	µg/L	3/yr [i]	Grab
PP – Acid-extractable compounds	µg/L	3/yr [i]	24-hr composite [b]
PP – Base-neutral compounds	µg/L	3/yr [i]	24-hr composite [b]

[a]	Continuous means uninterrupted except for brief lengths of time for calibration, power failure, or unanticipated equipment repair or maintenance.
[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.

Parameter	Units & Speciation	Minimum Sampling Frequency	Sample Type
c	% removal = $\frac{\text{Influent concentration (mg/L) – Effluent concentration (mg/L)}}{\text{Influent concentration (mg/L)}} \times 100$ Calculate the percent (%) removal of $CBOD_5$ and TSS using the above equation.		
d	Report the daily minimum and maximum pH.		
e	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).		
f	Grab means an individual sample collected over a fifteen (15) minute, or less, period.		
g	Calculated 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		
h	Temperature grab sampling must occur when the effluent is at or near its daily maximum temperature, which usually occurs in the late afternoon.		
i	Sampling to occur the year before the permit application is due. Results to be included in the next permit application.		

S2.B. Sampling and analytical procedures

Samples and measurements taken to meet the requirements of this permit must represent the volume and nature of the monitored parameters. The Permittee must conduct representative sampling of any unusual discharge or discharge condition, including bypasses, upsets, and maintenance-related conditions that may affect effluent quality.

Sampling and analytical methods used to meet the monitoring requirements specified in this permit must conform to the latest revision of the *Guidelines Establishing Test Procedures for the Analysis of Pollutants* contained in 40 CFR Part 136 (or as applicable in 40 CFR subchapters N [Parts 400–471] or O [Parts 501-503]) unless otherwise specified in this permit . Ecology may only specify alternative methods for parameters without permit limits and for those parameters without an EPA approved test method in 40 CFR Part 136.

S2.C. Flow measurement, and continuous monitoring devices

The Permittee must:

1. Select and use appropriate flow measurement, and 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 and the manufacturer's recommendation for that type of device.
3. Calibration as specified in this document is not required if the Permittee uses recording devices certified by the manufacturer.
4. Use field measurement devices as directed by the manufacturer and do not use reagents beyond their expiration dates.
5. Calibrate flow-monitoring devices at a minimum frequency of at least one calibration per year.
6. Maintain calibration records for at least three years.

S2.D. 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.E. 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. Reporting

The first monitoring period begins on the effective date of the permit. 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 WAWebDMR. 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 WAWebDMR go to: http://www.ecy.wa.gov/programs/wq/permits/paris/webdmr.html .

   If unable to submit electronically (for example, if you do not have an internet connection), the Permittee must contact Ecology to request a waiver and obtain instructions on how to obtain a paper copy DMR.

   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.

2. 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.
3. 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 S2.
4. Calculate average values (unless otherwise specified in the permit) using:
   a. The reported numeric value for all parameters measured between the agency-required detection value and the agency-required quantitation value.
   b. One-half the detection value (for values reported below detection) if the lab detected the parameter in another sample 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.
5. Report single-sample grouped parameters (for example priority pollutants, PAHs, pulp and paper chlorophenolics, TTOs) on the WAWebDMR form and include: sample date, concentration detected, detection limit (DL) (as necessary), and laboratory quantitation level (QL) (as necessary). The Permittee must also submit an electronic PDF copy of the laboratory report using WAWebDMR.

   If the Permittee has obtained a waiver from electronic reporting or if submitting prior to the compliance date, the Permittee must submit a paper copy of the laboratory report providing the following information: date sampled, sample location, date of analysis, parameter name, CAS number, analytical method/number, detection limit (DL), laboratory quantitation level (QL), reporting units, and concentration detected.

   The contract laboratory reports must also include information on the chain of custody, QA/QC results, and documentation of accreditation for the parameter.
6. Ensure that DMRs are electronically submitted no later than the dates specified below, unless otherwise specified in this permit.

   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 permit renewal application monitoring data in a report by July 30, 2018.
7. Submit reports to Ecology online using Ecology's electronic WAWebDMR submittal forms (electronic DMRs) as required above. Send paper reports to Ecology at:

   Water Quality Permit Coordinator
   Department of Ecology
   Bellingham Field Office
   1440 10th Street, Suite 102
   Bellingham, WA 98225-7028

S3.B. 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.C. 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.D. 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.E. 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 Department of Health, Shellfish Program, and the Local Health Jurisdiction (at the numbers listed below), all:

- Failures of the disinfection system.
- Collection system overflows.
- Plant bypasses discharging to marine surface waters.
- Any other failures of the sewage system (pipe breaks, etc.)

Northwest Regional Office	425-649-7000
Department of Health, Shellfish Program	360-236-3330 (business hours) 360-789-8962 (after business hours)
Whatcom County Health Department	360-715-2588

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 exceedence of an effluent limit in the permit (See Part S5.F, "Bypass Procedures").
3. Any upset that causes an exceedence 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.

f. Report submittal

The Permittee must submit reports to the address listed in S3.A.

S3.F. 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.G. 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:

Maximum Month Design Flow (MMDF)	3.23 MGD
$CBOD_5$ Influent Loading for Maximum Month	4490 lb/day
TSS Influent Loading for Maximum Month	5388 lb/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 30, 2018.

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.

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 in a manner 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 I (EPA 430/9-74-001) at the wastewater treatment plant. Reliability Class I requires a backup power source sufficient to operate all vital components and critical lighting and ventilation during peak wastewater flow conditions.

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

This permit prohibits a bypass, which is the intentional diversion of waste streams from any portion of a treatment facility. Ecology may take enforcement action against a Permittee for a bypass unless one of the following circumstances (1, 2, or 3) applies.

1. Bypass for essential maintenance without the potential to cause violation of permit limits or conditions.

   This permit authorizes a bypass if it allows for essential maintenance and does not have the potential to cause violations of limits or other conditions of this permit, or adversely impact public health as determined by Ecology prior to the bypass. The Permittee must submit prior notice, if possible, at least ten (10) days before the date of the bypass.

2. Bypass which is unavoidable, unanticipated, and results in noncompliance of this permit.

   This permit authorizes such a bypass only if:

   a. 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.

b. No feasible alternatives to the bypass exist, such as:
   - The use of auxiliary treatment facilities.
   - Retention of untreated wastes.
   - 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.
   - Transport of untreated wastes to another treatment facility or preventative maintenance), or transport of untreated wastes to another treatment facility.

c. Ecology is properly notified of the bypass as required in Special Condition S3.E of this permit.

3. If bypass is anticipated and has the potential to result in noncompliance of this permit.

   a. The Permittee must notify Ecology at least thirty (30) days before the planned date of bypass. The notice must contain:
      - A description of the bypass and its cause.
      - An analysis of all known alternatives which would eliminate, reduce, or mitigate the need for bypassing.
      - A cost-effectiveness analysis of alternatives including comparative resource damage assessment.
      - 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 exceedence of any water quality standard is anticipated.
      - Details of the steps taken or planned to reduce, eliminate, and prevent reoccurrence 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 preparation of the engineering report or facilities plan and plans and specifications and must include these 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 consider the following prior to issuing an administrative order for this type of bypass:

- If the bypass is necessary to perform construction or maintenance-related activities essential to meet the requirements of this permit.
- If feasible alternatives to bypass exist, such as the use of auxiliary treatment facilities, retention of untreated wastes, stopping production, maintenance during normal periods of equipment down time, or transport of untreated wastes to another treatment facility.
- If the Permittee planned and scheduled the bypass to minimize adverse effects on the public and the environment.

After consideration of the above and the adverse effects of the proposed bypass and any other relevant factors, Ecology will approve or deny the request. Ecology will give the public an opportunity to comment on bypass incidents of significant duration, to the extent feasible. Ecology will approve a request to bypass by issuing an administrative order under RCW 90.48.120.

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 and confirm this review by letter to Ecology by September 1 of each year.
2. Submit to Ecology for review substantial changes or updates to the O&M Manual whenever it incorporates them into the manual. The Permittee must submit a paper copy and an electronic copy (preferably as a PDF).
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 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.
8. Specify other items on case-by-case basis such as O&M for collection systems pump stations, lagoon liners, etc.

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(t)(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. Industrial user survey

The Permittee must complete two industrial user surveys listing all SIUs and potential significant industrial users (PSIUs) discharging to the POTW. The Permittee must submit the surveys to Ecology by January 1, 2016 and January 1, 2018. The Permittee must submit a paper copy and an electronic copy (preferably as a PDF). The Permittee must update the survey list and provide a copy by January 1, 2016, and January 1, 2018.

At a minimum, the Permittee must develop the list of SIUs and PSIUs by means of a telephone book search, a water utility billing records search, and a physical reconnaissance of the service area. Information on PSIUs must include, at a minimum, the business name, telephone number, address, description of the industrial process(s), and the known wastewater volumes and characteristics.

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 30, 2018. The Permittee must submit a paper copy and an electronic copy (preferably as a PDF). The Permittee must also submit a new application or supplement 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. Outfall evaluation

The Permittee must inspect, once during the permit cycle, the submerged portion of the outfall line and diffuser to document its integrity and continued function. If conditions allow for a photographic verification, the Permittee must include such verification in the report. By July 30, 2018, the Permittee must submit the inspection report to Ecology.

The inspector must, at a minimum:

- Assess the physical condition of the outfall pipe, and associated couplings.
- Determine the extent of sediment accumulation in the vicinity of the outfall.
- Ensure the outfall pipe is free of obstructions and is allowing uniform flow.
- Confirm physical location (latitude/longitude) and depth (at MLLW) of the opening of the outfall.
- Assess physical condition of anchors used to secure the submarine line.

S10. Acute toxicity

S10.A. Testing when there is no permit limit for acute toxicity

The Permittee must:

1. Conduct acute toxicity testing on final effluent once in the last winter, by January 15, 2018, and once in the last summer, by June 15, 2018 prior to submission of the application for permit renewal.
2. Submit the results to Ecology by July 30, 2018 (with the permit renewal application).
3. Conduct acute toxicity testing on a series of at least five concentrations of effluent, including 100% effluent and a control.
4. Use each of the following species and protocols for each acute toxicity test:

Acute Toxicity Tests	Species	Method
Fathead minnow 96-hour static-renewal test	*Pimephales promelas*	EPA-821-R-02-012
Daphnid 48-hour static test	*Ceriodaphnia dubia, Daphnia pulex,* or *Daphnia magna*	EPA-821-R-02-012

5. The Permittee must collect effluent samples for whole effluent toxicity testing just prior to the chlorination step in the treatment process.

6. The Permittee must collect 24-hour composite effluent samples for toxicity testing. The Permittee must cool the samples to 0 - 6 degrees Celsius during collection and send them 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 completed.
7. The laboratory must conduct water quality measurements on all samples and test solutions for toxicity testing, as specified in the most recent version of Ecology Publication No. WQ-R-95-80, *Laboratory Guidance and Whole Effluent Toxicity Test Review Criteria*.
8. All toxicity tests must meet quality assurance criteria and test conditions specified in the most recent versions of the EPA methods listed in Subsection C and the Ecology Publication No. WQ-R-95-80, *Laboratory Guidance and Whole Effluent Toxicity Test Review Criteria*. If Ecology determines any test results to be invalid or anomalous, the Permittee must repeat the testing with freshly collected effluent.
9. The laboratory must use control water and dilution water meeting the requirements of the EPA methods listed in Section A or pristine natural water of sufficient quality for good control performance.
10. The Permittee must chemically dechlorinate final effluent samples for whole effluent toxicity testing with sodium thiosulfate just prior to test initiation. Do not add more sodium thiosulfate than is necessary to neutralize the chlorine. Provide in the test report the calculations to determine the amount of sodium thiosulfate necessary to just neutralize the chlorine in the sample.

S11. Chronic toxicity

S11.A. Testing when there is no permit limit for chronic toxicity

The Permittee must:

1. Conduct chronic toxicity testing on final effluent once in the last winter, by January 15, 2018, and once in the last summer, by June 15, 2018, prior to submission of the application for permit renewal.
2. Submit the results to Ecology July 30, 2018 (with the permit renewal application).
3. Conduct chronic toxicity testing on a series of at least five concentrations of effluent and a control. This series of dilutions must include the acute critical effluent concentration (ACEC). The ACEC equals 25% effluent. The series of dilutions should also contain the CCEC of 3.4% effluent.
4. 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.
5. Perform chronic toxicity tests with all of the following species and the most recent version of the following 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

6. The Permittee must collect effluent samples for whole effluent toxicity testing just prior to the chlorination step in the treatment process.
7. The Permittee must submit all reports for toxicity testing in accordance with the most recent version of Ecology Publication No. WQ-R-95-80, *Laboratory Guidance and Whole Effluent Toxicity Test Review Criteria*. Reports must contain bench sheets and reference toxicant results for test methods. If the lab provides the toxicity test data in electronic format for entry into Ecology's database, then the Permittee must send the data to Ecology along with the test report, bench sheets, and reference toxicant results.
8. The Permittee must collect 24-hour composite effluent samples for toxicity testing. The Permittee must cool the samples to 0 - 6 degrees Celsius during collection and send them 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 completed.
9. The laboratory must conduct water quality measurements on all samples and test solutions for toxicity testing, as specified in the most recent version of Ecology Publication No. WQ-R-95-80, *Laboratory Guidance and Whole Effluent Toxicity Test Review Criteria*.
10. All toxicity tests must meet quality assurance criteria and test conditions specified in the most recent versions of the EPA methods listed in Section C and the Ecology Publication No. WQ-R-95-80, *Laboratory Guidance and Whole Effluent Toxicity Test Review Criteria*. If Ecology determines any test results to be invalid or anomalous, the Permittee must repeat the testing with freshly collected effluent.
11. The laboratory must use control water and dilution water meeting the requirements of the EPA methods listed in Subsection C or pristine natural water of sufficient quality for good control performance.

General Conditions

G1. Signatory requirements

1. All applications, reports, or information 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.
      - In the case of a partnership, by a general partner.
      - In the case of sole proprietorship, by the proprietor.
      - 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 shall 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 shall 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.E.
4. The Permittee complied with any remedial measures required under S3.E 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 shall, 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 shall 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.

CONVENTIONAL PARAMETERS

Pollutant & CAS No. ***(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
Soluble Biochemical Oxygen Demand	SM5210-B [3]		2 mg/L
Chemical Oxygen Demand	SM5220-D		10 mg/L
Total Organic Carbon	SM5310-B/C/D		1 mg/L
Total Suspended Solids	SM2540-D		5 mg/L
Total Ammonia (as N)	SM4500-NH3-B and C/D/E/G/H		20
Flow	Calibrated device		
Dissolved oxygen	SM4500-OC/OG		0.2 mg/L
Temperature (max. 7-day avg.)	Analog recorder or Use micro-recording devices known as thermistors		0.2º C
pH	SM4500-H^+ B	N/A	N/A

NONCONVENTIONAL PARAMETERS

Pollutant & CAS No. (if available)	Recommended Analytical Protocol	Detection (DL)[1] µg/L unless specified	Quantitation Level (QL)[2] µg/L unless specified
Total Alkalinity	SM2320-B		5 mg/L as CaCO3
Chlorine, Total Residual	SM4500 Cl G		50.0
Color	SM2120 B/C/E		10 color units
Fecal Coliform	SM 9221E,9222	N/A	Specified in method - sample aliquot dependent
Fluoride (16984-48-8)	SM4500-F E	25	100
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
Soluble Reactive Phosphorus (as P)	SM4500- PE/PF	3	10
Phosphorus, Total (as P)	SM 4500 PB followed by SM4500-PE/PF	3	10
Oil and Grease (HEM) (Hexane Extractable Material)	1664 A or B	1,400	5,000
Salinity	SM2520-B		3 practical salinity units or scale (PSU or PSS)
Settleable Solids	SM2540 -F		500 (or 0.1 mL/L)
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
Total Coliform	SM 9221B, 9222B, 9223B	N/A	Specified in method - sample aliquot dependent
Total dissolved solids	SM2540 C		20 mg/L
Total Hardness	SM2340B		200 as CaCO3
Aluminum, Total (7429-90-5)	200.8	2.0	10
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
Cobalt, Total (7440-48-4)	200.8	0.05	0.25
Iron, Total (7439-89-6)	200.7	12.5	50
Magnesium, Total (7439-95-4)	200.7	10	50
Molybdenum, Total (7439-98-7)	200.8	0.1	0.5
Manganese, Total (7439-96-5)	200.8	0.1	0.5
NWTPH Dx [4]	Ecology NWTPH Dx	250	250
NWTPH Gx [5]	Ecology NWTPH Gx	250	250
Tin, Total (7440-31-5)	200.8	0.3	1.5
Titanium, Total (7440-32-6)	200.8	0.5	2.5

PRIORITY POLLUTANTS

Pollutant & CAS No. *(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 (7440-36-0)	200.8	0.3	1.0
Arsenic, Total (7440-38-2)	200.8	0.1	0.5
Beryllium, Total (7440-41-7)	200.8	0.1	0.5
Cadmium, Total (7440-43-9)	200.8	0.05	0.25
Chromium (hex) dissolved (18540-29-9)	SM3500-Cr EC	0.3	1.2
Chromium, Total (7440-47-3)	200.8	0.2	1.0
Copper, Total (7440-50-8)	200.8	0.4	2.0
Lead, Total (7439-92-1)	200.8	0.1	0.5
Mercury, Total (7439-97-6)	1631E	0.0002	0.0005
Nickel, Total (7440-02-0)	200.8	0.1	0.5
Selenium, Total (7782-49-2)	200.8	1.0	1.0
Silver, Total (7440-22-4)	200.8	0.04	0.2
Thallium, Total (7440-28-0)	200.8	0.09	0.36
Zinc, Total (7440-66-6)	200.8	0.5	2.5
Cyanide, Total (57-12-5)	335.4	5	10
Cyanide, Weak Acid Dissociable	SM4500-CN I	5	10
Cyanide, Free Amenable to Chlorination (Available Cyanide)	SM4500-CN G	5	10
Phenols, Total	EPA 420.1		50

Pollutant & CAS No. *(if available)*	Recommended Analytical Protocol	Detection (DL)[1] *µg/L unless specified*	Quantitation Level (QL)[2] *µg/L unless specified*
ACID COMPOUNDS			
2-Chlorophenol (95-57-8)	625	1.0	2.0
2,4-Dichlorophenol (120-83-2)	625	0.5	1.0
2,4-Dimethylphenol (105-67-9)	625	0.5	1.0
4,6-dinitro-o-cresol (534-52-1) (2-methyl-4,6,-dinitrophenol)	625/1625B	1.0	2.0
2,4 dinitrophenol (51-28-5)	625	1.0	2.0
2-Nitrophenol (88-75-5)	625	0.5	1.0
4-nitrophenol (100-02-7)	625	0.5	1.0
Parachlorometa cresol (59-50-7) (4-chloro-3-methylphenol)	625	1.0	2.0
Pentachlorophenol (87-86-5)	625	0.5	1.0
Phenol (108-95-2)	625	2.0	4.0
2,4,6-Trichlorophenol (88-06-2)	625	2.0	4.0

PRIORITY POLLUTANTS (continued)

Pollutant & CAS No. ***(if available)***	**Recommended Analytical Protocol**	**Detection (DL)[1]** ***µg/L unless specified***	**Quantitation Level (QL)[2]** ***µg/L unless specified***
VOLATILE COMPOUNDS			
Acrolein (107-02-8)	624	5	10
Acrylonitrile (107-13-1)	624	1.0	2.0
Benzene (71-43-2)	624	1.0	2.0
Bromoform (75-25-2)	624	1.0	2.0
Carbon tetrachloride (56-23-5)	624/601 or SM6230B	1.0	2.0
Chlorobenzene (108-90-7)	624	1.0	2.0
Chloroethane (75-00-3)	624/601	1.0	2.0
2-Chloroethylvinyl Ether (110-75-8)	624	1.0	2.0
Chloroform (67-66-3)	624 or SM6210B	1.0	2.0
Dibromochloromethane (124-48-1)	624	1.0	2.0
1,2-Dichlorobenzene (95-50-1)	624	1.9	7.6
1,3-Dichlorobenzene (541-73-1)	624	1.9	7.6
1,4-Dichlorobenzene (106-46-7)	624	4.4	17.6
Dichlorobromomethane (75-27-4)	624	1.0	2.0
1,1-Dichloroethane (75-34-3)	624	1.0	2.0
1,2-Dichloroethane (107-06-2)	624	1.0	2.0
1,1-Dichloroethylene (75-35-4)	624	1.0	2.0
1,2-Dichloropropane (78-87-5)	624	1.0	2.0
1,3-dichloropropene (mixed isomers) (1,2-dichloropropylene) (542-75-6) [6]	624	1.0	2.0
Ethylbenzene (100-41-4)	624	1.0	2.0
Methyl bromide (74-83-9) (Bromomethane)	624/601	5.0	10.0
Methyl chloride (74-87-3) (Chloromethane)	624	1.0	2.0
Methylene chloride (75-09-2)	624	5.0	10.0
1,1,2,2-Tetrachloroethane (79-34-5)	624	1.9	2.0
Tetrachloroethylene (127-18-4)	624	1.0	2.0
Toluene (108-88-3)	624	1.0	2.0
1,2-Trans-Dichloroethylene (156-60-5) (Ethylene dichloride)	624	1.0	2.0
1,1,1-Trichloroethane (71-55-6)	624	1.0	2.0
1,1,2-Trichloroethane (79-00-5)	624	1.0	2.0
Trichloroethylene (79-01-6)	624	1.0	2.0
Vinyl chloride (75-01-4)	624/SM6200B	1.0	2.0

PRIORITY POLLUTANTS (continued)

Pollutant & CAS No. ***(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 (83-32-9)	625	0.2	0.4
Acenaphthylene (208-96-8)	625	0.3	0.6
Anthracene (120-12-7)	625	0.3	0.6
Benzidine (92-87-5)	625	12	24
Benzyl butyl phthalate (85-68-7)	625	0.3	0.6
Benzo(*a*)anthracene (56-55-3)	625	0.3	0.6
Benzo(b)fluoranthene (3,4-benzofluoranthene) (205-99-2)[7]	610/625	0.8	1.6
Benzo(j)fluoranthene (205-82-3)[7]	625	0.5	1.0
Benzo(k)fluoranthene (11,12-benzofluoranthene) (207-08-9)[7]	610/625	0.8	1.6
Benzo(r,s,t)pentaphene (189-55-9)	625	0.5	1.0
Benzo(*a*)pyrene (50-32-8)	610/625	0.5	1.0
Benzo(*ghi*)Perylene (191-24-2)	610/625	0.5	1.0
Bis(*2-chloroethoxy)*methane (111-91-1)	625	5.3	21.2
Bis(*2-chloroethyl*)ether (111-44-4)	611/625	0.3	1.0
Bis(*2-chloroisopropyl*)ether (39638-32-9)	625	0.3	0.6
Bis(*2-ethylhexyl*)phthalate (117-81-7)	625	0.1	0.5
4-Bromophenyl phenyl ether (101-55-3)	625	0.2	0.4
2-Chloronaphthalene (91-58-7)	625	0.3	0.6
4-Chlorophenyl phenyl ether (7005-72-3)	625	0.3	0.5
Chrysene (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 (53-70-3)(1,2,5,6-dibenzanthracene)	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 (91-94-1)	605/625	0.5	1.0
Diethyl phthalate (84-66-2)	625	1.9	7.6
Dimethyl phthalate (131-11-3)	625	1.6	6.4
Di-n-butyl phthalate (84-74-2)	625	0.5	1.0
2,4-dinitrotoluene (121-14-2)	609/625	0.2	0.4
2,6-dinitrotoluene (606-20-2)	609/625	0.2	0.4

PRIORITY POLLUTANTS (continued)

Pollutant & CAS No. ***(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-octyl phthalate (117-84-0)	625	0.3	0.6
1,2-Diphenylhydrazine (*as Azobenzene*) (122-66-7)	1625B	5.0	20
Fluoranthene (206-44-0)	625	0.3	0.6
Fluorene (86-73-7)	625	0.3	0.6
Hexachlorobenzene (118-74-1)	612/625	0.3	0.6
Hexachlorobutadiene (87-68-3)	625	0.5	1.0
Hexachlorocyclopentadiene (77-47-4)	1625B/625	0.5	1.0
Hexachloroethane (67-72-1)	625	0.5	1.0
Indeno(*1,2,3-cd*)Pyrene (193-39-5)	610/625	0.5	1.0
Isophorone (78-59-1)	625	0.5	1.0
3-Methyl cholanthrene (56-49-5)	625	2.0	8.0
Naphthalene (91-20-3)	625	0.3	0.6
Nitrobenzene (98-95-3)	625	0.5	1.0
N-Nitrosodimethylamine (62-75-9)	607/625	2.0	4.0
N-Nitrosodi-n-propylamine (621-64-7)	607/625	0.5	1.0
N-Nitrosodiphenylamine (86-30-6)	625	0.5	1.0
Perylene (198-55-0)	625	1.9	7.6
Phenanthrene (85-01-8)	625	0.3	0.6
Pyrene (129-00-0)	625	0.3	0.6
1,2,4-Trichlorobenzene (120-82-1)	625	0.3	0.6

Pollutant & CAS No. ***(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 (176-40-16) (2,3,7,8 TCDD)	1613B	1.3 pg/L	5 pg/L

PRIORITY POLLUTANTS (continued)

Pollutant & CAS No. ***(if available)***	**Recommended Analytical Protocol**	**Detection (DL)[1]** ***µg/L unless specified***	**Quantitation Level (QL)[2]** ***µg/L unless specified***
PESTICIDES/PCBs			
Aldrin (309-00-2)	608	0.025	0.05
alpha-BHC (319-84-6)	608	0.025	0.05
beta-BHC (319-85-7)	608	0.025	0.05
gamma-BHC (58-89-9)	608	0.025	0.05
delta-BHC (319-86-8)	608	0.025	0.05
Chlordane (57-74-9) [8]	608	0.025	0.05
4,4'-DDT (50-29-3)	608	0.025	0.05
4,4'-DDE (72-55-9)	608	0.025	0.05
4,4' DDD (72-54-8)	608	0.025	0.05
Dieldrin (60-57-1)	608	0.025	0.05
alpha-Endosulfan (959-98-8)	608	0.025	0.05
beta-Endosulfan (33213-65-9)	608	0.025	0.05
Endosulfan Sulfate (1031-07-8)	608	0.025	0.05
Endrin (72-20-8)	608	0.025	0.05
Endrin Aldehyde (7421-93-4)	608	0.025	0.05
Heptachlor (76-44-8)	608	0.025	0.05
Heptachlor Epoxide (1024-57-3)	608	0.025	0.05
PCB-1242 (53469-21-9) [9]	608	0.25	0.5
PCB-1254 (11097-69-1)	608	0.25	0.5
PCB-1221 (11104-28-2)	608	0.25	0.5
PCB-1232 (11141-16-5)	608	0.25	0.5
PCB-1248 (12672-29-6)	608	0.25	0.5
PCB-1260 (11096-82-5)	608	0.13	0.5
PCB-1016 (12674-11-2) [9]	608	0.13	0.5
Toxaphene (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 C

WAC Codes Chapter 173-240

Chapter 173-240 WAC

SUBMISSION OF PLANS AND REPORTS FOR CONSTRUCTION OF WASTEWATER FACILITIES

Chapter Listing

WAC Sections

DISPOSITION OF SECTIONS FORMERLY CODIFIED IN THIS CHAPTER

173-240-105 Form—Certificate of construction of water pollution control facilities. [Statutory Authority: RCW 90.48.110 . WSR 79-02-033 (Order DE 78-10), § 173-240-105, filed 1/23/79. Formerly chapter 372-20 WAC.] Repealed by WSR 83-23-063 (Order DE 83-30), filed 11/16/83. Statutory Authority: Chapters 43.21A and 90.48 RCW.

173-240-010
Purpose and scope.

The purpose of this chapter is to implement RCW 90.48.110. The department interprets "plans and specifications" as mentioned in RCW 90.48.110 as including "engineering reports," "plans and specifications," and "general sewer plans," all as defined in WAC 173-240-020. This chapter also includes provisions for review and approval of proposed methods of operation and maintenance.

[Statutory Authority: Chapters 43.21A and 90.48 RCW. WSR 83-23-063 (Order DE 83-30), § 173-240-010, filed

11/16/83. Statutory Authority: RCW 90.48.110. WSR 79-02-033 (Order DE 78-10), § 173-240-010, filed 1/23/79. Formerly chapter 372-20 WAC.]

173-240-020
Definitions.

(1) "Approval" means written approval.

(2) "Construction quality assurance plan" means a plan describing the methods by which the professional engineer in responsible charge of inspection of the project will determine that the facilities were constructed without significant change from the department approved plans and specifications.

(3) "Department" means the Washington state department of ecology.

(4) "Domestic wastewater" means water carrying human wastes, including kitchen, bath, and laundry wastes from residences, buildings, industrial establishments or other places, together with the groundwater infiltration or surface waters that may be present.

(5) "Domestic wastewater facility" means all structures, equipment, or processes required to collect, carry away, treat, reclaim or dispose of domestic wastewater together with the industrial waste that may be present. In the case of subsurface sewage treatment and disposal, the term is restricted to mean those facilities treating and disposing of domestic wastewater only from:

(a) A septic tank system with subsurface sewage treatment and disposal and an ultimate design capacity exceeding fourteen thousand five hundred gallons per day at any common point; or

(b) A mechanical treatment system or lagoon followed by subsurface disposal with an ultimate design capacity exceeding three thousand five hundred gallons per day at any common point.

Where the proposed system using subsurface disposal has received a state construction grant or a federal construction grant under the Federal Water Pollution Control Act as amended, such a system is a "domestic wastewater facility" regardless of size.

(6) "Engineering report" means a document that thoroughly examines the engineering and administrative aspects of a particular domestic or industrial wastewater facility. The report shall contain the appropriate information required in WAC 173-240-060 or 173-240-130. In the case of a domestic wastewater facility project, the report describes the recommended financing method.

The facility plan described in federal regulation 40 C.F.R. 35 is an "engineering report." This federal regulation describes the Environmental Protection Agency's municipal wastewater construction grants program.

(7) "General sewer plan" means the:

(a) Sewerage general plan adopted by counties under chapter 36.94 RCW; or

(b) Comprehensive plan for a system of sewers adopted by sewer districts under chapter 56.08 RCW; or

(c) Plan for a system of sewerage adopted by cities under chapter 35.67 RCW; or

(d) Comprehensive plan for a system of sewers adopted by water districts under chapter 57.08 RCW; or

(e) Plan for sewer systems adopted by public utility districts under chapter 54.16 RCW and by port districts under chapter 53.08 RCW.

(f) The "general sewer plan" is a comprehensive plan for a system of sewers adopted by a local government entity. The plan includes the items specified in each respective statute. It includes the general location and description of treatment and disposal facilities, trunk and interceptor sewers, pumping stations, monitoring and control facilities, local service areas and a general description of the collection system to serve those areas. The plan also includes preliminary engineering in adequate detail to assure technical feasibility, provides for the method of distributing the cost and expense of the sewer system, and indicates the financial feasibility of plan implementation.

(8) "Industrial wastewater" means the water or liquid that carries waste from industrial or commercial processes, as distinct from domestic wastewater. These wastes may result from any process or activity of industry, manufacture, trade or business, from the development of any natural resource, or from animal operations such as feedlots, poultry houses, or dairies. The term includes contaminated stormwater and also leachate from solid waste facilities.

(9) "Industrial wastewater facility" means all structures, equipment, or processes required to collect, carry away, treat, reclaim or dispose of industrial wastewater.

(10) "Owner" means the state, county, city, town, federal agency, corporation, firm, company, institution, person or persons, or any other entity owning a domestic or industrial wastewater facility.

(11) "Plans and specifications" means the detailed drawings and specifications used in the construction or modification of domestic or industrial wastewater facilities. Except as otherwise allowed, plans and specifications are preceded by an approved engineering report. For some industrial facilities final conceptual drawings for all or parts of the system may be substituted for plans and specifications with the permission of the department.

(12) "Sewerage system" means a system of sewers and appurtenances for the collection, transportation, pumping, treatment and disposal of domestic wastewater together with industrial waste that may be present. By definition a sewerage system is a "domestic wastewater facility."

(13) "Sewer line extension" means any pipe added or connected to an existing sewerage system, together with any pump stations: Provided, That the term does not include gravity side sewers that connect individual building or dwelling units to the sewer system when these side sewers are less than one hundred fifty feet in length and not over six inches in diameter.

(14) "Subsurface sewage treatment and disposal" means the physical, chemical, or bacteriological treatment and disposal of domestic wastewater within the soil profile by placement beneath the soil surface in trenches, beds, seepage pits, mounds, or fills.

(15) "Waters of the state" means all lakes, rivers, ponds, streams, inland waters, groundwaters, salt waters, and all other waters and watercourses within the jurisdiction of the state of Washington.

[Statutory Authority: RCW **90.48.110**. WSR 00-15-021 (Order 00-09), § 173-240-020, filed 7/11/00, effective 8/11/00. Statutory Authority: Chapters **43.21A** and **90.48** RCW. WSR 83-23-063 (Order DE 83-30), § 173-240-020, filed 11/16/83. Statutory Authority: RCW **90.48.110**. WSR 79-02-033 (Order DE 78-10), § 173-240-020, filed 1/23/79. Formerly WAC 372-20-010.]

173-240-030
Submission of plans and reports.

(1) Before constructing or modifying domestic wastewater facilities, engineering reports and plans and specifications for the project must be submitted to and approved by the department, except as noted in WAC 173-240-030(5).

(2) All reports and plans and specifications must be submitted by the owner or the owner's authorized representative consistent with a compliance schedule issued by the department or at least sixty days before the time approval is desired.

(3) Construction or modification of domestic wastewater facilities shall conform to the following schedule of tasks unless otherwise modified by these rules:

(a) Submission and approval of engineering report;

(b) Submission and approval of plans and specifications;

(c) Submission and approval of construction quality assurance plan;

(d) Submission and approval of draft operation and maintenance manual;

(e) Declaration of completion of construction by the project engineer; and

(f) Submission of complete operation and maintenance manual.

(4) Where two or more years has lapsed since approval of the engineering report or plans and specifications and construction has not begun, it may be necessary to update that document to reflect changed conditions such as: Water quality, services availability, regulatory requirements, or engineering technology.

(5) If the local government entity has received department approval of a general sewer plan and standard design criteria, engineering reports and plans and specifications for sewer line extensions, including pump stations, are not required to be submitted for approval. In this case the entity need only provide a description of the project and written assurance that the extension is in conformance with the general sewer plan. However, in the following situations specific department approval is necessary for sewer line extensions before construction:

(a) The proposed sewers, or pump stations involve installation of overflows or bypasses; or

(b) The proposed sewers, pump or lift stations discharge to an overloaded treatment, collection, or disposal facility.

[Statutory Authority: RCW 90.48.110. WSR 00-15-021 (Order 00-09), § 173-240-030, filed 7/11/00, effective 8/11/00. Statutory Authority: Chapters 43.21A and 90.48 RCW. WSR 83-23-063 (Order DE 83-30), § 173-240-030, filed 11/16/83. Statutory Authority: RCW 90.48.110. WSR 79-02-033 (Order DE 78-10), § 173-240-030, filed 1/23/79. Formerly chapter 372-20 WAC.]

173-240-035
Restrictions—Subsurface disposal systems.

Domestic wastewater facilities using subsurface sewage treatment and disposal, as defined in WAC 173-240-020(5), are prohibited except under those extraordinary circumstances where no other reasonable alternatives exist and: Providing that

(1) The facility is owned, operated, and maintained by a public entity, except as noted in WAC 173-240-104; and

(2) Adequate facility construction oversight is provided by the public entity; and

(3) The proposed project is consistent with local health and land use rules; and

(4) Loading rates do not exceed 1,570 gallons per day per acre of gross land area in medium sands or finer grained soils and may not exceed 900 gallons per day per acre of gross land in coarser grained soils or other soils where conditions do not provide for adequate treatment. For the purposes of this section gross land area is defined as the contiguous land area of a proposed development that might include the centerline of adjoining road or street right-of-ways.

[Statutory Authority: RCW 90.48.110. WSR 00-15-021 (Order 00-09), § 173-240-035, filed 7/11/00, effective 8/11/00. Statutory Authority: Chapters 43.21A and 90.48 RCW. WSR 83-23-063 (Order DE 83-30), § 173-240-035, filed 11/16/83.]

173-240-040
Review standards.

(1) The department will review general sewer plans, engineering reports, plans and specifications, and operation and maintenance manuals for domestic wastewater facilities to determine whether the proposed facilities will be designed, constructed, operated, and maintained to meet effluent limitations and other requirements of an NPDES or state waste discharge permit, if applicable, and to meet the policies and requirements of chapters 90.48 and 90.54 RCW pertaining to prevention and control of pollution of waters of the state.

(2) In addition to the above, the department will review documents submitted under this chapter to determine whether they are reasonably consistent with the appropriate sections of the state of Washington, "Criteria for sewage works design." Additional references may include, but are not limited to, the following:

(a) Manuals of Practice, Water Pollution Control Federation.

(b) Manuals of Engineering Practice, American Society of Civil Engineering.

(c) Standard Specifications for Municipal Public Works Construction, American Public Works Association.

(d) Considerations for Preparation of Operation and Maintenance Manuals, United States Environmental Protection Agency.

(e) Process Design Manuals, United States Environmental Protection Agency.

(f) Design Criteria for Mechanical, Electric, and Fluid System and Component Reliability, United States Environmental Protection Agency.

(g) Design Manual: Onsite Wastewater Treatment and Disposal Systems, U.S.E.P.A. October 1980.

(h) Guidelines for Larger On-Site Sewage Disposal Systems, Washington State Department of Social and Health Services and Department of Ecology.

[Statutory Authority: RCW 90.48.110. WSR 00-15-021 (Order 00-09), § 173-240-040, filed 7/11/00, effective

8/11/00. Statutory Authority: Chapters **43.21A** and **90.48** RCW. WSR 83-23-063 (Order DE 83-30), § 173-240-040, filed 11/16/83. Statutory Authority: RCW **90.48.110**. WSR 79-02-033 (Order DE 78-10), § 173-240-040, filed 1/23/79. Formerly chapter 372-20 WAC.]

173-240-050
General sewer plan.

(1) All general sewer plans required of any governmental agency before providing sewer service are "plans" within the requirements of RCW **90.48.110**. Three copies of the proposed general sewer plan and each amendment to it must be submitted to and approved by the department before implementing the plan.

(2) The general sewer plan must be sufficiently complete so that engineering reports can be developed from it without substantial alterations of concept and basic considerations.

(3) The general sewer plan shall include the following information together with any other relevant data as requested by the department. To satisfy the requirements of the local government jurisdiction, additional information may be necessary.

(a) The purpose and need for the proposed plan.

(b) A discussion of who will own, operate, and maintain the systems.

(c) The existing and proposed service boundaries.

(d) Layout map including the following:

(i) Boundaries. The boundary lines of the municipality or special district to be sewered, including a vicinity map;

(ii) Existing sewers. The location, size, slope, capacity, direction of flow of all existing trunk sewers, and the boundaries of the areas served by each;

(iii) Proposed sewers. The location, size, slope, capacity, direction of flow of all proposed trunk sewers, and the boundaries of the areas to be served by each;

(iv) Existing and proposed pump stations and force mains. The location of all existing and proposed pumping stations and force mains, designated to distinguish between those existing and proposed;

(v) Topography and elevations. Topography showing pertinent ground elevations and surface drainage must be included, as well as proposed and existing streets;

(vi) Streams, lakes, and other bodies of water. The location and direction of flow of major streams, the high and low elevations of water surfaces at sewer outlets, and controlled overflows, if any. All existing and potential discharge locations should be noted; and

(vii) Water systems. The location of wells or other sources of water supply, water storage reservoirs and treatment plants, and water transmission facilities.

(e) The population trend as indicated by available records, and the estimated future population for the stated design period. Briefly describe the method used to determine future population trends and the concurrence of any applicable local or regional planning agencies.

(f) Any existing domestic or industrial wastewater facilities within twenty miles of the general plan area and within the same topographical drainage basin containing the general plan area.

(g) A discussion of any infiltration and inflow problems and a discussion of actions that will alleviate these problems in the future.

(h) A statement regarding provisions for treatment and discussion of the adequacy of the treatment.

(i) List of all establishments producing industrial wastewater, the quantity of wastewater and periods of production, and the character of the industrial wastewater insofar as it may affect the sewer system or treatment plant. Consideration must be given to future industrial expansion.

(j) Discussion of the location of all existing private and public wells, or other sources of water supply, and distribution structures as they are related to both existing and proposed domestic wastewater treatment facilities.

(k) Discussion of the various alternatives evaluated, and a determination of the alternative chosen, if applicable.

(l) A discussion, including a table, that shows the cost per service in terms of both debt service and operation and maintenance costs, of all facilities (existing and proposed) during the planning period.

(m) A statement regarding compliance with any adopted water quality management plan under the Federal

Water Pollution Control Act as amended.

(n) A statement regarding compliance with the State Environmental Policy Act (SEPA) and the National Environmental Policy Act (NEPA), if applicable.

[Statutory Authority: RCW **90.48.110**. WSR 00-15-021 (Order 00-09), § 173-240-050, filed 7/11/00, effective 8/11/00. Statutory Authority: Chapters **43.21A** and **90.48** RCW. WSR 83-23-063 (Order DE 83-30), § 173-240-050, filed 11/16/83. Statutory Authority: RCW **90.48.110**. WSR 79-02-033 (Order DE 78-10), § 173-240-050, filed 1/23/79. Formerly chapter 372-20 WAC.]

173-240-060
Engineering report.

(1) The engineering report for a domestic wastewater facility shall include each appropriate (as determined by the department) item required in WAC **173-240-050** for general sewer plans unless an up-to-date general sewer plan is on file with the department. Normally, an engineering report is not required for sewer line extensions or pump stations. See WAC **173-240-020**(13) and **173-240-030**(5). The facility plan described in federal rule 40 C.F.R. 35 is an "engineering report."

(2) The engineering report must be sufficiently complete so that plans and specifications can be developed from it without substantial changes. Three copies of the report must be submitted to the department for approval, except as waived under WAC **173-240-030**(5).

(3) The engineering report shall include the following information together with any other relevant data as requested by the department:

(a) The name, address, and telephone number of the owner of the proposed facilities, and the owner's authorized representative.

(b) A project description that includes a location map and a map of the present and proposed service area.

(c) A statement of the present and expected future quantity and quality of wastewater, including any industrial wastes that may be present or expected in the sewer system.

(d) The degree of treatment required based upon applicable permits and rules, the receiving body of water, the amount and strength of wastewater to be treated, and other influencing factors.

(e) A description of the receiving water, applicable water quality standards, and how water quality standards will be met outside any applicable dilution zone.

(f) The type of treatment process proposed, based upon the character of the wastewater to be handled, the method of disposal, the degree of treatment required, and a discussion of the alternatives evaluated and the reasons they are unacceptable.

(g) The basic design data and sizing calculations of each unit of the treatment works. Expected efficiencies of each unit and also of the entire plant, and character of effluent anticipated.

(h) Discussion of the various sites available and the advantages and disadvantages of the site or sites recommended. The proximity of residences or developed areas to any treatment works. The relationship of the twenty-five-year and one hundred-year flood to the treatment plant site and the various plant units.

(i) A flow diagram that shows general layout of the various units, the location of the effluent discharge, and a hydraulic profile of the system that is the subject of the engineering report and any hydraulically related portions.

(j) A discussion of infiltration and inflow problems, overflows and bypasses, and proposed corrections and controls.

(k) A discussion of any special provisions for treating industrial wastes, including any pretreatment requirements for significant industrial sources.

(l) Detailed outfall analysis or other disposal method selected.

(m) A discussion of the method of final sludge disposal and any alternatives considered.

(n) Provision for future needs.

(o) Staffing and testing requirements for the facilities.

(p) An estimate of the costs and expenses of the proposed facilities and the method of assessing costs and expenses. The total amount shall include both capital costs and also operation and maintenance costs for the life of the project, and must be presented in terms of total annual cost and present worth.

(q) A statement regarding compliance with any applicable state or local water quality management plan or any plan adopted under the Federal Water Pollution Control Act as amended.

(r) A statement regarding compliance with the State Environmental Policy Act (SEPA) and the National Environmental Policy Act (NEPA), if applicable.

(4) The engineering report for projects that use land application, including seepage lagoons, irrigation, and subsurface disposal, shall include information on the following together with appropriate parts of subsection (3) of this section, as determined by the department:

(a) Soils and their permeability;

(b) Geohydrologic evaluation of factors such as:

(i) Depth to groundwater and groundwater movement during different times of the year;

(ii) Water balance analysis of the proposed discharge area;

(iii) Overall effects of the proposed facility upon the groundwater in conjunction with any other land application facilities that may be present;

(c) Availability of public sewers;

(d) Reserve areas for additional subsurface disposal.

(5) The engineering report for projects funded by the Environmental Protection Agency shall, in addition to the requirements of subsection (3) or (4) of this section, follow EPA facility plan guidelines contained in the EPA publication, "Guidance for Preparing a Facility Plan" (MCD-46), and shall indicate how the special requirements contained in 40 C.F.R. 35.719-1 will be met.

[Statutory Authority: RCW **90.48.110**. WSR 00-15-021 (Order 00-09), § 173-240-060, filed 7/11/00, effective 8/11/00. Statutory Authority: Chapters **43.21A** and **90.48** RCW. WSR 83-23-063 (Order DE 83-30), § 173-240-060, filed 11/16/83. Statutory Authority: RCW **90.48.110**. WSR 79-02-033 (Order DE 78-10), § 173-240-060, filed 1/23/79. Formerly chapter 372-20 WAC.]

173-240-070
Plans and specifications.

(1) The plans and specifications for a domestic wastewater facility are the detailed construction documents by which the owner or his or her contractor bid and construct the facility. The content and format of the plans and specifications must be as stated in the state of Washington, "Criteria for sewage works design," and shall include a list of the facility design criteria and a plan for interim operation of facilities during construction.

(2) Plans and specifications for sewer line extensions shall include, as a separate report, an analysis of the existing collection and treatment system's ability to transport and treat additional flow and loading.

(3) Two copies of the plans and specifications must be submitted to the department for approval before starting construction, except as waived under WAC **173-240-030**(5).

[Statutory Authority: RCW **90.48.110**. WSR 00-15-021 (Order 00-09), § 173-240-070, filed 7/11/00, effective 8/11/00. Statutory Authority: Chapters **43.21A** and **90.48** RCW. WSR 83-23-063 (Order DE 83-30), § 173-240-070, filed 11/16/83. Statutory Authority: RCW **90.48.110**. WSR 79-02-033 (Order DE 78-10), § 173-240-070, filed 1/23/79. Formerly chapter 372-20 WAC.]

173-240-075
Construction quality assurance plan.

(1) Before construction a detailed plan must be submitted to the department that shows how adequate and competent construction inspection will be provided.

(2) The construction quality assurance plan shall include a:

(a) Construction schedule with a summary of planned construction activities, their sequence, interrelationships, durations, and terminations.

(b) Description of the construction management organization, management procedures, lines of communication, and responsibility.

(c) Description of anticipated quality control testing that includes type of test, frequency, and who will perform the tests.

(d) Description of the change order process that includes who will initiate change orders, as well as who will review, negotiate, and approve change orders.

(e) Description of the technical records handling methodology that includes where plans and specifications, as-built drawings, field orders, and change orders will be kept.

(f) Description of the construction inspection program that includes inspection responsibility, anticipated inspection frequency, deficiency resolution, and inspector qualifications.

[Statutory Authority: RCW **90.48.110**. WSR 00-15-021 (Order 00-09), § 173-240-075, filed 7/11/00, effective 8/11/00. Statutory Authority: Chapters **43.21A** and **90.48** RCW. WSR 83-23-063 (Order DE 83-30), § 173-240-075, filed 11/16/83.]

173-240-080
Operation and maintenance manual.

(1) The proposed method of operation and maintenance of the domestic wastewater facility must be stated in the engineering report or plans and specifications and must be approved by the department. The statement must be a discussion of who will own, operate, and maintain the facility and what the staffing and testing requirements are. The owner shall follow the approved method of operation after the facility is constructed, unless changes have been approved by the department.

(2) In those cases where the facility includes mechanical components, a detailed operation and maintenance manual must be prepared before completing the construction. The purpose of the manual is to present technical guidance and regulatory requirements to the operator to enhance operation under both normal and emergency conditions. Two copies of the manual must be submitted to the department for approval before completing the construction.

(3) In order to assure proper operation during construction and timely review and approval of the final operation and maintenance manual, a draft manual must be submitted in the early stages of the construction of a facility. In addition, manufacturer's information on equipment must be available to the plant operator before unit start up.

(4) The operation and maintenance manual shall include the following list of topics. For those projects funded by the Environmental Protection Agency the manual shall also follow the requirements of the EPA publication, "Considerations for Preparation of Operation and Maintenance Manuals."

(a) The assignment of managerial and operational responsibilities, including plant classification and classification of required operators.

(b) A description of plant type, flow pattern, operation, and efficiency expected.

(c) The principal design criteria.

(d) A process description of each plant unit, including function, relationship to other plant units, and schematic diagrams.

(e) A discussion of the detailed operation of each unit and description of various controls, recommended settings, fail-safe features, etc.

(f) A discussion of how the treatment facilities are to be operated during anticipated maintenance procedures, and under less than design loading conditions, if applicable, such as initial loading on a system designed for substantial growth.

(g) A section on laboratory procedures, including sampling techniques, monitoring requirements, and sample analysis.

(h) Recordkeeping procedures and sample forms to be used.

(i) A maintenance schedule that incorporates manufacturer's recommendations, preventative maintenance and housekeeping schedules, and special tools and equipment usage.

(j) A section on safety.

(k) A section that lists the spare parts inventory, address of local suppliers, equipment warranties, and appropriate equipment catalogues.

(l) Emergency plans and procedures.

(5) In those cases where the facility does not include mechanical components, an operation and maintenance manual, which may be less detailed than that described in subsection (4) of this section, must be submitted to the department for approval before completing construction. The manual shall fully describe the treatment and disposal system and outline routine maintenance procedures needed for proper operation of the system.

[Statutory Authority: RCW **90.48.110**. WSR 00-15-021 (Order 00-09), § 173-240-080, filed 7/11/00, effective 8/11/00. Statutory Authority: Chapters **43.21A** and **90.48** RCW. WSR 83-23-063 (Order DE 83-30), § 173-240-080, filed 11/16/83. Statutory Authority: RCW **90.48.110**. WSR 79-02-033 (Order DE 78-10), § 173-240-080, filed 1/23/79. Formerly chapter 372-20 WAC.]

173-240-090
Declaration of construction completion.

(1) Within thirty days after acceptance by the owner of the construction or modification of a domestic wastewater facility, the professional engineer in responsible charge of inspection of the project shall submit to the department:

(a) One complete set of record drawings or as-builts;

(b) A declaration stating the facilities were constructed in accordance with the provisions of the construction quality assurance plan and without significant change from the department approved plans and specifications.

(2) The declaration will be furnished by the department and will be the same form as WAC **173-240-095**, declaration of construction of water pollution control facilities. The submission of the declaration is not necessary for sewer line extensions where the local government entity has received approval of a general sewer plan and standard design criteria.

[Statutory Authority: RCW **90.48.110**. WSR 00-15-021 (Order 00-09), § 173-240-090, filed 7/11/00, effective 8/11/00. Statutory Authority: Chapters **43.21A** and **90.48** RCW. WSR 83-23-063 (Order DE 83-30), § 173-240-090, filed 11/16/83. Statutory Authority: RCW **90.48.110**. WSR 79-02-033 (Order DE 78-10), § 173-240-090, filed 1/23/79. Formerly chapter 372-20 WAC.]

173-240-095
Form—Declaration of construction of water pollution control facilities.

DECLARATION OF CONSTRUCTION OF WATER POLLUTION CONTROL FACILITIES

Instructions:

A. Upon completion, and before using any project or portions thereof, a professional engineer shall complete and sign this form, declaring that the project was constructed in accordance with the provisions of the construction quality assurance plan and with the plans and specifications and major change orders approved by the department of ecology.

B. If a project is being completed in phased construction, a map must be attached

showing that portion of the project to which the declaration applies. A declaration of construction must be submitted for each phase of a project as it is completed. Additional declaration forms are available upon request from the department of ecology offices listed below.

NAME AND BRIEF DESCRIPTION OF PROJECT: . . . .

. . . .

. . . .

NAME OF OWNER . . . . DOE PROJECT NO. . . . .

ADDRESS . . . . DATE PROJECT OR PHASE COMPLETED . . . .

CITY . . . . STATE . . . . ZIP . . . .

DOE PLAN AND SPECIFICATION APPROVAL DATE . . . .

I hereby declare that I am the project engineer of the above identified project and that the project was reviewed and observed by me or my authorized agent in accordance with the provisions of the construction quality assurance plan. I further declare that the project was, to the best of my knowledge and information, constructed and completed in accordance with the plans and specification and major change orders approved by the department of ecology and as shown on the owner's "as-built" plans.

. . . . SEAL

Signature of Professional Engineer OF

ENGINEER

DATE . . . .

Please return completed form to the department of ecology office checked below.

□ SW Regional Office
Department of Ecology
P.O. Box 47600
Olympia, WA 98504-7600

□ Central Regional Office
Department of Ecology
15 W. Yakima Ave., Suite 200
Yakima, WA 98902-3401

□ NW Regional Office
Department of Ecology
3190 160th Ave. S.E.
Bellevue, WA 98008-5452

□ Eastern Regional Office
Department of Ecology
N. 4601 Monroe, Ste. 100
Spokane, WA 99205-1295

□ Water Quality Program
Department of Ecology

P.O. Box 47600
Olympia, WA 98504-
7600

[Statutory Authority: RCW **90.48.110**. WSR 00-15-021 (Order 00-09), § 173-240-095, filed 7/11/00, effective 8/11/00. Statutory Authority: Chapters **43.21A** and **90.48** RCW. WSR 83-23-063 (Order DE 83-30), § 173-240-095, filed 11/16/83.]

173-240-100
Requirement for certified operator.

Each owner of a domestic wastewater treatment facility is required by chapter **70.95B** RCW to have an operator, certified by the state, in responsible charge of the day to day operation of the facility. This requirement does not apply to a septic tank using subsurface disposal. The certification procedures are set forth in chapter **173-230** WAC.

[Statutory Authority: RCW **90.48.110**. WSR 00-15-021 (Order 00-09), § 173-240-100, filed 7/11/00, effective 8/11/00. Statutory Authority: Chapters **43.21A** and **90.48** RCW. WSR 83-23-063 (Order DE 83-30), § 173-240-100, filed 11/16/83. Statutory Authority: RCW **90.48.110**. WSR 79-02-033 (Order DE 78-10), § 173-240-100, filed 1/23/79. Formerly chapter 372-20 WAC.]

173-240-104
Ownership and operation and maintenance.

(1) Except as provided in subsections (2) and (3) of this section, domestic sewage facilities will not be approved unless ownership and responsibility for operation and maintenance is by a public entity. If a waste discharge permit is required it must be issued to the public entity. Nothing in this rule precludes a public entity from contracting operation and maintenance of domestic sewage facilities.

(2) Ownership by nonpublic entities may be approved if the department determines the ownership is in the public interest: Provided, That there is an enforceable contract, approved by the department, between the nonpublic entity and a public entity with an approved sewer general plan that will assure immediate assumption of the system under the following conditions:

(a) Treatment efficiency is unsatisfactory either as a result of plant capacity or physical operation; or

(b) If such an assumption is necessary for the implementation of a general sewer plan.

(3) The following domestic wastewater facilities would not require public entity ownership, operation, and maintenance:

(a) Those facilities existing or approved for construction as of the effective date of this section, until such a time the facility is expanded to accommodate additional development.

(b) Those facilities which serve a single nonresidential, industrial, or commercial establishment. Commercial/industrial complexes serving multiple owners or tenants and multiple residential dwelling facilities such as mobile home parks, apartments, and condominiums are not considered commercial establishments for the purpose of this section.

[Statutory Authority: RCW **90.48.110**. WSR 00-15-021 (Order 00-09), § 173-240-104, filed 7/11/00, effective 8/11/00. Statutory Authority: Chapters **43.21A** and **90.48** RCW. WSR 83-23-063 (Order DE 83-30), § 173-240-104, filed 11/16/83.]

173-240-110
Submission of plans and reports.

(1) Before constructing or modifying industrial wastewater facilities, engineering reports and plans and specifications for the project must be submitted to and approved by the department.

(2) All engineering reports and plans and specifications should be submitted by the owner consistent with a compliance schedule issued by the department or at least thirty days before the time approval is desired. The department will generally review and either approve (or conditionally approve), comment on, or disapprove those plans and reports within the thirty-day period unless circumstances prevent, in which case the owner will be notified and informed of the reason for the delay.

(3) Construction or modification of industrial wastewater facilities shall conform to the following schedule of tasks unless waived in accordance with subsection (5).

(a) Submission and approval of an engineering report;

(b) Submission and approval of plans and specifications;

(c) Submission of an operation and maintenance manual.

(4) Where two or more years has elapsed since approval of the engineering report or plans and specifications, it may be necessary to update that document to reflect changed water quality conditions, regulatory requirements, or engineering technology.

(5) Upon request by the owner, the department may waive the requirement for a three step submission of documents for industrial facilities. In such a case the department will require instead conceptual plans that also include the appropriate (as determined by the department) information from the engineering report and an operation and maintenance manual.

[Statutory Authority: RCW **90.48.110**. WSR 00-15-021 (Order 00-09), § 173-240-110, filed 7/11/00, effective 8/11/00. Statutory Authority: Chapters **43.21A** and **90.48** RCW. WSR 83-23-063 (Order DE 83-30), § 173-240-110, filed 11/16/83. Statutory Authority: RCW **90.48.110**. WSR 79-02-033 (Order DE 78-10), § 173-240-110, filed 1/23/79. Formerly chapter 372-20 WAC.]

173-240-120
Review standards.

The department will review engineering reports, plans and specifications, and operation and maintenance manuals for industrial wastewater facilities to:

(1) Determine whether the proposed facilities will be designed, constructed, operated and maintained to meet effluent limitations and other requirements of an NPDES or state waste discharge permit, if applicable; and

(2) To meet the policies and requirements of chapters **90.48** and **90.54** RCW pertaining to prevention and control of pollution of waters of the state; and

(3) To determine whether the facility will be designed, constructed, and operated consistent with good engineering practices.

[Statutory Authority: RCW **90.48.110**. WSR 00-15-021 (Order 00-09), § 173-240-120, filed 7/11/00, effective 8/11/00. Statutory Authority: Chapters **43.21A** and **90.48** RCW. WSR 83-23-063 (Order DE 83-30), § 173-240-120, filed 11/16/83. Statutory Authority: RCW **90.48.110**. WSR 79-02-033 (Order DE 78-10), § 173-240-120, filed 1/23/79. Formerly chapter 372-20 WAC.]

173-240-130
Engineering report.

(1) The engineering report for an industrial wastewater facility must be sufficiently complete so that plans and specifications can be developed from it without substantial changes. Two copies of the report must be submitted

to the department for approval.

(2) The engineering report shall include the following information together with any other relevant data as requested by the department:

(a) Type of industry or business;

(b) The kind and quantity of finished product;

(c) The quantity and quality of water used by the industry and a description of how it is consumed or disposed of, including:

(i) The quantity and quality of all process wastewater and method of disposal;

(ii) The quantity of domestic wastewater and how it is disposed of;

(iii) The quantity and quality of noncontact cooling water (including air conditioning) and how it is disposed of; and

(iv) The quantity of water consumed or lost to evaporation.

(d) The amount and kind of chemicals used in the treatment process, if any;

(e) The basic design data and sizing calculations of the treatment units;

(f) A discussion of the suitability of the proposed site for the facility;

(g) A description of the treatment process and operation, including a flow diagram;

(h) All necessary maps and layout sketches;

(i) Provisions for bypass, if any;

(j) Physical provision for oil and hazardous material spill control or accidental discharge prevention or both;

(k) Results to be expected from the treatment process including the predicted wastewater characteristics, as shown in the waste discharge permit, where applicable;

(l) A description of the receiving water, location of the point of discharge, applicable water quality standards, and how water quality standards will be met outside of any applicable dilution zone;

(m) Detailed outfall analysis;

(n) The relationship to existing treatment facilities, if any;

(o) Where discharge is to a municipal sewerage system, a discussion of that system's ability to transport and treat the proposed industrial waste discharge without exceeding the municipality's allocated industrial capacity. Also, a discussion on the effects of the proposed industrial discharge on the use or disposal of municipal sludge;

(p) Where discharge is through land application, including seepage lagoons, irrigation, and subsurface disposal, a geohydrologic evaluation of factors such as:

(i) Depth to groundwater and groundwater movement during different times of the year;

(ii) Water balance analysis of the proposed discharge area;

(iii) Overall effects of the proposed facility upon the groundwater in conjunction with any other land application facilities that may be present;

(q) A statement expressing sound engineering justification through the use of pilot plant data, results from other similar installations, or scientific evidence from the literature, or both, that the effluent from the proposed facility will meet applicable permit effluent limitations or pretreatment standards or both;

(r) A discussion of the method of final sludge disposal selected and any alternatives considered with reasons for rejection;

(s) A statement regarding who will own, operate, and maintain the system after construction;

(t) A statement regarding compliance with any state or local water quality management plan or any plan adopted under the Federal Water Pollution Control Act as amended;

(u) Provisions for any committed future plans;

(v) A discussion of the various alternatives evaluated, if any, and reasons they are unacceptable;

(w) A timetable for final design and construction;

(x) A statement regarding compliance with the State Environmental Policy Act (SEPA) and the National Environmental Policy Act (NEPA), if applicable;

(y) Additional items to be included in an engineering report for a solid waste leachate treatment system are:

(i) A vicinity map and also a site map that shows topography, location of utilities, and location of the leachate collection network, treatment systems, and disposal;

(ii) Discussion of the solid waste site, working areas, soil profile, rainfall data, and groundwater movement and usage;

(iii) A statement of the capital costs and the annual operation and maintenance costs;

(iv) A description of all sources of water supply within two thousand feet of the proposed disposal site.

Particular attention should be given to showing impact on usable or potentially usable aquifers.

[Statutory Authority: RCW 90.48.110. WSR 00-15-021 (Order 00-09), § 173-240-130, filed 7/11/00, effective 8/11/00. Statutory Authority: Chapters 43.21A and 90.48 RCW. WSR 83-23-063 (Order DE 83-30), § 173-240-130, filed 11/16/83. Statutory Authority: RCW 90.48.110. WSR 79-02-033 (Order DE 78-10), § 173-240-130, filed 1/23/79. Formerly chapter 372-20 WAC.]

173-240-140
Plans and specifications.

(1) Upon request of the owner the department may, at its discretion, allow submission of conceptual plans for industrial facilities, as noted in WAC 173-240-110(5). Two copies of the plans and specifications must be submitted to the department for approval before the start of construction.

(2) The plans and specifications shall include the following information together with any other relevant data as requested by the department:

(a) Repeat presentation of the basic engineering design criteria from the engineering report.

(b) If there are any deviations from the concepts of the engineering report, an explanation of the changes that includes as much detail as would have been provided in an engineering report.

(c) The plan and section drawings of major components, such as the treatment units, pump stations, flow measuring devices, sludge handling equipment, and influent and effluent piping. Foundations or soil preparation or both should be shown for major structures.

(d) A general site drawing that shows the location with respect to the entire plant site and a detailed site drawing that shows the component siting.

(e) A schematic drawing that shows flows that include: In plant collection, and wastewater pumping, treatment, and discharge.

(f) A hydraulic profile that shows head under maximum flows. This requirement may be waived where the three step submission of documents has been waived under WAC 173-240-110(5).

(g) Instrumentation, controls, and sampling schematics.

(h) General operating procedures, such as startup, shutdown, spills, etc.

[Statutory Authority: RCW 90.48.110. WSR 00-15-021 (Order 00-09), § 173-240-140, filed 7/11/00, effective 8/11/00. Statutory Authority: Chapters 43.21A and 90.48 RCW. WSR 83-23-063 (Order DE 83-30), § 173-240-140, filed 11/16/83. Statutory Authority: RCW 90.48.110. WSR 79-02-033 (Order DE 78-10), § 173-240-140, filed 1/23/79. Formerly chapter 372-20 WAC.]

173-240-150
Operation and maintenance manual.

(1) A detailed operation and maintenance manual must be prepared for an industrial wastewater facility that includes mechanical components before completing the construction. The manual is to be submitted to the department for review and approval. The purpose of the manual is to present technical guidance and regulatory requirements to the operator to enhance operation under both normal and emergency conditions.

(2) The operation and maintenance manual shall include the following topics:

(a) The names and phone numbers of the responsible individuals.

(b) A description of plant type, flow pattern, operation, and efficiency expected.

(c) The principal design criteria.

(d) A process description of each plant unit, that includes function, relationship to other plant units, and schematic diagrams.

(e) An explanation of the operational objectives for the various wastewater parameters, such as sludge age, settleability, etc.

(f) A discussion of the detailed operation of each unit and a description of various controls, recommended settings, fail-safe features, etc.

(g) A discussion of how the facilities are to be operated during anticipated startups and shutdowns, maintenance procedures, and less than design loading conditions, so as to maintain efficient treatment.

(h) A section on laboratory procedures that includes sampling techniques, monitoring requirements, and sample analysis.

(i) Recordkeeping procedures and sample forms to be used.

(j) A maintenance schedule that incorporates manufacturer's recommendations, preventative maintenance and housekeeping schedules, and special tools and equipment usage.

(k) A section on safety.

(l) A section that contains the spare parts inventory, address of local suppliers, equipment warranties, and appropriate equipment catalogues.

(m) Emergency plans and procedures.

[Statutory Authority: RCW **90.48.110**. WSR 00-15-021 (Order 00-09), § 173-240-150, filed 7/11/00, effective 8/11/00. Statutory Authority: Chapters **43.21A** and **90.48** RCW. WSR 83-23-063 (Order DE 83-30), § 173-240-150, filed 11/16/83. Statutory Authority: RCW **90.48.110**. WSR 79-02-033 (Order DE 78-10), § 173-240-150, filed 1/23/79. Formerly chapter 372-20 WAC.]

173-240-160
Requirement for professional engineer.

(1) All required engineering reports, and plans and specifications for the construction or modification of wastewater facilities must be prepared under the supervision of a professional engineer licensed in accordance with chapter **18.43** RCW. All copies of these documents submitted to the department for review shall bear the seal of the professional engineer under whose supervision they have been prepared.

(2) Upon request of the owner, the department may waive the above requirement for construction or modification at industrial wastewater facilities.

[Statutory Authority: RCW **90.48.110**. WSR 00-15-021 (Order 00-09), § 173-240-160, filed 7/11/00, effective 8/11/00. Statutory Authority: Chapters **43.21A** and **90.48** RCW. WSR 83-23-063 (Order DE 83-30), § 173-240-160, filed 11/16/83. Statutory Authority: RCW **90.48.110**. WSR 79-02-033 (Order DE 78-10), § 173-240-160, filed 1/23/79. Formerly chapter 372-20 WAC.]

173-240-170
Right of inspection.

Under RCW **90.48.090**, the department or its authorized representative has the right to enter at all reasonable times in or upon any property, public or private, for the purposes of inspection or investigation relating to the pollution or possible pollution of the waters of the state, including the inspection of construction activities related to domestic or industrial wastewater facilities.

[Statutory Authority: RCW **90.48.110**. WSR 00-15-021 (Order 00-09), § 173-240-170, filed 7/11/00, effective 8/11/00. Statutory Authority: Chapters **43.21A** and **90.48** RCW. WSR 83-23-063 (Order DE 83-30), § 173-240-170, filed 11/16/83. Statutory Authority: RCW **90.48.110**. WSR 79-02-033 (Order DE 78-10), § 173-240-170, filed 1/23/79. Formerly chapter 372-20 WAC.]

173-240-180
Approval of construction changes.

All wastewater facilities subject to the provisions of this rule must be constructed in accordance with the plans and specifications approved by the department. Any contemplated changes during construction, which are significant deviations from the approved plans, must first be submitted to the department for approval.

[Statutory Authority: RCW **90.48.110**. WSR 00-15-021 (Order 00-09), § 173-240-180, filed 7/11/00, effective 8/11/00. Statutory Authority: Chapters **43.21A** and **90.48** RCW. WSR 83-23-063 (Order DE 83-30), § 173-240-180, filed 11/16/83. Statutory Authority: RCW **90.48.110**. WSR 79-02-033 (Order DE 78-10), § 173-240-180, filed 1/23/79. Formerly chapter 372-20 WAC.]

APPENDIX D

Summary of Wastewater Grant and Loan Programs

Appendix D

Summary of Some Grant and Loan Programs for Drinking Water and Wastewater Projects

Updated 4-5-16

Please contact Cathi Read at cathi.read@commerce.wa.gov if you would like to update your program information or if you would like an electronic copy of this document.

PLANNING **Programs**	**Eligible Projects**	**Eligible Applicants**	**Funding Available**	**How To Apply**
CDBG-POG Community Development Block Grant – Planning-Only Grant Fund	• Comprehensive plans • Infrastructure plans • Feasibility studies • Community action plans • Low-income housing assessments	Projects must principally benefit low- to moderate-income people in non-entitlement cities and counties. • Cities or towns with fewer than 50,000 people • Counties with fewer than 200,000 people	Grant • Up to $24,000 for a single jurisdiction.	Applications for the 2015 program year will be accepted until April 30, 2016 on a fund-available basis. 2016 applications will be accepted on June 1, 2016 as part of the CDBG General Purpose Grant funding cycle (see page 7 for more information). **Contact:** Phyllis Cole 360-725-4001 phyllis.cole@commerce.wa.gov Visit www.commerce.wa.gov/cdbg for information and forms.
DWSRF Drinking Water State Revolving Fund Pre-Construction Grant Program	• Water System Plans, SWSMP, and Plan amendments • Feasibility studies • Engineering and design • Historic and cultural review • Environmental review	Not-for-profit Group A water systems with fewer than 10,000 people. Projects must principally be to move entities closer to applying for a DWSRF Construction Loan.	Grant • Up to $25,000 for a single jurisdiction. • No match required.	2017 applications accepted January 2-31, 2017. Paper applications are accepted. **Contact:** Karen Klocke 360-236-3116 karen.klocke@doh.wa.gov Visit DWSRF internet site for information and forms.
DWSRF Drinking Water State Revolving Fund – Consolidation Grant Program	• Water System Plans and Plan amendments • Feasibility studies • Consolidation of Group A water systems	Cities, towns, and special purpose district water systems with fewer than 10,000 people.	Grant • Up to $30,000 for a single jurisdiction. • $150,000 million will be available for this cycle. • No match required.	2017 applications accepted February 1-28, 2017. Paper applications are accepted. **Contact:** Karen Klocke 360-236-3116 karen.klocke@doh.wa.gov Visit DWSRF internet site for information and forms.

PLANNING **Programs**	**Eligible Projects**	**Eligible Applicants**	**Funding Available**	**How To Apply**
DWSRF Drinking Water State Revolving Fund – Pre-Construction Loan Program	• Water System Plans and Plan amendments • Feasibility studies • Engineering and design • Historic and cultural review • Environmental review	Not-for-profit Group A water systems with fewer than 10,000 people. Projects must principally be to move entities closer to applying for a DWSRF Construction Loan.	• Grant/ loan package • $6 million expected to be available for the next two years. • Limit of $300,000 per water system. • No match required.	2016 applications accepted March 1-April 29, 2016. Applications must be submitted online. **Contact**: Karen Klocke 360-236-3116 Karen.klocke@doh.wa.gov Visit DWSRF internet site for information and forms.
SOURCE WATER PROTECTION GRANT PROGRAM	Source water protection studies (watershed, hydrogeologic, feasibility studies). Projects need to identify solutions to source water protection problems, assist in implementation of protection plans, or increase or update data that directly benefits source water protection.	Counties, cities, towns, and special purpose districts. Homeowner's associations and non-municipal water systems are not eligible. Project must be considered a priority for drinking water source protection by Department of Health Regional Office.	Grants • Funding is dependent upon project needs, but typically does not exceed $30,000.	Applications accepted anytime; grants awarded on a funds available basis. **Contact:** Corina Hayes Source Water Protection Program Manager 360-236-3114 corina.hayes@doh.wa.gov http://www.doh.wa.gov/CommunityandEnvironment/DrinkingWater/SourceWater/SourceWaterProtection.aspx
ECOLOGY: INTEGRATED WATER QUALITY FUNDING PROGRAM State Water Pollution Control Revolving Fund (SRF) Centennial Clean Water Fund	Planning projects associated with publicly-owned wastewater and stormwater facilities. The integrated program also funds planning and implementation of nonpoint source pollution control activities.	Counties, cities, towns, conservation districts, or other political subdivision, municipal or quasi-municipal corporations, and tribes	Loan (SFY 2017 interest rates) at either: • 2% interest for 6-20 year term, or • 1% interest for 5 year term Pre-Construction Set-aside (Distressed Communities) 50% forgivable principal loan and 50% loan	Applications are due October 21, 2016. **Contact:** David Dunn 360-407-6503 david.dunn@ecy.wa.gov http://www.ecy.wa.gov/programs/wq/funding/funding.html

PLANNING **Programs**	**Eligible Projects**	**Eligible Applicants**	**Funding Available**	**How To Apply**
RD PRE-DEVELOPMENT GRANTS (PPD) U.S. Dept. of Agriculture Rural Development – Rural Utilities Service – Water and Waste Disposal Direct Loans and Grants	Water and/or sewer planning; environmental work; and other work to assist in developing an application for infrastructure improvements.	Low-income, small communities and systems serving areas under 10,000 population.	Planning grant to assist in paying costs associated with developing a complete application for RD funding for a proposed project. Maximum $30,000 grant. Requires minimum 25% match.	Applications accepted year-round, on a fund-available basis. **Contact:** Janice Roderick 360-704-7739 janice.roderick@wa.usda.gov http://www.rurdev.usda.gov/wa
RD 'SEARCH' GRANTS: SPECIAL EVALUATION ASSISTANCE FOR RURAL COMMUNITIES U.S. Dept. of Agriculture Rural Development – Rural Utilities Service – Water and Waste Disposal Direct Loans and Grants	Water and/or sewer planning; environmental work; and other work to assist in developing an application for infrastructure improvements.	Low-income, small communities and systems serving areas under 2,500 population.	Maximum $30,000 grant. No match required.	Applications accepted year-round, on a fund-available basis. **Contact:** Janice Roderick 360-704-7739 janice.roderick@wa.usda.gov http://www.rurdev.usda.gov/wa
CERB PLANNING AND FEASIBILITY GRANTS Community Economic Revitalization Board – Project-Specific Planning Program	Project-specific feasibility and pre-development studies that advance community economic development goals for industrial sector business development.	Eligible statewide • Counties, cities, towns, port districts, special districts. • Federally recognized tribes • Municipal corporations, quasi-municipal corporations w/ economic development purposes.	Grant • Up to $50,000 per application. • Requires 25% matching funds.	Applications accepted year-round. The Board meets six times a year. **Contact:** Janea Eddy 360-725-3151 janea.eddy@commerce.wa.gov
RCAC RURAL COMMUNITY ASSISTANCE CORPORATION Feasibility and Pre-Development Loans	Water, wastewater, stormwater, and solid waste planning; environmental work; and other work to assist in developing an application for infrastructure improvements.	Non-profit organizations, public agencies, tribes, and low-income rural communities with a 50,000 population or less, or 10,000 or less if proposed permanent financing is through USDA Rural Development.	• Typically up to $50,000 for feasibility loan. • Typically up to $350,000 for pre-development loan. • Typically up to a 1-year term. • 5% interest rate.	Applications accepted anytime. **Contact**: Chuck Miller 360-253-7683 cmiller@rcac.org Applications available online at http://www.rcac.org/lending/environmental-loans/

PRECONSTRUCTION ONLY **Programs**	**Eligible Projects**	**Eligible Applicants**	**Funding Available**	**How To Apply**
ECOLOGY: INTEGRATED WATER QUALITY FUNDING PROGRAM State Water Pollution Control Revolving Fund (SRF) Centennial Clean Water Fund Stormwater Financial Assistance Program (SFAP)	Design projects associated with publicly-owned wastewater and stormwater facilities. The integrated program also funds planning and implementation of nonpoint source pollution control activities.	Counties, cities, towns, conservation districts, or other political subdivision, municipal or quasi-municipal corporations, and tribes.	Loan (SFY 2017 interest rates), at either: • 2% interest for 6-20 year term, or • 1% interest for 5 year term Pre-Construction Set-aside (Distressed Communities) 50% forgivable principal loan and 50% loan Stormwater grant maximum award per jurisdiction: $250,000, with a required 25% match	Applications are due October 21, 2016. SERP review and the cost effectiveness analysis must be complete at the time of application. **Contact:** David Dunn 360-407-6503 david.dunn@ecy.wa.gov http://www.ecy.wa.gov/programs/wq/funding/funding.html
DWSRF Drinking Water State Revolving Fund Pre-Construction Grant Program	• Water System Plans, SWSMP, Plan amendments • Feasibility studies • Engineering and design • Historic and cultural review • Environmental review	Not-for-profit Group A water systems with fewer than 10,000 people. Projects must principally be to move entities closer to applying for a DWSRF Construction Loan.	Grant • Up to $25,000 for a single jurisdiction. • No match required.	2017 applications accepted January 2-31, 2017. Paper applications are accepted. **Contact:** Karen Klocke 360-236-3116 karen.klocke@doh.wa.gov Visit DWSRF internet site for information and forms.
DWSRF Drinking Water State Revolving Fund – Consolidation Grant Program	• Water System Plans and Plan amendments • Feasibility studies • Consolidation of Group A water systems.	Cities, towns, and special purpose district water systems with fewer than 10,000 people.	Grant • Up to $30,000 for a single jurisdiction. • $150,000 will be available for this cycle. • No match required.	2017 applications accepted February 1-28, 2017. Paper applications accepted. **Contact:** Karen Klocke 360-236-3116 karen.klocke@doh.wa.gov Visit DWSRF internet site for information and forms.

PRECONSTRUCTION ONLY **Programs**	**Eligible Projects**	**Eligible Applicants**	**Funding Available**	**How To Apply**
DWSRF Drinking Water State Revolving Fund – Pre-Construction Loan Program	• Water System Plans and Plan amendments • Feasibility studies • Engineering and design • Historic and cultural review • Environmental review	Not-for-profit Group A water systems with fewer than 10,000 people. Projects must principally be to move entities closer to applying for a DWSRF Construction Loan.	• Grant/ loan package. • $6 million expected to be available for the next two years. • Limit of $300,000 per water system. • No match required.	2016 applications accepted March 1 – April 29, 2016. Application must be submitted online. **Contact:** Karen Klocke 360-236-3116 Karen.klocke@doh.wa.gov Visit DWSRF internet site for information and forms.
RCAC **RURAL COMMUNITY ASSISTANCE CORPORATION** Feasibility and Pre-Development Loans	Water, wastewater, stormwater, or solid waste planning; environmental work; and other work to assist in developing an application for infrastructure improvements.	Non-profit organizations, public agencies, tribes, and low-income rural communities with a 50,000 population or less, or 10,000 or less if proposed permanent financing is through USDA Rural Development.	• Typically up to $50,000 for feasibility loan. • Typically up to $350,000 for pre-development loan. • Typically a 1-year term. • 5% interest rate.	Applications accepted anytime. **Contact**: Chuck Miller 360-253-7683 cmiller@rcac.org Applications available on-line at http://www.rcac.org/lending/environmental-loans/

CONSTRUCTION AND DESIGN/CONSTRUCTION Programs	**Eligible Projects**	**Eligible Applicants**	**Funding Available**	**How To Apply**
CDBG-GP Community Development Block Grant – General Purpose Grant Fund	• Planning activities including comprehensive plans, non-routine infrastructure plans, feasibility studies, community action plans, and low-income housing assessments. • Final design and construction of wastewater, drinking water, side connections, stormwater, streets, bridge, community facility, economic development, and housing rehabilitation projects.	Projects must principally benefit low- to moderate-income people in non-entitlement cities and counties. • Cities or towns with fewer than 50,000 people • Counties with fewer than 200,000 people	Maximum grant amounts: • $750,000 for construction projects and acquisition projects. • $500,000 for local housing rehabilitation programs. • $250,000 for local microenterprise assistance programs. • $24,000 for planning-only activities.	Applications for the 2016 program year are due June 1, 2016. **Contact:** Sheila Lee-Johnston 360-725-3009 sheila.lee-johnston@commerce.wa.gov Visit www.commerce.wa.gov/cdbg for information and forms.
RD U.S. Dept. of Agriculture Rural Development - Rural Utilities Service - Water and Waste Disposal Direct Loans and Grants	Pre-construction and construction associated with building, repairing, or improving drinking water, solid waste facilities and wastewater facilities.	• Cities or towns with fewer than 10,000 population. • Counties, special purpose districts, non-profit corporations or tribes unable to get funds from other sources at reasonable rates and terms.	Loans; Grants in some cases • Interest rates vary (currently 1.75 - 2.875%) • Up to 40-year loan term. • No pre-payment penalty.	Applications accepted year-round on a fund-available basis. **Contact:** Janice Roderick 360-704-7739 janice.roderick@wa.usda.gov http://www.rurdev.usda.gov/wa

CONSTRUCTION AND DESIGN/CONSTRUCTION Programs	**Eligible Projects**	**Eligible Applicants**	**Funding Available**	**How To Apply**
DWSRF Drinking Water State Revolving Fund Construction Loan Program	Drinking water system infrastructure projects aimed at increasing public health protection. The program now includes dedicated funding for subsidy. There is a limited amount of principal forgiveness for communities with high affordability index numbers and water system restructuring/ consolidation projects.	Community and not-for-profit non-community water systems, but not federal or state-owned systems; both privately- and publicly-owned systems are eligible.	Loan • 1 percent loan fee (water systems receiving subsidy are not subject to loan fees). • $3 million per jurisdiction per year. (2016 limit) • $6 million for jointly-owned projects. (2016 limit) • 1.0 - 1.5% interest rate. • Loan repayment period: 20 years or life of the project, whichever is less. • No local match required. • $35 million expected to be available this cycle.	The Fall 2016 application cycle will be August 1 - September 30, 2016. Application must be submitted online. **Contact:** Karen Klocke 360-236-3116 karen.klocke@doh.wa.gov Visit DWSRF internet site for information and forms.
ECOLOGY: INTEGRATED WATER QUALITY FUNDING PROGRAM State Water Pollution Control Revolving Fund (SRF) Centennial Clean Water Fund Stormwater Financial Assistance Program (SFAP)	Construction projects associated with publicly-owned wastewater and stormwater facilities. The integrated program also funds planning and implementation of nonpoint source pollution control activities.	Counties, cities, towns, conservation districts, or other political subdivision, municipal or quasi-municipal corporations, and tribes. Hardship Assistance Jurisdictions listed above with a population of 25,000 or less.	Loan (SFY 2017 interest rates) at either: • 2% interest for 6-20 year term, or • 1% interest for 5-year term Hardship assistance for the construction of wastewater treatment facilities may be available in the form of a reduced interest rate, grant subsidy, or loan forgiveness. Hardship assistance is based on impact to residential ratepayers and the community MHI. Hardship funding is only available for the portion of a facility serving existing residential need. Stormwater grant maximum award per jurisdiction: $5 million, with a required 25% match.	Applications are due October 21, 2016. SERP review and the cost effectiveness analysis must be complete at the time of application. **Contact:** David Dunn 360-407-6503 david.dunn@ecy.wa.gov http://www.ecy.wa.gov/programs/wq/funding/funding.html

CONSTRUCTION AND DESIGN/CONSTRUCTION **Programs**	**Eligible Projects**	**Eligible Applicants**	**Funding Available**	**How To Apply**
RCAC **RURAL COMMUNITY ASSISTANCE CORPORATION** Construction Loans	Water, wastewater, solid waste and stormwater facilities that primarily serve low-income rural communities. Can include pre-development costs.	Non-profit organizations, public agencies, tribes, and low-income rural communities with a 50,000 population or less, or 10,000 populations or less if using USDA Rural Development financing as the takeout.	• Maximum $3 million with commitment letter for permanent financing • Security in permanent loan letter of conditions • Term matches construction period. • 5% interest rate • 1% loan fee	Applications accepted anytime. **Contact:** Chuck Miller 360-253-7683 cmiller@rcac.org Applications available on-line at http://www.rcac.org/lending/environmental-loans/
RCAC **RURAL COMMUNITY ASSISTANCE CORPORATION** Intermediate Term Loan	Water, wastewater, solid waste and stormwater facilities that primarily serve low-income rural communities.	Non-profit organizations, public agencies, tribes, and low-income rural communities with a 50,000 population or less.	• For smaller capital needs, normally not to exceed $100,000. • Typically up to a 20-year term • 5% interest rate • 1% loan fee	Applications accepted anytime. **Contact**: Chuck Miller 360-253-7683 cmiller@rcac.org Applications available on-line at http://www.rcac.org/lending/environmental-loans/
RURAL WATER REVOLVING LOAN FUND	Short-term costs incurred for replacement equipment, small scale extension of services, or other small capital projects that are not a part of regular operations and maintenance for drinking water and wastewater projects.	Public entities, including municipalities, counties, special purpose districts, Native American Tribes, and corporations not operated for profit, including cooperatives, with up to 10,000 population and rural areas with no population limits.	• Loan amounts may not exceed $100,000 or 75% of the total project cost, whichever is less. Applicants will be given credit for documented project costs prior to receiving the RLF loan. • Interest rates at the lower of the poverty or market interest rate as published by USDA RD RUS, with a minimum of 3% at the time of closing. • Maximum repayment period is 10 years. Additional ranking points for a shorter repayment period. The repayment period cannot exceed the useful life of the facilities or financed item.	Applications accepted anytime. **Contact**: Tracey Hunter Evergreen Rural Water of WA 360-462-9287 thunter@erwow.org Download application online: http://nrwa.org/initiatives/revolving-loan-fund/

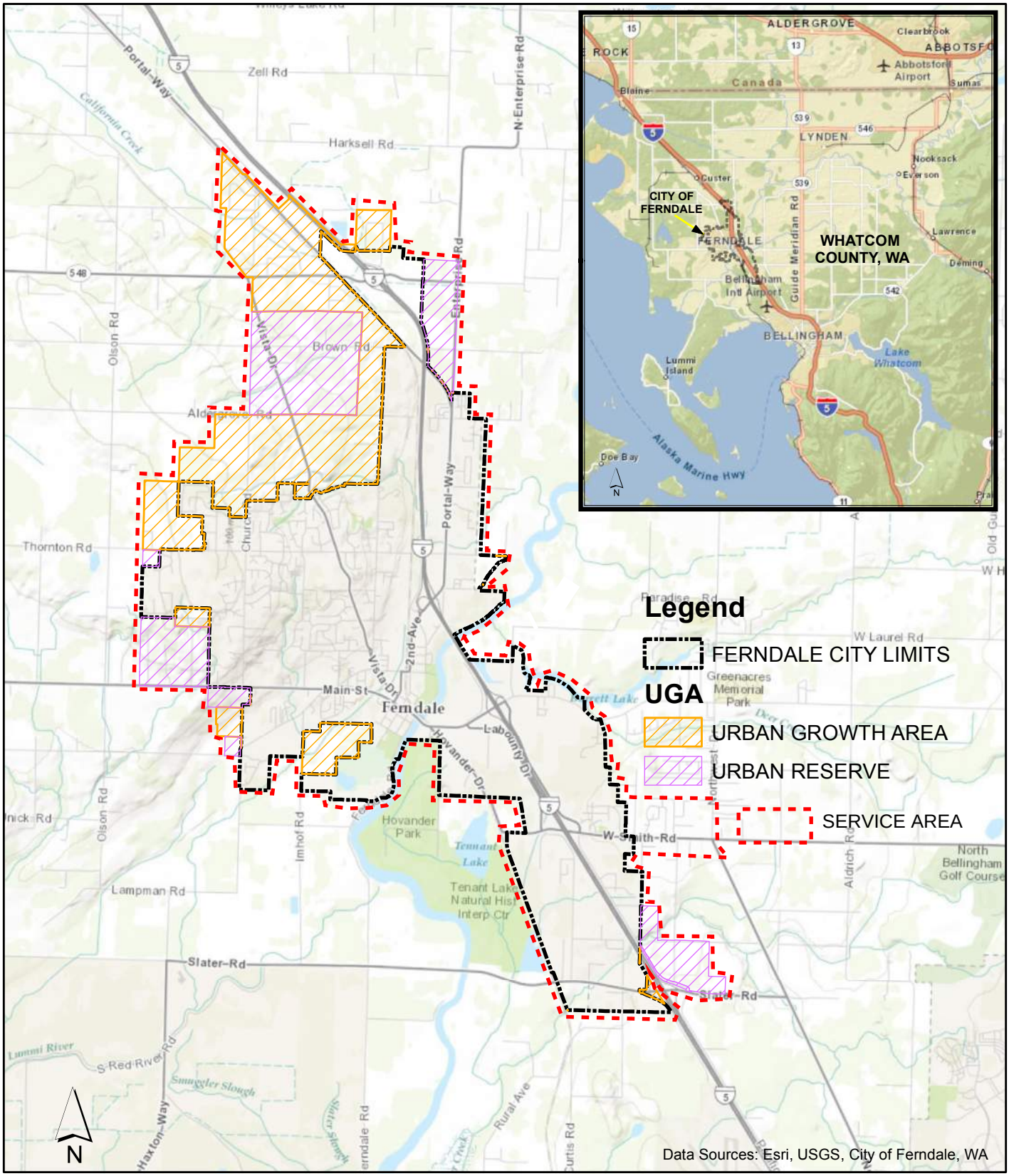
CONSTRUCTION AND DESIGN/CONSTRUCTION **Programs**	**Eligible Projects**	**Eligible Applicants**	**Funding Available**	**How To Apply**
CERB Community Economic Revitalization Board - Construction Program	Public facility projects required by private sector expansion and job creation. Projects must support significant job creation or significant private investment in the state. • Bridges, roads and railroad spurs, domestic and industrial water, sanitary and storm sewers. • Electricity, natural gas and telecommunications • General purpose industrial buildings, port facilities. • Acquisition, construction, repair, reconstruction, replacement, rehabilitation	• Counties, cities, towns, port districts, special districts • Federally-recognized tribes • Municipal and quasi-municipal corporations with economic development purposes.	Loans; grants in unique cases • Projects without a committed private partner allowed for in rural areas. • $2 million maximum per project, per policy. • Interest rates: 3% for non-distressed counties 2.5% for distressed counties • 20-year maximum loan term • Match for committed private partners: 20% (of total project cost). • Match for prospective partners: 50% (of total project cost). • Applicants must demonstrate gap in public project funding and need for CERB assistance. • CERB is authority for funding approvals.	Applications accepted year-round. The Board meets six times a year. **Contact:** Janea Eddy 360-725-3151 janea.eddy@commerce.wa.gov

EMERGENCY **Programs**	**Eligible Projects**	**Eligible Applicants**	**Funding Available**	**How To Apply**
CDBG - IT Community Development Block Grant – Imminent Threat Grant Fund	Repair unanticipated water, sewer and other public drainage facility damages that pose an immediate, urgent threat to public health and safety. Requires formal declaration of emergency.	• Non-entitlement cities or towns with fewer than 50,000 people. • Non-entitlement counties with fewer than 200,000 people.	Grant: • Up to $100,000, depending on fund availability. • Intended for a temporary fix while funding for permanent solution is secured.	Applications accepted year-round. **Contact:** Kaaren Roe 360-725-3018 kaaren.roe@commerce.wa.gov Visit www.commerce.wa.gov/cdbg for information and forms.
RD – ECWAG U.S. Dept. of Agriculture Rural Development Emergency Community Water Assistance Grants	Domestic water projects needing emergency repairs due to an incident such as: a drought; earthquake; flood; chemical spill; fire; etc. A significant decline in quantity or quality of potable water supply that was caused by an emergency.	Public bodies, tribes and private non-profit corporations serving rural areas with populations under 10,000.	Grant; pending availability of funds • $150,000 limit for incident related emergency repairs to an existing water system. • $500,000 limit to alleviate a significant decline in potable water supply caused by an emergency.	Applications accepted year-round on a fund-available basis. **Contact:** Janice Roderick 360-704-7739 janice.roderick@wa.usda.gov http://www.rurdev.usda.gov/wa
DWSRF Department of Health – Drinking Water State Revolving Fund Emergency Loan Program	Will financially assist eligible communities experiencing the loss of critical drinking water services or facilities due to an emergency.	• Publicly or privately owned (not-for-profit) Group A community water systems with a population of fewer than 10,000. • Transient or non-transient non-community public water systems owned by a non-profit organization. Non-profit non-community water systems must submit tax-exempt documentation. • Water system owned by an Indian tribe. The water system must meet all capacity requirements and the proposed project may not receive Safe Drinking Water Act (SDWA) national set-aside funds for Indian tribes.	6-year loans with the following terms: • Interest rate: 1.0–1.5% • Forgiveness: up to 75% • Loan term: 6 years • Time of performance: 2 years from contract execution to project completion date • Repayment commencing first October after contract execution	Applications accepted anytime. Paper applications are accepted. To be considered for an emergency loan, an applicant must submit a completed emergency application package to the department. **Contacts:** Department of Health Regional Engineers or Janet Cherry 360-236-3153 Janet.cherry@doh.wa.gov Download application at the DWSRF internet site.

EMERGENCY **Programs**	**Eligible Projects**	**Eligible Applicants**	**Funding Available**	**How To Apply**
RCAC **RURAL COMMUNITY ASSISTANCE CORPORATION** Intermediate Term Loan	Water, wastewater, solid waste and stormwater facilities that primarily serve low-income rural communities.	Non-profit organizations, public agencies, tribes, and low-income rural communities with a 50,000 population or less.	• For smaller capital needs, normally not to exceed $100,000. • Typically up to a 20-year term • 5% interest rate • 1% loan fee	Applications accepted anytime. **Contact**: Chuck Miller 360-253-7683 cmiller@rcac.org Applications available on-line at http://www.rcac.org/lending/environmental-loans/
RURAL WATER REVOLVING LOAN FUND Disaster area emergency loans	Contact staff for more information on emergency loans.	Public entities, including municipalities, counties, special purpose districts, Native American Tribes, and corporations not operated for profit, including cooperatives, with up to 10,000 population and rural areas with no population limits.	90-day, no interest, disaster area emergency loans with immediate turn-around.	Applications accepted anytime. **Contact**: Tracey Hunter Evergreen Rural Water of WA 360-462-9287 thunter@erwow.org Download application online: http://nrwa.org/initiatives/revolving-loan-fund/

APPENDIX E

Map Exhibits - Vicinity Map, Zoning, Comp Plan Land Use



1 inch = 1 miles

Wilson Engineering, LLC

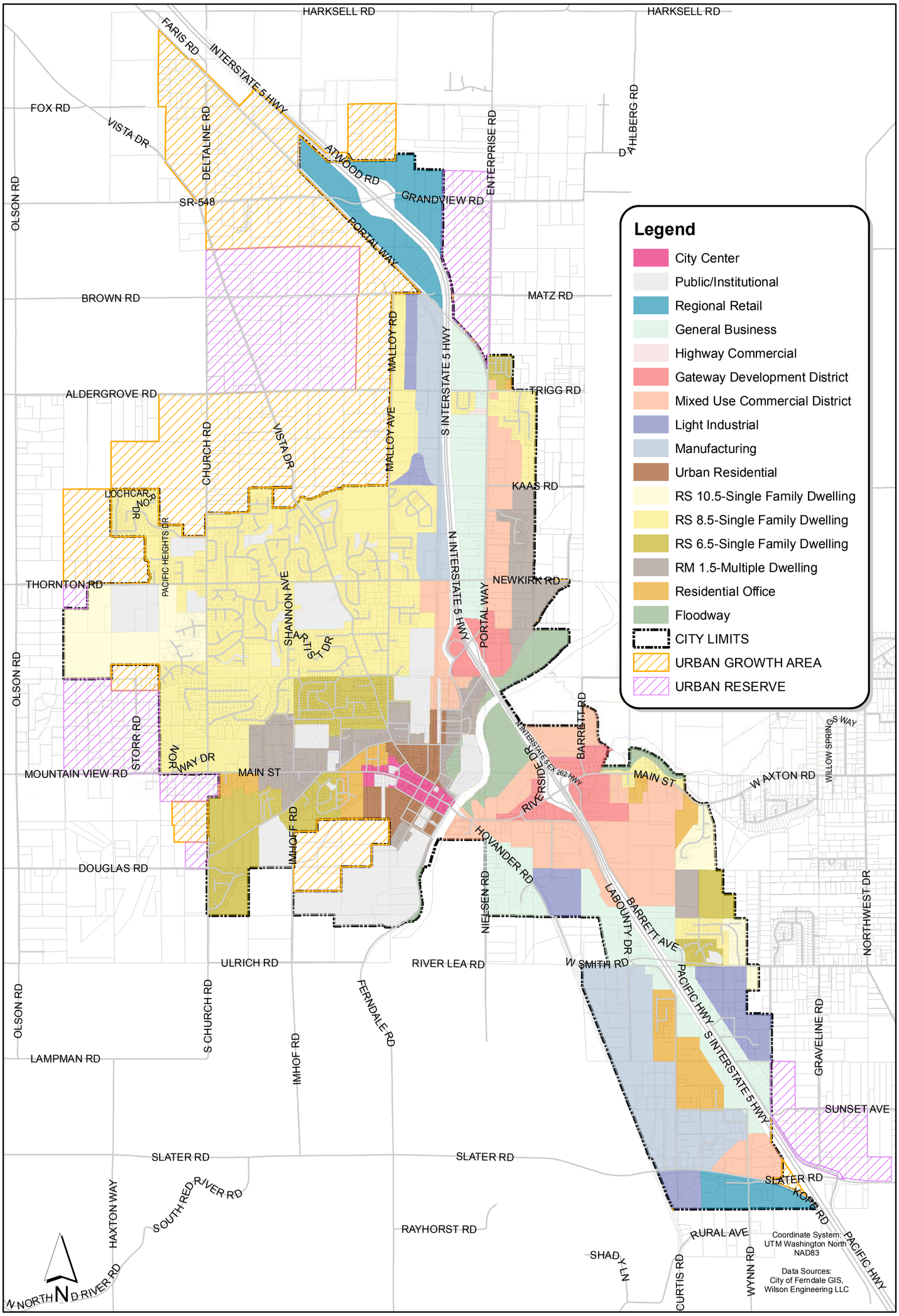
WILSON ENGINEERING, LLC
805 DUPONT STREET
BELLINGHAM, WA 98225
(360) 733-6100 FAX (360) 647-9061
www.wilsonengineering.com

CITY OF FERNDALE, WA

WHATCOM COUNTY — WASHINGTON

EXHIBIT A
VICINITY MAP

DATE	SHEET
JUNE 2014	1
SCALE 1:63,360	OF 3
JOB NUMBER 2014-036	



1 inch = 0.5 miles

Wilson Engineering LLC, GIS

Wilson SURVEY/ENGINEERING
WILSON ENGINEERING, LLC
805 DUPONT STREET
BELLINGHAM, WA 98225
(360) 733-6100 FAX (360) 647-9061
www.wilsonengineering.com

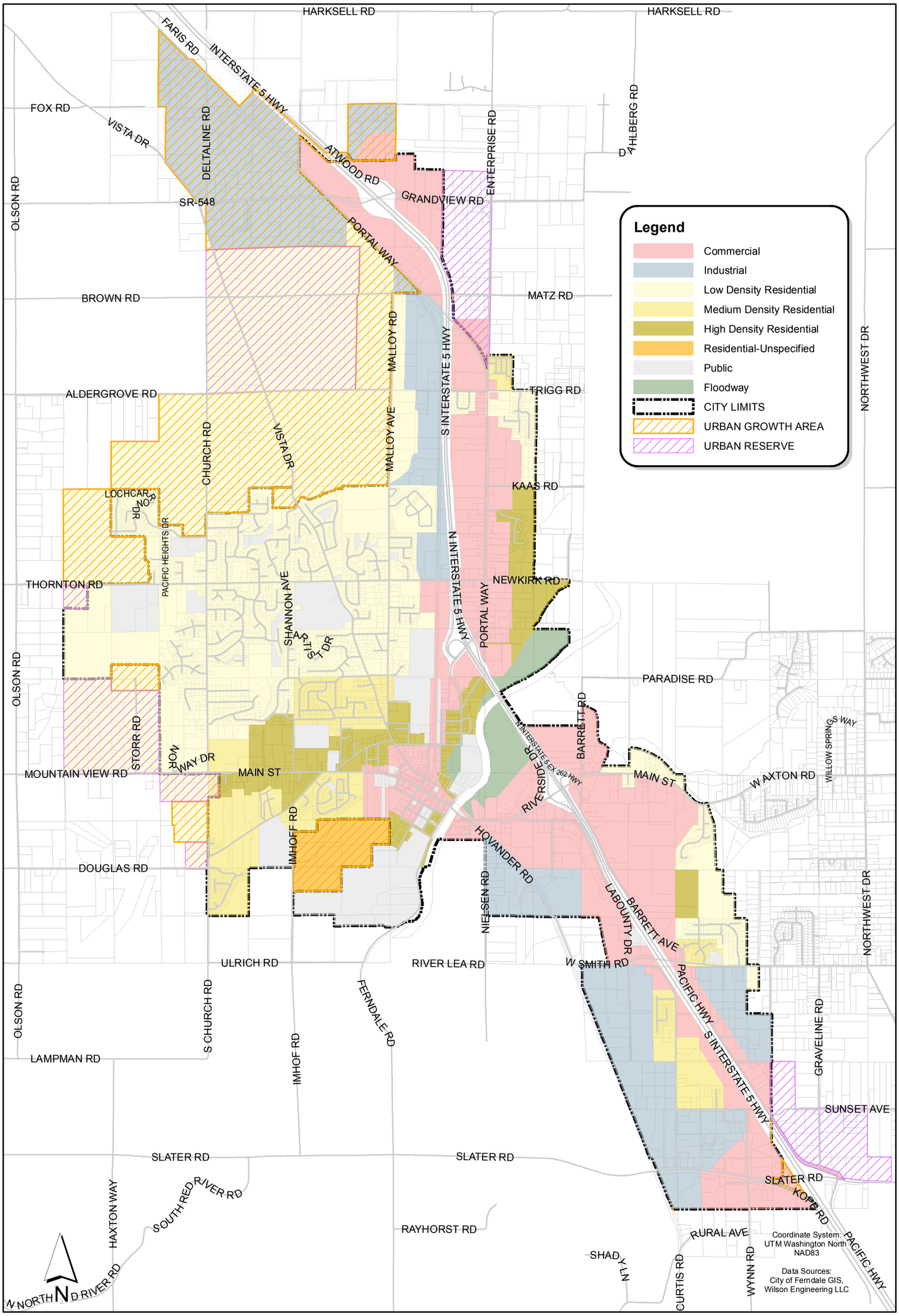
CITY OF FERNDALE, WA

WHATCOM COUNTY WASHINGTON

EXHIBIT A

Zoning Map

DATE	SHEET
JUNE 2014	2
SCALE 1:31,680	OF 3
JOB NUMBER 2014-036	



1 inch = 0.5 miles

Wilson Engineering LLC, GIS

Wilson SURVEY/ENGINEERING
WILSON ENGINEERING, LLC
805 DUPONT STREET
BELLINGHAM, WA 98225
(360) 733-6100 FAX (360) 647-9061
www.wilsonengineering.com

CITY OF FERNDALE, WA

WHATCOM COUNTY WASHINGTON

EXHIBIT A

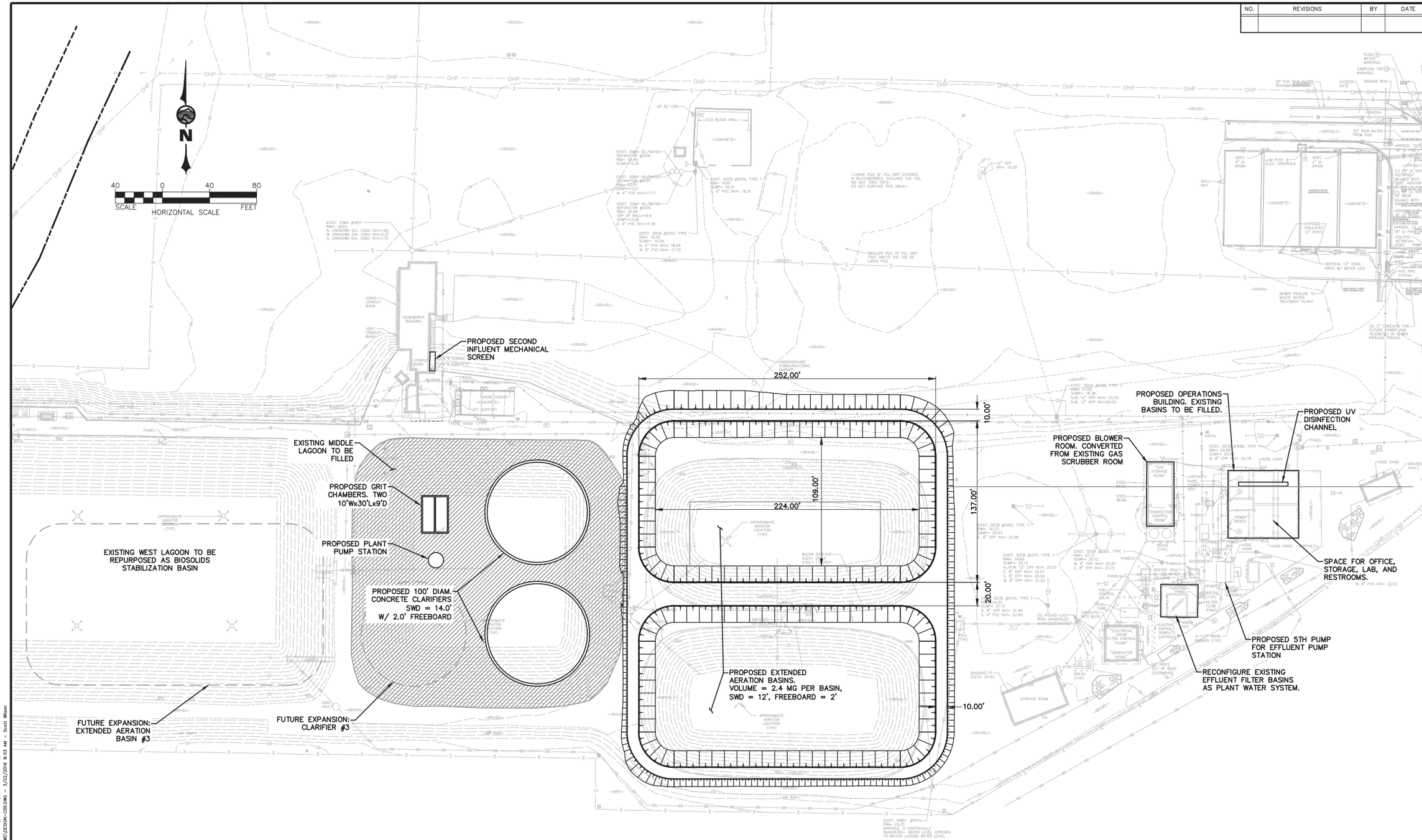
Comprehensive Plan Land Use

DATE	SHEET
JUNE 2014	3
SCALE 1:31,680	OF 3
JOB NUMBER 2014-036	

APPENDIX F

Proposed Treatment Site Plan

NO.	REVISIONS	BY	DATE



WILSON ENGINEERING, LLC
805 DUPONT STREET
BELLINGHAM, WA 98225
(360) 733-6100 • FAX (360) 647-9061
www.wilsonengineering.com
Wilson SURVEY/ENGINEERING

DESIGNED BY	DRAWN BY	CHECKED BY
SJW/JGC	SJW	

CITY OF FERNDALE
WASHINGTON

WASTEWATER FACILITIES PLAN
FIGURE 5-6 PROPOSED EXT. AIR SITE PLAN

SHEET	DATE	SCALE	JOB NUMBER
5-6	3-15-2016	AS SHOWN	2014-036

PAGE 1 OF 1

APPENDIX G

Ferndale WWTP Initial Floodplain Assessment (NHC, Oct. 28, 2015)

16300 Christensen Road, Suite 350 | Seattle, WA 98188-3422 | 206.241.6000 | www.nhcweb.com

nhc
northwest hydraulic consultants

NHC Ref. No. 200197

October 28, 2015

WILSON ENGINEERING, LLC
805 Dupont St
Bellingham, WA 98225

Attention: **Jeff Christner, PE**

Via email: jgc@wilsonengineering.com

Re: **Ferndale WWTP Initial Floodplain Assessment**

Dear Mr. Christner:

This letter describes our initial review of the floodplain regulations that may impact the proposed Ferndale Wastewater Treatment Plant (WWTP) expansion project and our recommendations for how to address the hydraulic aspects of the Ferndale Municipal Code (FMC). The pertinent FMC ordinances are discussed as well as the potential hydraulic evaluation needed to address the floodplain requirements.

1 PROJECT DESCRIPTION

The proposed improvements to the Ferndale WWTP include a proposed lagoon area and control building as shown in Figure 1 (labeled "EX 1" as provided by Wilson Eng.). The proposed lagoon would be located west of the existing lagoons and replace the existing leachate area. The proposed lagoon would place about 10-ft of fill from the existing 17.0-ft ground elevation up to elevation 27.0-ft. The fill area would be approximately 420-ft by 260-ft less the existing leachate area fill of 110-ft by 150-ft. The proposed control building pad, located northeast of the existing ponds and west of the water treatment plant building, would be 50-ft by 50-ft with 4 to 1 fill slopes and be elevated to about 24.5-ft, which is about 2 to 4 feet above the surrounding grade.

1.1 Vertical Datum

Please note that all elevations in this document are in the vertical datum NGVD29, which corresponds with the effective FEMA maps. The following equation was used to convert between vertical datums for this site: NGVD29 + 3.96 ft = NAVD88.

2 FLOOD STUDIES

2.1 Effective FEMA Flood insurance Study

The entire Ferndale WWTP property lies within the effective FEMA floodplain as shown in Figure 2. The figure and effective Flood Insurance Rate Map (FIRM) number 53073C-1180D show that the property is within an AE zone, which corresponds to the 100-year floodplain for the Nooksack River. There is no effective floodway for this section of the Nooksack, though a floodway has been determined and mapped upstream. The effective FEMA Flood Insurance Study (FIS) for Whatcom County (2004) describes the effective hydraulic and hydrologic study that corresponds to the FIRM. According to the FIS, the Nooksack River study was developed in the 1970's using the USACE "Method 2" backwater computer program and utilized topographic data collected in 1964-65.

During other projects, NHC has previously requested the effective model from FEMA, as well as from Whatcom County; however the effective model could not be located and is unavailable for use.

2.2 Whatcom County's Flood Study of the Lower Nooksack River

Whatcom County and FEMA have been developing an unsteady hydraulic model of the Lower Nooksack River that simulates flood conditions from Deming to Bellingham Bay. The hydraulic model was developed using FEQ software by Linsley, Kraeger Associates (2004), and applies more advanced modeling techniques and updated topography when compared to the effective FEMA FIS. The FEQ Nooksack River model has also been updated and re-calibrated by the County. This is the best available tool for simulating floodplain conditions, however the study has been delayed for several years while FEMA revises their levee policy. The Lower Nooksack has many levees that generally are overtopped during events less than the 100-year flood, therefore assumptions must be made on how to model those levees during flooding event (fail, intact, ignore, etc.).

The current FEQ model schematic in the vicinity of the Ferndale WWTP is shown in Figure 3. The FEQ model simulates about 1,340 cfs overtopping the levee at the WWTP along the west (right) bank during the 100-year event. Currently in the FEQ model, the overtopping flow is simply aggregated into a large ponding area, referred to as a "level pool reservoir". This level pool reservoir is located to the south and west without any detailed modeling or mapping of flooding in the vicinity of the WWTP. Historic overtopping and failures of this levee system have occurred, and could cause significantly more than the 1,340 cfs to enter the floodplain in the vicinity of the WWTP.

FEMA and Whatcom County are currently working with NHC and others on the final tasks to complete the hydraulic analysis for the Lower Nooksack. These tasks include finalizing the floodway and levee assumptions, and may include detailed 1-D modeling of the west floodplain in the vicinity of the Ferndale WWTP. The floodplain in the vicinity of the Ferndale WWTP has been noted as a deficiency in the initial review of the FEQ study, therefore we anticipate the floodplain to be modeled and mapped in detail during the next project phase. Following the latest FEMA procedures we expect the floodplain to be simulated assuming the right levee is entirely removed, which would convey much more water in the

vicinity of the WWTP. The final levee assumptions made in the revised FEQ hydraulic model study will be critical to determining whether the proposed fill are within the 100-year floodplain and how much impact they would have. As of the date of this report, the FEQ updates and revised floodplain mapping are tentatively planned to occur within the next six months, though this has not been finalized. The FEMA adoption process of these then becoming the new effective maps will take a significant amount of time (years) after that.

3 FLOODPLAIN REGULATIONS

The placement of fill or development within the mapped floodplain subjects the proposed project to floodplain regulations of the National Flood Insurance Program (NFIP). FEMA Region X sets minimum regulatory standards for participating in NFIP, while the City of Ferndale may adopt additional more restrictive standards. The typical FEMA requirements and additional City requirements are described in the following sections.

3.1 FEMA and NFIP Requirements

The proposed WWTP development would place fill within the mapped AE Zone (100-year floodplain). There is no designated floodway in this reach of the Nooksack, therefore the following federal regulation section typically applies, 44 CFR 60.3.c.10:

- "Require until a regulatory floodway is designated, that no new construction, substantial improvements, or other development (including fill) shall be permitted within Zones A1-30 and AE on the community's FIRM, unless it is demonstrated that the cumulative effect of the proposed development, when combined with all other existing and anticipated development, will not increase the water surface elevation of the base flood more than **one foot** at any point within the community."

The hydraulic analysis to demonstrate the effect of a project on water levels can be submitted and reviewed by the local agency, or can be submitted to FEMA for review. The FEMA review process for development and proposed changes within the floodplain is typically through the Conditional Letter of Map Revision (CLOMR) process.

FEMA also requires that projects comply with the Endangered Species Act (ESA). That requirement has been implemented differently by each NFIP community, and many projects demonstrate compliance through the State Environmental Policy Act (SEPA) process. ESA will need to be addressed and could impact floodplain requirements for this project, however that should be discussed with the project's permitter.

3.2 City of Ferndale Ordinances

The City of Ferndale floodplain regulations are described in Municipal Code Chapter 15.24 titled "Floodplain Management". In response to changes with the NFIP regarding compliance with ESA, in 2011 the City chose to take a programmatic approach and revise the municipal code. For the WWTP

there is a floodplain defined and no floodway, thus it's not immediately clear what the City requires as commented on in the following text. We suggest a consultation with the City for clarification.

Where a floodway doesn't existing, the code requires that a floodway be defined for development greater than 50 lots or five acres and submitted to FEMA for review. The proposed development of the WWTP site is likely less than this threshold.

- 15.24.120.B: Must submit CLOMR.
  - "…may submit a detailed technical study needed to replace existing data with more accurate data using best available science and in accordance with FEMA mapping guidelines. ….If the data in question are shown on the published FIRM, the submittal must also include a request to FEMA for a conditional letter of map revision."
- 15.24.120.D: Must delineate floodway for development over 5 acres.
  - "Where a floodway delineation is not available, applicants for approval of new subdivisions and other proposed developments greater than 50 lots or five acres, whichever is the lesser, shall include such data with their permit applications".

Development in the floodplain shall not increase the 100-year flood levels or mitigation/compensatory storage is required.

- 15.24.190.D: No-rise in floodplain or mitigation/compensatory storage is required.
  - "New development shall not reduce the effective flood storage volume of the regulatory floodplain and/or shall not create a net increase in flood level. The applicant shall use best available science to determine if the new development will have a net increase in flood level and submit the same to the City, which shall review the data and if necessary consult with other agencies, such as Department of Ecology. If best available science does establish that the development will cause a net increase in flood level and/or results in harm to endangered species, the applicant must undertake the following: Completion of compensatory storage or alternate flood attenuation methods or mitigation measures may be incorporated, provided they do not create a net increase in flood level as determined by a professional engineer or other best available science."

There is a potential conflict as the FMC allows up to a one foot rise in the floodplain where a floodway hasn't been defined.

- 15.24.320: May cause up to 1.0 ft of rise in AE zone floodplain.
  - "In areas with base flood elevations (but a regulatory floodway has not been designated), no new construction, substantial improvements, or other development (including fill) shall be permitted within Zones A1-30 and AE on the community's FIRM, unless it is demonstrated that the cumulative effect of the proposed development, when combined with all other existing and anticipated development, will not increase the water surface elevation of the base flood more than one foot at any point within the community."

4 NEXT STEPS

4.1 Floodplain Hydraulic Analysis of WWTP

The proposed development lies within the mapped FEMA effective AE zone and will likely remain within the 100-year floodplain once the FEQ modeling and mapping update is completed and adopted by FEMA. As such, our understanding of the code is that the proposed WWTP project must be evaluated for impact on 100-year flood levels. The impact of the proposed project in the FEQ model study depends significantly on a clarification of what the City code requires (discussed in the prior section) and the levee assumptions, as those assumptions govern how much water would be conveyed by the west floodplain surrounding the WWTP. The following three methods should be considered for evaluating the impact on 100-year water levels, depending on timing and other factors:

1) Develop 2D model of west floodplain with inflow based on the simulated FEQ levee overtopping flow.. Use FEMA approved 2D model and LiDAR for floodplain to determine flow paths, depths and velocities to assess the actual impact of proposed development. This would be relatively quick model to develop by relying on the FEQ modeling to date. The model would be simulated for both with and without the west levee in place.
2) Wait and then utilize the FEQ 1D modeling of the west floodplain. The on-going FEQ modeling study may incorporate this floodplain into the modeling and mapping in more detail.
3) Perform hand conveyance calculations and provide compensatory storage volume, using the effective FEMA FIS data. This method is generally not used anymore, however it may be applicable to this floodplain.

Method 1 would be quick to develop and provide the most reliable analysis by utilizing the general FEQ model and performing more detailed 2D modeling of the WWTP floodplain. Method 2 would require waiting for the FEQ study to finish, and then would still rely on 1D modeling of the WWTP floodplain. Method 3 is very general, antiquated, and no longer recommended in FEMA Region X. However, the simple procedure has been applied historically for small developments within the Nooksack floodplain as a reasonable analysis option (based on conversations with Whatcom County staff, NHC 2015).

4.2 Identified Issues

The following are a few key issues that we recommend discussing with the project team, permitters and the City of Ferndale Floodplain Manager:

- Is the proposed development outside of the riparian zone buffers or riparian protection area?
- What regulatory process have other developments in this floodplain had to follow? Have they had to provide compensatory storage? No-rise or up to one foot of rise in this floodplain?
- Is compensatory storage volume required? Can mitigation be provided elsewhere? Compensatory storage volume at similar elevations would likely be difficult to achieve on-site.
- Can variances be granted as a public or critical facility?

- Will a CLOMR be required even for a No-rise? FEMA Region X has No-rise procedures that allow for a No-rise analysis to be completed without submitting a CLOMR in some situations.

5 REFERENCES

FEMA 2004. Flood Insurance Study, Whatcom County, Washington. 53073C V000A. January 16, 2004.

Ferndale, City of. Municipal Code published online at: http://www.codepublishing.com/wa/Ferndale/, reviewed in October 2015.

LKA 2004. Linsley, Kraeger Associates, Ltd. Lower Nooksack River Unsteady-Flow Model and Analysis of Initial Scenarios Near Everson, Whatcom County, Washington. February 6, 2004.

NHC 2015. Northwest Hydraulic Consultants, Inc. Personal communication with Whatcom County Public Works, Paula Cooper. Pat Flanagan, September 2015.

6 CLOSURE

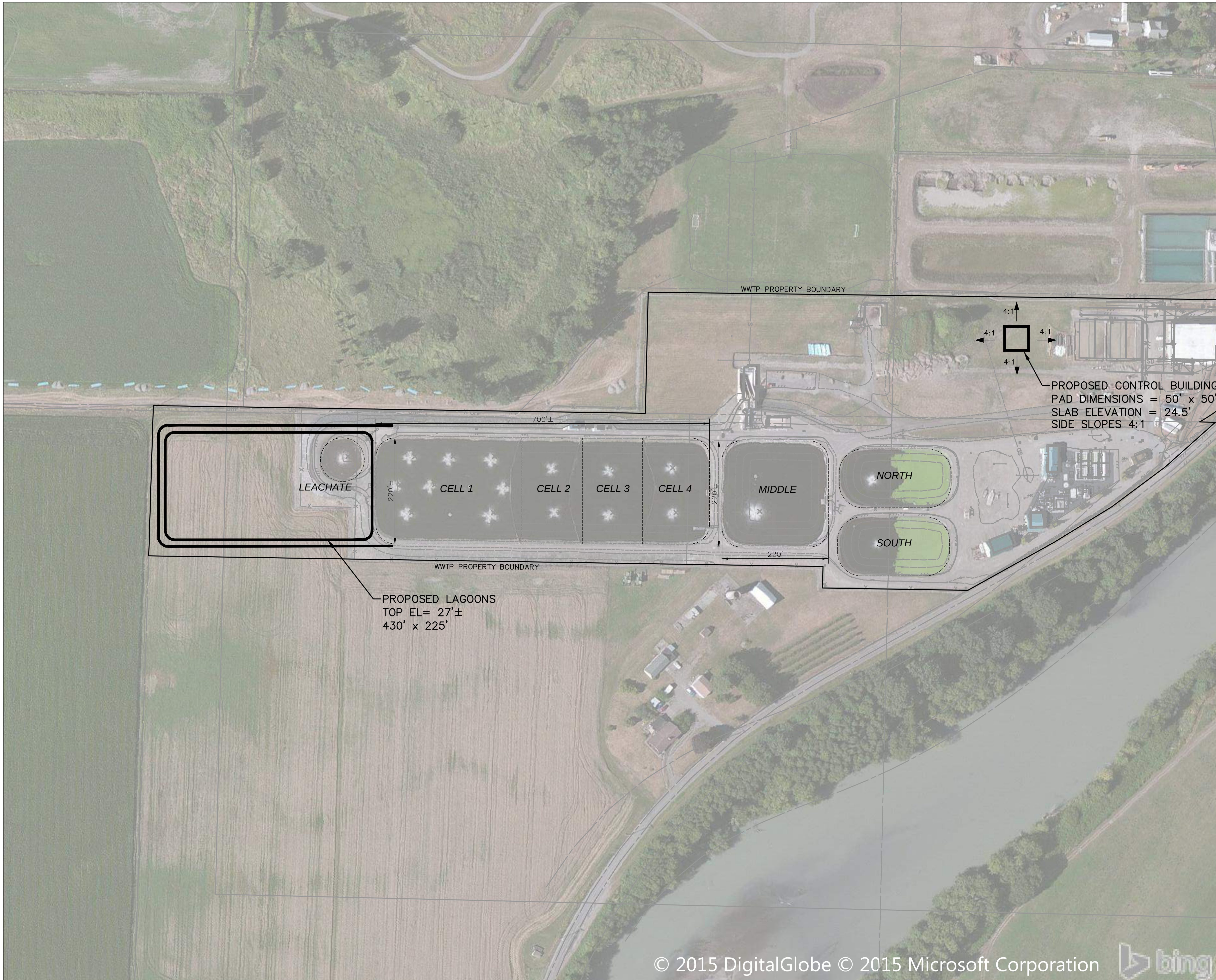
Thank you for requesting NHC to provide this review of floodplain regulations along the Nooksack River for the proposed Ferndale WWTP project. Please feel free to contact NHC if you have any comments or questions regarding this review or the next steps.

Sincerely,

Northwest Hydraulic Consultants Inc.
Prepared by:

Pat Flanagan, P.E.
Senior Hydraulic Engineer

ENCLOSED:
Figure 1 – EX 1 (provided by Wilson Eng.) WWTP Proposed Improvements Flood Plain Exhibit
Figure 2 – Effective FEMA Floodplain Mapping
Figure 3 – Draft FEQ Model Schematic in Vicinity of the Ferndale WWTP



NO.	REVISIONS	BY	DATE

N

100 0 100 200
SCALE HORIZONTAL SCALE FEET

CALL
TWO BUSINESS DAYS
BEFORE YOU DIG
1-800-424-5555
UTILITIES UNDERGROUND LOCATION CENTER

WILSON ENGINEERING, LLC
805 DUPONT STREET
BELLINGHAM, WA 98225
(360) 733-6100 • FAX (360) 647-9061
www.wilsonengineering.com
Wilson
SURVEY/ENGINEERING

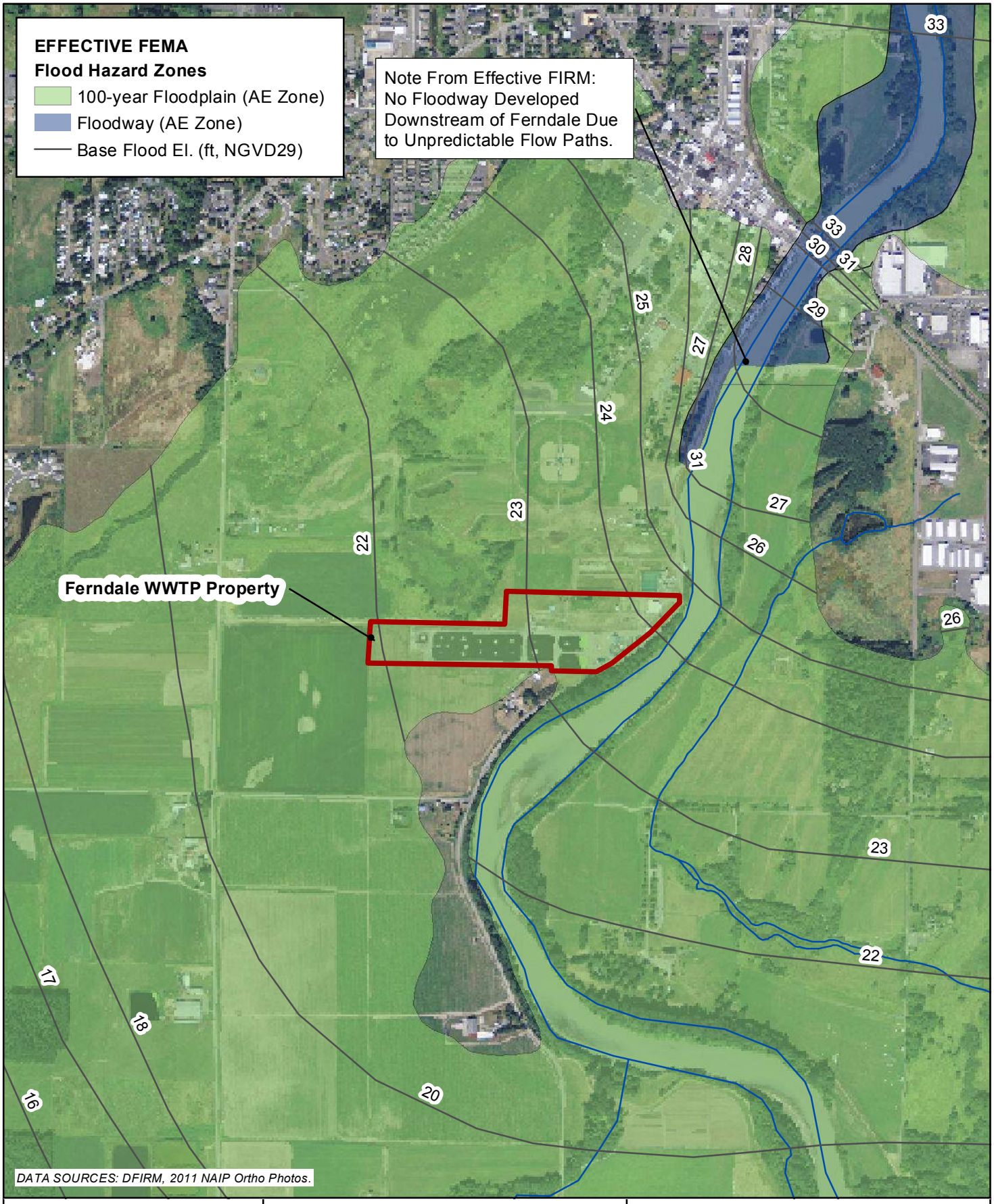
DESIGNED BY -
DRAWN BY SJW
CHECKED BY

CITY OF FERNDALE

FERNDALE WASHINGTON

WWTP PROPOSED IMPROVEMENTS
FLOOD PLAIN EXHIBIT

DATE 8/25/2015
SCALE AS SHOWN
JOB NUMBER 2014-036
SHEET EX1
PAGE 1 OF 1



FOR:
WILSON ENGINEERING

SCALE - 1:12,000

0 1,000 2,000 Feet

N

nhc
northwest hydraulic consultants

Coordinate System: NAD 1983 STATEPLANE WASHINGTON NORTH FIPS 4601 FEET

Job: 200197

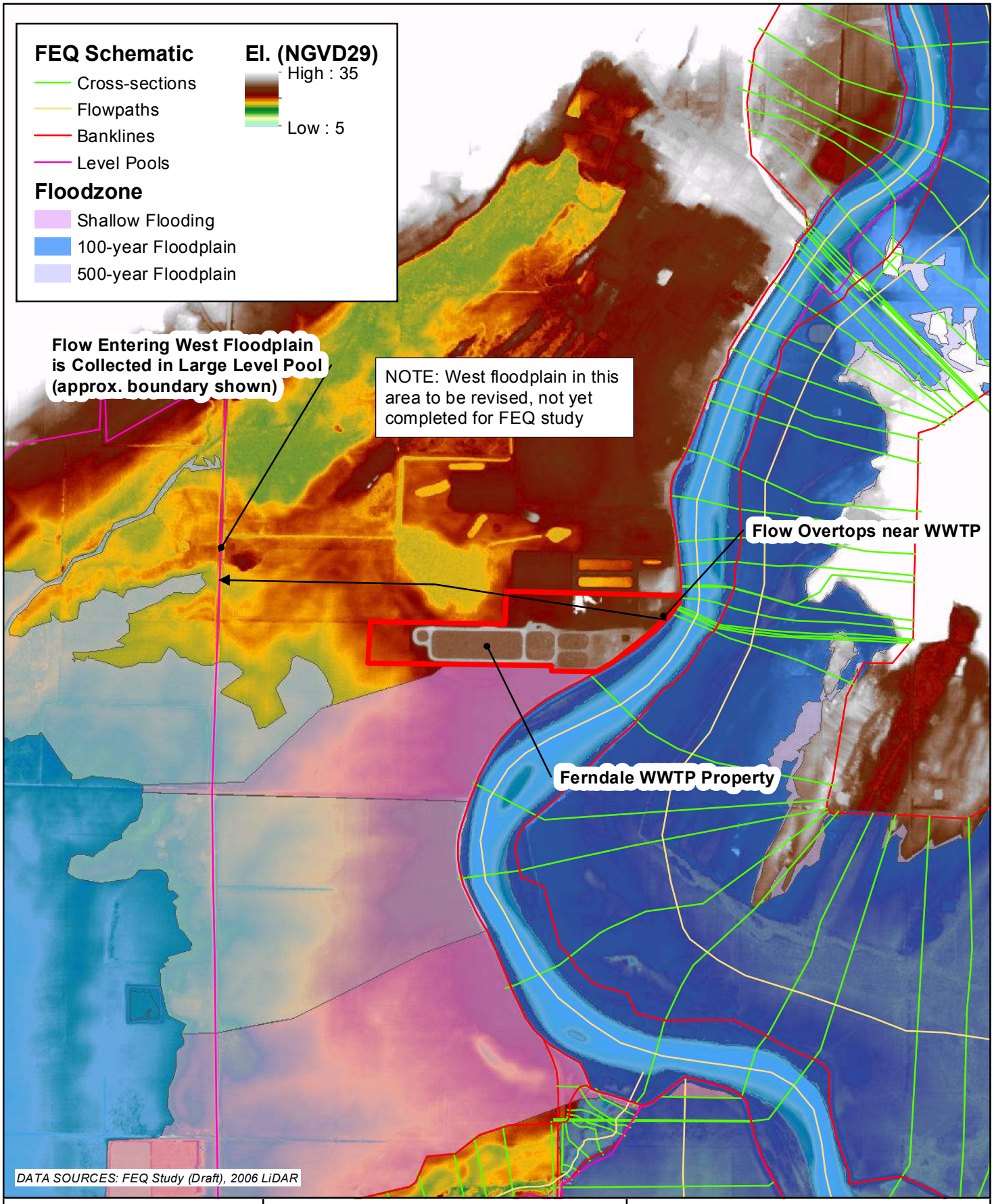
Date: 28-OCT-2015

FERNDALE WWTP

EFFECTIVE FEMA FLOODPLAIN MAPPING

FIGURE 2

ABC, C:\Projects\200197_Ferndale_WWTP\GIS\MXD\Memo1_fig2_EffectiveStudy.mxd



FOR:
WILSON ENGINEERING

SCALE - 1:12,000

0 1,000 2,000 Feet

N

nhc
northwest hydraulic consultants

Coordinate System: NAD 1983 STATEPLANE WASHINGTON NORTH FIPS 4601 FEET

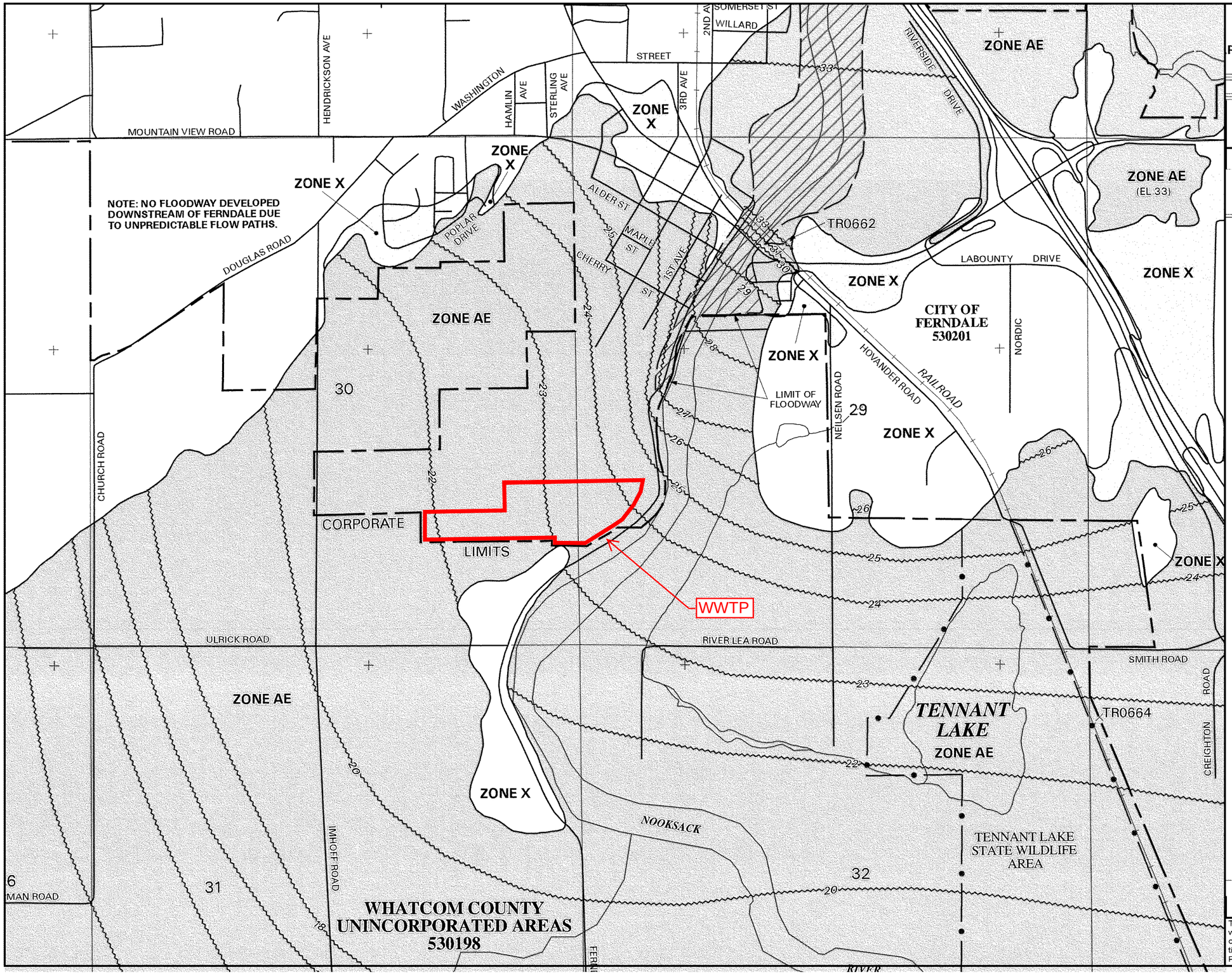
Job: 200197

Date: 28-OCT-2015

FERNDALE WWTP DRAFT FEQ MODEL SCHEMATIC IN VICINITY OF FERNDALE WWTP

FIGURE 3

ABC, C:\Projects\200197_Ferndale_WWTP\GIS\MXD\Memo1_fig3_FEQ_schematic.mxd



PANEL 1180D

FIRM

FLOOD INSURANCE RATE MAP

WHATCOM COUNTY, WASHINGTON (ALL JURISDICTIONS)

PANEL 1180 OF 2025

(SEE MAP INDEX FOR FIRM PANEL LAYOUT)

CONTAINS:

COMMUNITY	NUMBER	PANEL	SUFFIX
WHATCOM COUNTY, UNINCORPORATED AREAS	530198	1180	D
FERNDALE, CITY OF	530201	1180	D
LUMMI INDIAN RESERVATION	530331	1180	D

Notice to User: The **Map Number** shown below should be used when placing map orders; the **Community Number** shown above should be used on insurance applications for the subject community.

MAP NUMBER
53073C1180D

EFFECTIVE DATE:
JANUARY 16, 2004

Federal Emergency Management Agency

APPENDIX H

Expanded Permitting Description & Requirements

WASTEWATER TREATMENT PLANT PERMITTING TABLE

Permit	Agency	Trigger	Exemption	Requirements
Local				
Building Permit	City of Ferndale	• Building Construction	• No exemption found	• Building Permit Application • Master Application and Owner Consent Form • Fee Responsibility Form • Site Plans
Land Disturbance and Grading	City of Ferndale	• Grading activities	• No Exemptions in County Code.	• Master Application and Owner Consent Form • Land Disturbance Permit Application • Fee Responsibility Form • Site plans
Critical Areas and Resource Lands Assessment	City of Ferndale	• Mapped wetlands adjacent to facility • Situated adjacent to Nooksack River • Floodplain Development	• Based on conversation with Jori from City of Ferndale, the project will likely not qualify for floodplain development exemptions. • May be able to address critical areas through submittal of shoreline permit with expanded SEPA.	• Field Study • Critical Area Report (if needed) • Expanded SEPA discussion on impacts to floodplain habitat • Master Application and Owner Consent Form • Fee Responsibility Form • Site Plans
Shoreline Substantial Development	City of Ferndale	• Nooksack River is a Shoreline of the state and the project may be located within Shoreline jurisdiction.	• No Exemptions in County Code. Appears to be within shoreline area of the Nooksack River	• Shoreline Management Application • Site plans and maps • Master Application and Owner Consent Form • Fee Responsibility Form • Project narrative
SEPA Determination	City of Ferndale	• Required for any proposal which involves an action	• No Exemptions because it appears the project does not qualify for normal repair, remodeling and maintenance activities.	• Environmental Checklist • Expanded SEPA discussion on impacts to listed species habitat within the 100-year floodplain • Attach Critical Areas field report and studies/assessments by NHC
State				
Section 401	Washington Department of Ecology	• N/A: Project will likely NOT discharge material into waters of Washington State	• N/A – not needed	• N/A – not needed
Hydrologic Project Approval (HPA)	Washington State Department of Fish and Wildlife	• N/A: Project will not change or affect the natural flow of water.	• N/A – not needed	• N/A – not needed
Federal				
Section 10 Permit	USACE	• N/A: Project will likely NOT have construction within Waters of the United States	• N/A – not needed	• N/A – not needed
Section 404 Permit	USACE	• N/A: Project will likely NOT work within Waters of the United States	• N/A – not needed	• N/A – not needed
Nationwide Permits	USACE	• N/A: Project will likely NOT work within Waters of the United States	• N/A – not needed	• N/A – not needed
Section 106 National Historic Preservation Act Compliance	State of Washington Office of Archeology and Historic Preservation	• Possible impacts to cultural resources that may be uncovered during excavation. However, if USACE permits are not triggered then this permit may not be required	• May not be needed if USACE permits are not triggered.	• State should be contacted before construction to research their cultural resources database
Section 7 Endangered Species Act Compliance	US Fish and Wildlife Service and NOAA Fisheries	• Chinook, steelhead, bull trout are mapped within the Nooksack River. However, if USACE permits are not triggered then this permit may not be required	• May not be needed if USACE permits are not triggered. Project impacts to listed species will be discussed under local floodplain development.	• Impacts to listed species habitat will be addressed through an expanded SEPA discussion.