CITY OF FERNDALE

COMPREHENSIVE SEWER PLAN

Prepared for:

By:

Wilson Engineering, LLC

December 2016

CITY OF FERNDALE

Public Works Department
2095 Main Street
Ferndale, Washington
98248

COMPREHENSIVE SEWER PLAN

MAYOR:
Jon Mutchler

CITY ADMINISTRATOR:
Greg Young

CITY COUNCIL:
Rebecca Xczar
Greg Hansen
Keith Olson
Teresa Taylor
Cathy Watson
Carol Bersch
Fred Kennedy

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

December 2016

CITY OF FERNDALE

COMPREHENSIVE SEWER PLAN

Prepared for:

City of Ferndale

By:

Wilson Engineering, LLC

December 2016

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

EXECUTIVE SUMMARY

E-1. BACKGROUND

This updated Comprehensive Sewer 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 173-240-050, city sewer planning requirements as presented in RCW 35.67.020, and Growth Management Act requirement as presented in RCW 36.70A.070.

Scope and Objective of Update

This plan updates the 2012 Comprehensive Sewer Plan. The purpose of this Comprehensive Sewer Plan is to provide a comprehensive overview of the existing sewage collection and treatment facilities currently operated and maintained by the City of Ferndale. The report evaluates the City's wastewater facility needs based on projected residential population growth and commercial and industrial demands on the collection and treatment system through 2036. This evaluation included not only the City's Urban Growth areas, but also the current Urban Reserve areas.

This update of the Comprehensive Sewer Plan for the City of Ferndale seeks to comply with its own Comprehensive Plan, the Whatcom County Comprehensive Plan and the requirements of the Growth Management Act.

Service Area and Population

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's current population is estimated at 13,249 (2015). A 2036 population projection of 19,591 has been used in this study (growth rate of 1.88 percent for population growth and 3.0 percent for commercial/industrial growth).

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 (see Section C.2 for discussion).

Proposed Sewer Service Areas

The City of Ferndale's policy does not allow sewer service to be extended outside of the City limits. Areas must complete the annexation process before they can be served by City sewer. Exceptions may be made in emergency situations where there are health risks associated with existing development with no practical alternative besides connecting with City services.

E-II. EXISTING SEWER SYSTEM FACILITIES AND LOCATIONS

Wastewater Collection and Delivery System

This section describes and analyzes the existing City facilities, which consist of gravity main and force main collection and delivery system piping that convey wastewater directly to the City Wastewater Treatment Plant.

System Description

Ferndale's existing collection system contains more than 308,000 lineal feet of sewer piping (gravity and force main). It is made up of piping 4 to 48 inches in diameter. Approximately 64% of the system consists of 8-inch gravity sewers. There are also 17 pumping stations currently used for transmission of wastewater flows, which are described in more detail in Section II.B. Exhibit B is based on this GIS database and shows the sewer pipe and pump station locations and flow directions.

Inflow and Infiltration (I & I)

Infiltration and Inflow (non-sewage flows) increase the volume of wastewater in a sewer conveyance system causing pipelines and pump stations to be sized larger than necessary or increasing the risk of sanitary sewer overflows. The most recent I & I report prepared in 2013 shows that I & I is seasonal (during wet months), and is increasing at 2-3% per annum, which is similar to the annual population growth rate. Seasonal peak infiltration rate is about 600 GPM (equivalent to 77 gpcd) and the peak infiltration and inflow is about 1600 GPM (equivalent to 200 gpcd). In comparison, dry weather wastewater flow is about 75 gpcd. I & I is a concern and is bordering on excessive, but it is not driving the upgrade of the wastewater treatment plant. Peak instantaneous flows to the wastewater treatment plant during larger rain events ranged from 5 MGD to 7 MGD during 2011-2015.

Existing Wastewater Flows and Loads

The existing wastewater influent flow rates and loading of CBOD and TSS are summarized below.

Year 2015	Flow (MGD)	CBOD (lb/day)	TSS (lb/day)
Average Annual	2.00	3,550	3,650
Peak Month	2.60	3,920	4,343
Percent of Limit	80%	87%	81%
Permit Limit	3.23	4,490	5,388

The influent flow rate is at about 80 percent of capacity and the influent CBOD and TSS are 87 and 81 percent of capacity, respectively. Per the NPDES Permit, planning for capacity increase must begin five years before influent loading is projected to be 100 percent of capacity. The WWTP is projected to be at capacity by 2019. Planning began in 2014 and a facility (upgrade) plan and design is being completed concurrent with this general sewer plan.

Wastewater Treatment Plant Performance

The treatment plant performs adequately to meet all effluent limits for the permitted influent flows and loadings. However, the performance of the existing DPAL Lagoon System needs to be improved before it can be relied on solely to provide full treatment without relying on additional treatment by the Middle and South/North Lagoons, which will be eliminated in Phase III. The ability to dose the West Lagoon with chemical agents was added in 2014. Now, polymer can be dosed directly to the West lagoon. This improves settling and filtration system performance; however, it is expensive ($5,000-$10,000/ month) and does not totally negate the need for additional treatment (i.e., clarification) in the Middle and South/North Lagoons and/or filtration. The treatment plant performance and alternatives or options to improve performance are included in the 2016 Facility Plan.

E-III. FUTURE SEWER SERVICE REQUIREMENTS

The City will only provide sewer service where it is legally possible to do so considering applicable land use and development regulations. Details for potential developer extension/ULID facilities that are included in this section are conceptual. Development driven infrastructure improvement projects are highly dependent on the nature of the development.

Potential Growth in the Sewer Collection System within the City limits

The City plans to extend the sewer collection system within the City limits as the opportunity arises, such as in conjunction with a road reconstruction project or a new development project. At this time, there are several known potential areas for expansion within the City's service area, including:

1. Sewer Extensions with Road Reconstruction (TIP projects).
2. Sewer Extension Inquiry for Smith Road at Pacific Highway.
3. North Malloy (170 acres between Malloy Road and I-5, south of Brown Road).
4. Thornton South (95 acres south side of Thornton Road inside City Limits).
5. West Slater (25 acres south side of Slater Road inside City Limits).
6. Other Developer Extensions / Local Improvement Districts (there are several properties remaining within the City limits that could be subdivided or grouped to create a development).

A local improvement district or utility local improvement district (LID/ ULID) can be a funding alternative for areas with multiple owners and where significant infrastructure improvements are needed. The process involves a vote of those who will be assessed, but also allows the assessment to be paid off over a period of time (up to twenty years).

Potential Growth in the Sewer Collection System within the Unincorporated Urban Growth & Urban Reserve Area

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). The City will only expand the sewer collection system into the UGA once an area has been annexed into the City. Exhibit B-3 shows the future areas to be served by City sewer.

The sewer system hydraulic analysis performed in support of this plan has confirmed that the City of Ferndale maintains a sewer capacity sufficient to serve projected growth to 2036. While specific conveyance projects to individual parcels have not been included in the plan, the City has determined that the unincorporated UGA areas can be adequately served with the construction of projects as described below. The cost of such improvements will be borne by development unless or until the City adds the project as a capital facility improvement. UGA / Urban Reserve areas include:

1. Grandview Area Sewer (East and West). At this time, the Grandview area is the only active inquiry regarding a developer extension for sewer within the UGA. The options for extending sewer service to this area are outlined in a feasibility study provided to the City, and included here as Exhibit G. In summary, the Grandview East area sewer extension will include over 10,000 LF of 8 and 12-inch gravity main, over 5,000 LF of 4-inch force main and one or two new sewer pump stations.
2. Brown Urban Growth Area: 16-20 year timeframe
3. Aldergrove Urban Growth Areas (West, Central, and East): 11-15 year timeframe
4. Mid-Church Urban Growth Area (at Stoneyfield): 6-10 year timeframe
5. Thornton North Urban Growth Area: 11-15 year timeframe
6. Riverbend Urban Growth Area: 0-5 year timeframe
7. Mountain View Urban Growth Area: 6-10 year timeframe
8. Douglas Urban Growth Area: 6-10 year timeframe
9. Schell Creek Urban Growth Area: 6-10 year timeframe
10. East Slater Urban Growth Area: 0-5 year timeframe

E-IV. SEWER RATE STRUCTURE AND REVENUE PLANNING

Requirements for Connection to the City Sewer System

The requirements for connecting to the City sewer system are listed in the City's municipal Code Chapter 13.20.085. New developments that lie within the City limits are required to connect to the sewer. There are existing septic systems within the City limits that were allowed to be installed in areas that did not have sewer collection mains. When public sewer becomes available to properties served by septic systems, those properties must connect to the public sewer either when the on-site system fails, or when certain repairs, reconstruction, or improvements are made to the structure (see Code for details).

Revenue Planning

The City performs a review of the sewer rate schedule regularly to determine that these charges are sufficient to generate revenue to offset the cost of all necessary operation and maintenance of the City sewer system. In the event that this review indicates a necessary revision of user charges, the City amends the rates by formal ordinance of the City council.

Sewer Rate Structure

The City sewer service rates and charges outlined below shall be subject to change by ordinance of the City council as conditions warrant.

1. Sewer Service Rates

The City bills bi-monthly for sewer service. The calculation of bi-monthly sewer charges is based on water meter usage for metered customers, and is a flat rate for non-metered customers. The current Water and Sewer Rates and Fees for the City are attached as Exhibit F, which includes the details for the sewer rates.

2. Sewer Connection Fee

The City currently assesses $7,293 per Equivalent Residential Unit (ERU) for the base Sewer Connection Fee (Jan. 1, 2015). Additional fees may also apply. The City also charges fees for inspection in accordance with the current Fee Code and Fee Summary (Ordinance #1605).

The Fee Code and Fee Summary Schedule, and Water and Sewer Rates and Fees are incorporated here by reference. The current schedules are included in Exhibit F.

3. Cost per Service

The City's cost per service currently is about $665 per ERU/year in terms of debt service and operation and maintenance costs. This cost includes $321 per year in operation and maintenance costs. Debt service costs are currently $344 per year. Debt service will decrease by $100 per ERU/year once the 2005 bonds are paid off in 2016.

Funding Capacity

The City expects to have sufficient revenue to fund the City's sewer system operations and maintenance, debt payment, and future sewer capital improvement projects as shown below:

	Low Estimate	Mean Estimate	High Estimate
Revenue	$ 115,000,000	$ 125,000,000	$ 135,000,000
Expenses			
O & M/Admin	$ 42,000,000	$ 45,000,000	$ 48,000,000
Capital Plan	$ 48,000,000	$ 53,000,000	$ 58,000,000
Debt Service	$ 24,000,000	$ 26,000,000	$ 28,000,000
Total Expenses	$ 114,000,000	$ 124,000,000	$ 134,000,000

The City therefore has a sufficient revenue stream to fund operations and maintenance, debt service, and capital improvements and to obtain new bonds. Additional funds that can be allocated/reserved for emergency projects, unanticipated projects, and/or sewer extensions. However, it is the City's stated policy that developers fund sewer extensions to unserved areas. The City's existing sewer collection and treatment systems have sufficient capacity (with planned improvements) to provide sewer service to growth within the City limits and UGA for the next twenty years.

E-V. FUTURE IMPROVEMENT PROJECTS

This section describes the main improvement projects that are scheduled for the next six years. The City has developed 6-year and 20-year sewer capital improvement plans which are included in Exhibit H. The Exhibit includes the anticipated project schedule and estimated project costs.

Future Maintenance and Operational Improvements

The following additions or enhancements are recommended:

1. Sewer Inspection Program Enhancement
2. Smoke Testing Program (to identify improper sewer connections and leaks
3. Sewer I & I Projects - Miscellaneous Sewer Line Replacement and Repair
4. Sewer I & I Projects - Manhole rehabilitation to eliminate identified leaks in manholes

Future Sewer Capital Improvement Projects

The proposed Sewer Capital Improvement Plan schedule and costs are shown in Exhibit H. The following sewer capital improvement projects are deemed the highest priority:

1. Pump Station Upgrades – Ongoing

   The City has completed several pump replacements and telemetry upgrades in the last six years. The City plans to continue replacing and/or upgrading aging pump stations. Replacement of the aged pump and control equipment will result in increased reliability, reduced emergency call-outs, and reduced equipment operation costs.

2. Miscellaneous Sewer Line Replacement and Repair

   The projects include sewer improvements associated with the 2016-2021 Six-Year Transportation Improvement Program (TIP) projects, one sewer main replacement to increase capacity, a sewer main extension, and two projects to replace aging and failing sewers without increasing size.

3. Pump Station Decommissioning

   The City identified pump stations where gravity sewer pipelines could be installed to bypass the pump stations in the previous Comprehensive Plan. The pump stations could then be removed and decommissioned. One has been decommissioned (PS #21 Ariel Court) since that report. Three additional pump stations have been identified as candidates for decommissioning. The three stations scheduled for decommissioning are PS #11 - Aquarius / Apollo, PS #15 Smith Rd / Bellaire Estates, and PS #19 Malloy Village.

4. Sewer Sliplining Project

   Many of the older sewer mains in Ferndale are reinforced concrete pipe or vitreous clay pipe with joints every 10 feet that can often be repaired in place by sliplining. The City has identified numerous pipes that would be candidates for sliplining instead of complete pipe replacement. The Capital Improvement Plan provides an annual budget to address the repair and rehabilitation of the oldest pipes in the City's system.

5. Developer Extension Projects

   The City regularly reviews applications by Developers to extend City sewer facilities. The City requires the Developer to provide engineered plans prepared in accordance with the City Standards, and requires regular inspections to ensure installation is according to the approved plans.

6. Utility Local Improvement Projects

   The City will review any petition from property owners for extension of sewer service. For example, two potential areas that could petition for service are the low density rural residential UGA on the west side of the City and the recently annexed area south of Slater Road.

   Under certain conditions, the City may install new facilities for specific areas under the Utility Local Improvement District (ULID). ULID funded projects are eventually paid for by the property owners within the ULID, either in a lump sum or over time (with interest).

7. Wastewater Treatment Plant Upgrade

   The Phase III WWTP upgrade is tentatively scheduled for 2017-2019. See the facility plan for evaluation of upgrade alternatives.

I. BACKGROUND

This updated Comprehensive Sewer 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 173-240-050, and city sewer planning requirements as presented in RCW 35.67.020. This comprehensive plan includes a schedule for the City to provide adequate sewer collection and treatment capacity in accordance with Washington DOE requirements. In addition, this comprehensive plan is intended to be used to apply for and receive either grants or loans from the Department of Ecology or other funding sources for Sewer Capital Improvement Projects. Finally, this comprehensive plan is intended to satisfy the requirements of the Washington State Growth Management Act (GMA – RCW 36.70A.070 (3)).

A Glossary of Terms is included at the end of this document.

A. Scope and Objective of Update

1. General

This plan will identify needed capital facility improvements to the City's sewer collection system infrastructure based on existing and future capacity needs, and ongoing replacement of aging infrastructure. These needed improvements become Capital Projects with a preliminary scope, cost estimate, and proposed schedule. The City has various funding sources available for sewer capital projects including (but not limited to) sewer rates and connection fees, bonds, loans, grants, utility local improvement districts (ULIDs), and developer extension contracts.

2. Scope and Objective

The purpose of this Comprehensive Sewer Plan is to provide a comprehensive overview of the existing sewage collection and wastewater treatment facilities currently operated and maintained by City of Ferndale. In addition, this report addresses proposed future facilities development and population growth within the City and its unincorporated Urban Growth Area (UGA). The report evaluates the City's wastewater facility needs based on projected residential population growth and commercial and industrial demands on the collection and treatment system through 2036. This evaluation included not only the City's Urban Growth areas, but also the current Urban Reserve areas. The plan is based on population projections developed as part of the City's population allocation as determined by Whatcom County, pursuant to policies and procedures described in the GMA.

This report will cover the following topics:

- system owner/operator information
- sewer system layout including a description of the existing system boundaries,
- description of existing collection and treatment facilities including recently completed improvements
- discussion of development trends within City sewer boundaries
- discussion of existing and future collection and treatment issues such as current and future sewer flows, and infiltration and inflow (I & I)
- discussion of sewer rate structure and revenue planning
- discussion of present and future development alternatives within the City boundaries

- outline of future improvement projects within the City

3. Overview of Growth Management Implications on this Comprehensive Sewer Plan Update

This update of the Comprehensive Sewer Plan for the City of Ferndale seeks to comply with its own Comprehensive Plan, the Whatcom County Comprehensive Plan and the requirements of the Growth Management Act. The primary reasons for the City of Ferndale to update its plan at this time are:

- to ensure compliance with regulations requiring regular updates
- to incorporate capital improvements made in the last several years
- to reflect changes to the City's Urban Growth Area boundaries over the last several years
- to model and analyze the collection system's capacity to meet existing and future needs, and identify capital projects where necessary to meet those needs
- to outline and update the City's Sewer Capital Improvement Plan for the sewer system
- to ensure the City's ability to set and collect appropriate connection charges and sewer service charges for all City facilities

4. Documents Incorporated by Reference

The City maintains several documents that are relevant to this Comprehensive Sewer Plan that are hereby incorporated by reference. Since the nature of these documents require them to be updated separately from the Comprehensive Sewer Plan, they have not been integrated into this Plan. Some of these documents have been attached as Exhibits for convenience and are current as of the Plan publication date, but are subject to change and should not be considered the official version of the document.

The documents incorporated by reference include:

- City of Ferndale Municipal Code
- 1996 Comprehensive Wastewater Facilities Plan and Addendum #1
- City of Ferndale Design and Construction Standards (currently under review/revision)
- Developer Extension Agreement - Master Form
- Water System Comprehensive Plan (currently undergoing an update)
- City of Ferndale Zoning and Comprehensive Plan Maps (reprinted in Exhibit A)
- City of Ferndale Sewer Rates and Fee Schedule (reprinted in Exhibit F)

B. System Owner/Operator Information

1. Office Location and Governing Information

The sewer collection facilities covered in this report are owned and operated by:

City of Ferndale – Public Works Department
2095 Main Street
Ferndale, Washington 98248
(360) 384-4006 – Office Telephone
(360) 384-5189 – Office Fax

The City is administered by the Mayor, City Administrator, and a seven-person City Council who are each elected at large for four-year overlapping terms. The City Council meets at least twice monthly and holds special sessions as the need arises.

2. Operations Information

The City Public Works Department is responsible for planning, construction, and operation/maintenance of all public sewer facilities within the City's boundaries. The operation and maintenance of the City's facilities is overseen by the Public Works Director who works with a support staff consisting of office administrative staff and operations and maintenance crew. The City contracts for legal counsel and consulting engineers. The City Public Works Department operates out of the office at City Hall at 2095 Main Street, the Public Works Department Shop Facility at 5735 Legoe Avenue, and the Water and Wastewater Treatment Plant at 5405 Ferndale Rd, Ferndale, WA.

C. City Boundaries and Sewer Service Areas

1. 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 4,560 acres. An additional 1,300 acres are identified as Urban Growth Area (UGA). The City's current population is estimated at 13,249 (2015). 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 (growth rate of 1.88 percent for population and 3.0 percent for commercial/industrial). 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 Exhibit A 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.

2. 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.

3. 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 are shown in Exhibit A.

II. EXISTING SEWER SYSTEM FACILITIES AND LOCATIONS

A. Wastewater Collection and Delivery System

This section describes and analyzes the existing City facilities, which consist of gravity main and force main collection and delivery system piping that convey wastewater directly to the City Wastewater Treatment Plant. Analysis of the current and future projected wastewater flows for the system, as well as a discussion of the system inflow and infiltration, is included.

1. System Description

Ferndale's existing collection system contains more than 308,000 lineal feet of sewer piping (gravity and force main). It is made up of piping 4 to 48 inches in diameter. Approximately 64% of the system consists of 8-inch gravity sewers. There are also 17 pumping stations currently used for transmission of wastewater flows, which are described in more detail in Section II.B. Table 1 summarizes the collection and delivery system piping components for the City collection system.

Table 1. City of Ferndale Collection System - Component Listing

System Component	Approximate Quantity
Sewer Manholes	1,426
Sewer Pump Stations	17
4-inch Force Main	6,200 LF
6-inch Force Main	7,942 LF
8-inch Force Main	8,025 LF
12-inch Force Main	1,790 LF
6-inch Gravity Sewer	6,183 LF
8-inch Gravity Sewer	201,731 LF
10-inch Gravity Sewer	22,592 LF
12-inch Gravity Sewer	16,356 LF
15-inch Gravity Sewer	13,695 LF
16-inch Gravity Sewer	2,078 LF
18-inch Gravity Sewer	12,627 LF
21-inch Gravity Sewer	8,148 LF
24-inch Gravity Sewer	736 LF
27-inch Gravity Sewer	3,698 LF
30-inch Gravity Sewer	694 LF
36-inch Gravity Sewer	852 LF
42-inch Gravity Sewer	2,148 LF
48-inch Gravity Sewer	431 LF
8-inch Siphon Sewer	1,087 LF
12-inch Siphon Sewer	1,085 LF

The City completed a significant mapping project of the sewer collection system which began with a field survey of its 1,400 manholes to obtain x-y coordinates and rim elevations. Public Works staff then inspected every manhole and recorded the inlet and outlet pipe information – size, material, and depth. This data was integrated into the City's GIS database in 2010. Exhibit B is based on this GIS database and shows the sewer pipe and pump station locations and flow directions.

The City has also completed several capital projects that improved the operation of the sewer collection system. The most recent of these projects are listed below.

Thornton Street Improvements Project (2012)
This project consisted of replacing 1000 feet of 8-inch sanitary sewer main on Thornton Street from Maureen Drive to Vista Drive.

Ariel Court Sewer Extension (2012)
Under this project approximately 400 feet of 8-inch sanitary sewer was installed from Ariel Court to Imhof Road, and Pump Station #21 was decommissioned.

Guinevere Sewer Project (2013)
This project consisted of installing 220 feet of 8-inch sanitary sewer main on Guinevere Street.

Cottage Place Sanitary Sewer Project (2013)
This project consisted of replacing 325 feet of 8-inch sanitary sewer main along Cottage Place to Golden Eagle Drive.

Main Street- Douglas to Church Road Project (2012-2013)
This project consisted 900 feet of new and replaced 12-inch and 18-inch sanitary sewer main on Main Street from Douglas Drive to Church Road.

Vista Pavement Preservation and Utility Improvements Project (2013)
This project consisted of replacing 1500 feet of 12-inch sanitary sewer main along Vista Drive from Third Street to the roundabout.

Sterling Street Sewer Main Project (2015)
This work provides for the installation of approximately 430 lineal feet of 8-inch sanitary sewer main along Sterling Avenue.

Malloy Avenue Sanitary Sewer Project (2015)
This project replaced approximately 1000 feet of aging sewer main with a larger 15-inch sanitary sewer main along Malloy between Oxford Court and Thornton Street, and on Thornton Street 200 feet east of Malloy Avenue.

Pump Station #7 Project (2014)
This project replaced the telemetry and control panels at Pump Station #7.

Sewer Pump Station Telemetry Upgrade Project (2013-2014)
This project consisted of replacing existing and installing new telemetry panels at all of the City's sewer lift stations. The project also included upgrading the SCADA and telemetry control program.

Pump Station #4 Project (2015)
This project was a complete replacement of the old pump station with a new higher capacity pump station (1,250 GPM).

2. Inflow and Infiltration (I & I)

Infiltration and Inflow (non-sewage flows) increase the volume of wastewater in a sewer conveyance system causing pipelines and pump stations to be sized larger than necessary or increasing the risk of sanitary sewer overflows. Infiltration and inflow also increases the cost of treating sewage at the WWTP. Infiltration and inflow cannot be totally eliminated in a system and a careful analysis of the cost of reduction must be made to avoid spending limited capital resources unnecessarily.

Statistical evaluation of the City's I & I indicates an approximately 2%-3% per annum increase in I & I, which is similar 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 partially implemented.

The most recent I & I report prepared in 2013 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.

Recent influent data from 2011-2015 (see Exhibit C) shows that peak day flows (due to increased inflow) are typically less than 4 MGD and only once exceeded 5 MGD. Peak instantaneous flows to the wastewater treatment plant during larger rain events ranged from 5 MGD to 7 MGD during 2011-2015

City sewer flow monitoring was conducted from April 27 – May 26, 2010 at six locations. The data and results are still representative of the sewer system flows patterns, even though I&I has been mitigated in some localized sewer segments. 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, 2011

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 Capital Improvement Plan (e.g., CIP: annual Sewer Replacement Projects; Annual Sewer Slipline Projects starting in 2016; specific pipe replacement projects).

I&I (and inflow in particular) should be reduced where economically feasible or where specific problems are identified to reduce likelihood of total suspended solids passing through during high inflow events. Infiltration and Inflow investigations (smoke testing, camera investigations, and/or flow monitoring) are planned for 2016/2017. The intent of these it to find the worst inflow locations, as well as to quantify I/I in specific pipe segments.

3. 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 2 presents the annual average wastewater flows as recorded at the City WWTP effluent during the years 2007 through 2015. Also presented in Table 2 are estimated population and the calculated annual average per capita flow rates.

Table 2. 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 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. Year 2015 flows were substantially lower than in the previous three years (drought conditions may have contributed to this decrease).

Table 3. Ferndale WWTP Monthly Average Flow

	Flow (MGD)								
Month/ Year	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 4 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 2.47 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 (see Figure 1 in Appendix C). Peak instantaneous influent flows were not measured prior to 2011.

Table 4. 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	
Max % of Limit =	86%		--	
Permit Limit =	3.23		none	

Peak month influent flow is currently about 2.60 MGD or about 80% of the permit limit. Current (i.e., 2015) peak month flow is derived from the graph in Figure 1 (page 13).

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

The influent wastewater quality is characterized below in terms of 5-day Carbonaceous Biochemical Oxygen Demand (CBOD) and Total Suspended Solids (TSS) (Table 5).

Table 5. 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	3,422	3,973	3,148	3,754
Average =	3,109	3,703	3,145	3,968
Maximum =	3,535	4,018	3,639	4,591
Max % of Limit =	79%	89%	68%	85%
Permit Limit =	4,490	4,490	5,388	5,388

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.

Peak month influent CBOD loading is currently about 3,920 lb/day or about 87% of the permit limit. Peak month influent TSS loading is currently about 4,343 lb/day or about 81% of the permit limit. Current (i.e., 2015) peak month loading is derived from the graph in Figure 1 (page 13).

Fats, Oils, and Grease (FOG) loadings are controlled by ordinance and are not problematic, except for infrequent slug loads (i.e., larger quantities discharged over a very short time period).

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 the permit dilution factors would be smaller and a strict ammonia limit might be required. This will need to be evaluated in the design of treatment plant upgrades. For example, an additional treatment step, such a moving bed bioreactor (MBBR; “fixed film”), could be added to remove ammonia year-round if necessary.

5. Future Projected Wastewater Flows

Wastewater flow is projected to increase at 2.13 percent per year through 2036 (this is higher than the population growth rate due to higher expected growth rate for commercial/industrial). See Section I.C.1 for discussion of growth rates. These are flow estimates based on the assumption that per capita rates of water consumption and I & I will not decrease. Table 6 displays the projected average and peak flows to the WWTP from the collection system.

Table 6. Ferndale WWTP Projected Flow

	Existing 2015	5 years 2020	10 years 2025	20 years 2035	21 years 2036
ERUs	5,413	5,985	6,617	8,089	8,253
Projected Population	13,249	14,542	15,961	19,229	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	1.09	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 1). Therefore, per the permit requirement, planning for increasing WWTP capacity or rerating capacity ***for flow*** needs to begin in 2020. This planning process began in 2014.

ERUs (Equivalent Residential Units) are calculated as shown in the example below for 2015 Table 7). 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. Note that apartment (multi-family) housing is expected to grow faster than single-family housing, which should result in somewhat lower flows than projected (i.e., the flow projections are conservatively high).

Table 7. 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

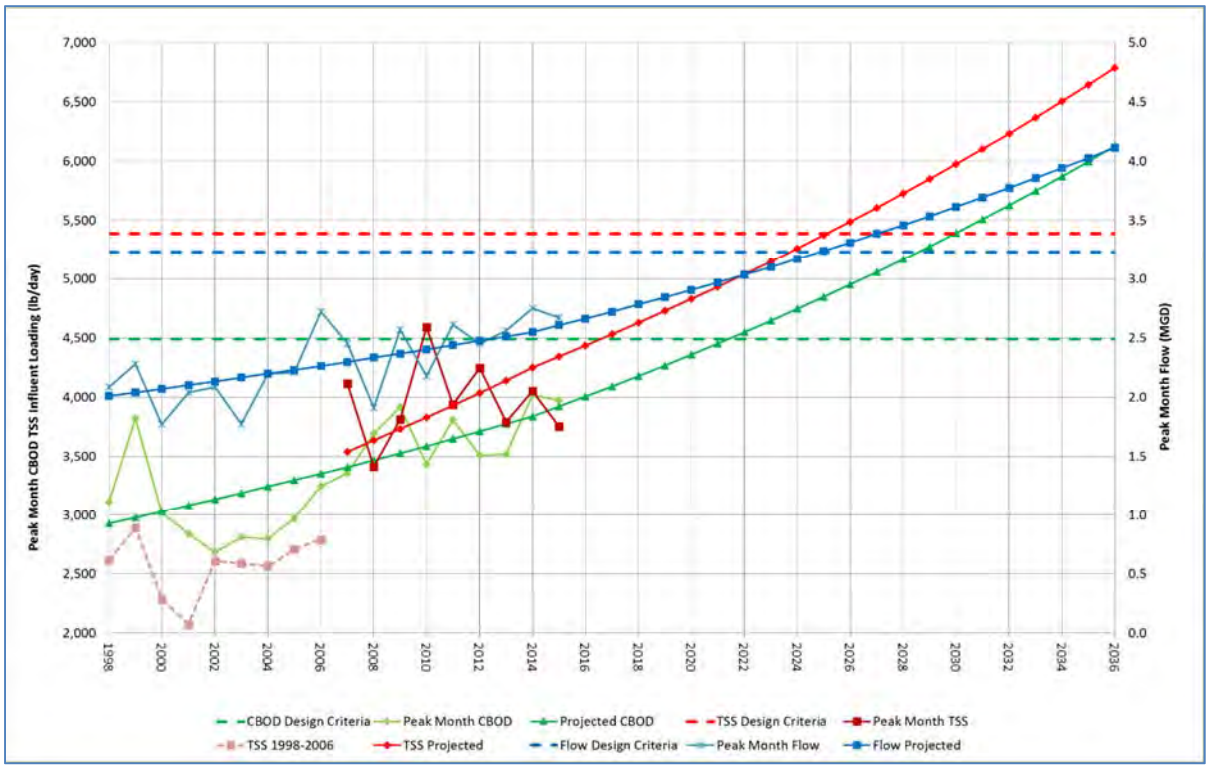


Figure 1. Existing Peak Month Influent Loading and Flow 1998-2015. Projected Peak Month Influent Flow and Loading 2016-2036.

6. Future Projected Wastewater Loadings (CBOD, TSS)

Influent loadings of CBOD and TSS are expected to increase proportionally with increase in flow. Table 8 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 needs to begin by 2016 (i.e., five years prior to reaching capacity).

Planning for an increase in WWTP capacity began in 2014. A WWTP Facility Plan is being completed concurrent with this General Sewer Plan. The 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 2019/2020.

In looking at Figure 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 8. Ferndale WWTP Projected Loadings

	Permit Limits	Existing 2015	5 years 2020	10 years 2025	20 years 2035	21 years 2036
Connections (ERUs)	--	5,413	5,985	6,617	8,089	8,253
Population Estimate	--	13,249	14,542	15,961	19,229	19,591
Projected Average CBOD (lb/day)	--	3,550	3,925	4,340	5,305	5,413
Projected Peak Month CBOD (lb/day)	4,490	3,920	4,334	4,792	5,858	5,977
Projected Average TSS (lb/day)	--	3,650	4,036	4,462	5,454	5,565
Projected Peak Month TSS (lb/day)	5,388	4,343	4,802	5,309	6,490	6,622

B. Pumping Facilities

The City of Ferndale collection system is equipped with seventeen (17) operating sewer pump stations, which lift and transport wastewater collected from various sewer service zones of the City to the City WWTP. Exhibit D shows the City sewer zones and their flow paths. Exhibit J includes the pump curves and system information for each station. The City's sewer pump stations and their characteristics are shown in Table 9.

Table 9. Ferndale Pumping Facilities

Pump Station ID and Location	Service Area (Contributing Sewer Zones & Pump Stations)	Capacity (GPM)
PS # 2 - Main St N Side Pioneer Bridge	E1 (PS#3, PS#4)	1,438
PS # 3 - Barrett Rd South of Main St	E2 (PS#15, PS#5)	1,488
PS # 4 - Smith Rd / North of Ready Mix	E3 (PS#17)	1,250
PS # 5 - Northwest Rd / County Planning	E6	259
PS # 6 - Correll Park / Flair	W4	187
PS # 7 - Main St / 7-11 / Post Office	W12	75
PS # 9 - Portal Way North	Portion of W3	209
PS # 10 - Aquarius / Apollo Dr	W6 (PS#18)	132
PS # 11 - Oxford / Unrein Dr	W8	84
PS # 12 - Northwest Ave/Day Academy	Whatcom Day Academy (within E6)	Unknown
PS # 15 - Smith Rd / Bellaire Estates	E5	764
PS #16 - Portal Way South near I-5	Portion of W3 (PS#9, PS#22)	404
PS # 17 - Slater Rd / Silver Ck Ind Park	E4	415
PS # 18 - Nicholas Dr / Ryan's Glen	W7	128
PS # 19 - Malloy Village	W9	113
PS # 20 - Church Rd / South Church LLC	W10	133
PS #22 - Whiskey Creek	Portion of W3	205
PS #23 – Thornton (not operating yet as of this publication)	Portion of W11	230

Notes: All listed capacities are with the largest pump offline.
All listed capacities are actual field measured flow rates.
Multiple pump operation could provide higher flows for short durations.

Each pump station installation is comprised of a wet well, dry-pit, or top-mounted pumping equipment and local pump station controls. All seventeen (17) pump stations now have telemetry communication systems. Four pump stations are connected to emergency backup generators to insure normal pump station operation in the event of a power outage. Ten (10) of the remaining lift stations are equipped with onsite generator receptacles for connection to the City's portable generators in the event of a power outage. There are two pump stations that do not have generators or the ability to connect to a portable generator: PS #7 Main St/7-11/Post Office and PS #11 Oxford/Unrein Dr (Cascade Peaks).

The proposed sewer capital improvement plan includes an ongoing program for pump station upgrades, improvements, and replacement of aging equipment. Table 10 lists some of the recent pump station projects.

Table 10. Sewer Pump Station Projects Completed

Pump Station ID and Location	Description
PS # 23 Thornton	Completion in spring 2016
PS # 2 - Main St N Side Pioneer Bridge	Pumps replaced in 2006; DESIGN in progress for upgrade project; increase capacity, replace equipment, generator, controls.
PS # 3 – Barrett Rd South of Main St	DESIGN in progress for rehab project; replace equipment, generator, controls, increase capacity.
PS # 4 – Smith Rd / North of Ready Mix	Construction completed during 2015 for rehab project; increase capacity, replace equipment, controls, generator.
PS # 5 - Northwest Rd / County Planning	Pumps were replaced in 2010-2011
PS # 10 - Aquarius / Apollo Dr	Pumps replaced in 2008
PS # 19 - Malloy Village	New pump station installed (2005)
PS # 20 - Church Rd / South Church	New pump station installed (2007)
PS # 21 – Ariel Ct	Decommissioned in 2012
PS # 22 - Whiskey Creek	New pump station installed (2007)
PS # 2, 3, 4, 5, 9, 11, 15, 16, 17, 19	Telemetry systems upgraded or added (2013)
PS # 6, 7, 10, 12, 18	Telemetry systems upgraded or added (2014)

C. Wastewater Treatment Plant

1. Background

The City of Ferndale WWTP serves a population of approximately 12,959 in 2015 (total city population is 13,249). 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 historically accepted some trucked landfill leachate in the small leachate lagoon. 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 increase from about 7,300 in 1996) 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 2015.

"Phase III" as planned in the 1996 Sewer Plan, would effectively double the WWTP capacity to 6.37 MGD. 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 (growth has been only about 3 percent per annum 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 was 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. Phase III improvements will involve the addition of a second parallel DPMC system modified from the existing partial-mix aerated lagoons, along with a capacity increase for the effluent pump station and possibly the filter system.

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.

Recent upgrades or changes include (1) replacement of the 1/2-inch mechanical screen at the headworks with a new 3/8-inch mechanical screen in 2013; (2) replacement of two Parshall Flumes with two V-notch weirs for influent flow measurement; (3) addition of a trailer-mounted backup pump for use in lieu of the influent screw pumps in 2014; and (4) expansion of the chemical addition system to allow dosing of polymer to any of the lagoons in 2014.

2. Treatment Process

A schematic diagram of the existing WWTP process is included in Exhibit K. 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). A new mechanical screen with the required 3/8-inch screen slots was installed in 2013 to replace the old 1/2-inch mechanical screen. Flow is measured through one or two V-notch weirs. Sediment collects behind the V-notch weirs and must be removed periodically. 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. In 2014, additional piping was installed to convey chemical dosing to the West Lagoon. The operator can now dose polymer directly to the West Lagoon to improve settling of flow in the partial-mix lagoons.

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.

3. Treatment Plant Performance

The treatment plant performs adequately to meet all effluent limits for the permitted influent flows and loadings. However, the performance of the existing DPAL needs to be improved before the DPAL can be relied on solely to provide full treatment without using the Middle and South/North Lagoons, which will be eliminated in Phase III. The performance of the filter system needs to be improved also. The filter system cannot handle the design flow excessive backwash cycling and bypassing part of the flow. The filter hydraulic capacity and system head need to be increased.

The ability to dose the West Lagoon was added in 2014. Now, polymer can be dosed directly to the West Lagoon. This improves settling and filtration system performance; however, it is expensive ($5,000-$10,000/ month) and does not totally negate the need for additional treatment (i.e., clarification) in the Middle and South/North Lagoons and/or improved filtration.

The treatment plant performance and alternatives or options to improve performance are included in the 2016 Facility Plan.

4. Operator

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.

5. 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

6. 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. Biosolids land application is about 70 dry tons per year and hauling is about 40 dry tons per year.

7. Design Criteria

   Under WAC 173-220-150 (1)(g), influent flows and waste loadings must not exceed approved design criteria (Table 11).

Table 11. 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

Wastewater flows to the treatment plant are currently 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.

Other treatment plant design criteria are shown in Table 12.

The WWTP operates under a National Pollution Discharge Elimination System (NPDES) permit. Ecology issued the current permit for the WWTP effective on August 1, 2014 (see Exhibit L). The permit places effluent limits on CBOD, TSS, pH, fecal coliform bacteria, and total residual chlorine.

8. Existing Wastewater Flows

   Existing wastewater flows to the City WWTP are presented and discussed in Section II.A.3 above.

9. Projected 20-Year Wastewater Flows

   Projected WWTP wastewater flows were presented and discussed in Section II.A.5 above.

Table 12. Ferndale Wastewater Treatment Plant Capacity

Unit (No.)	Capacity*	Comment
Influent Pumps (3)	35 MGD (17.5 MGD each)	One standby (17.5 MGD)
Backup Influent Pump	3.6 MGD	
Mechanical Screen (1)	18 MGD	No standby
Bar Screen (1)	18 MGD	No standby
Influent Flow Measurement (2)	18.2 MGD (9.1 MGD each)	Approx. at higher flows
Influent pipes: 30-inch/24-inch	22 MGD/12 MGD	Total = 34 MGD
DPAL (1) (Dual-Powered Aerated Lagoon)	3.23 MGD (Peak Month)	
	11.0 MGD (Peak Day)	
	28. 0 MGD (Peak Hour)	
	12.6 MGD (Peak Hour Effluent)	
DPAL (Phase III) (2 parallel units)	6.46 MGD (Peak Month)	Future
	17.0 MGD (Peak Day)	Future
	35. 0 MGD (Peak Hour)	Future
	16.2 MGD (Peak Hour Effluent)	Future
Filter System (22 Disk Filters)		
Hydraulic Loading	4.29 MGD (Average)	
	8.53 MGD (Peak)	
Solids Loading	2,163 lb/day (Average)	These solids loading rates have not been achievable**
	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) (60 min)	
	16.2 MGD (Peak Hr) (23.6 min)	
Effluent Flow Measurement (1)	15.8 MGD	
Effluent Pump Station (4 pumps)	12.6 MGD (3 pumps)	One Standby
Effluent Pump Station (Phase III) (5)	16.2 MGD (4 pumps)	One Standby; Future
Effluent Pipeline: 30-inch	16.2 MGD	

* All capacities are for existing facilities unless denoted as Phase III and Future.

** See Section 11.C.3 for discussion.

D. Industrial Wastewater Producing Facilities within the City System

The WWTP receives wastewater from one permitted industrial contributor: Republic Services (formerly RECOMP), a solid waste transfer station. The flow source is considered relatively minor in quantity and quality, is not discussed in detail, and does not require special analysis. However, it does have a large stormwater discharge from approximately one acre of pavement. 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), with the exception of Hempler Foods Group (due to high BOD).

Republic Services 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. Republic Services 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.

Hempler Foods Group is the largest discharger based on flow and loading. A monitoring program has recently been implemented to determine BOD, TSS, and TKN loading from Hempler Foods to quantify the loading. Preliminary monitoring results show that the loading is greater than 10 percent of the wastewater treatment plant loading for BOD and TKN. Hempler Foods is currently attempting to implement a pretreatment system for their sewer discharge.

Landfill leachate from Olivine Corporation and Whatcom County's Cedarville Landfill was historically hauled via tanker to the WWTP for disposal. Olivine Corporation is the owner of a closed municipal solid waste incinerator ash monofill and discharged only about 60,000 gallons to Ferndale in 2015.

A summary of industrial dischargers over 1,000 GPD are shown in Table 13. Industrial dischargers over 1,000 GPD

Table 13. Industrial dischargers over 1,000 GPD

Name	Type of Industry	Approximate Average Daily Discharge (GPD)
Hempler Foods Group	Sausage, Ham, Bacon Production	20,000
Republic Services (formerlyRecomp)	Solid Waste Transfer Station	8,000
Botanical Labs	Dietary Supplement Manufacturing	6,000
Cascade Dafo	Dynamic Orthoses Manufacturing	1,500
Bellingham Marine	Docks, Concrete Manufacturing	1,500
Sauder Moulding	Wood Moulding Manufacturing	1,500

III. FUTURE SEWER SERVICE REQUIREMENTS

The City will only provide sewer service where it is legally possible to do so considering applicable zoning and development regulations. See City of Ferndale Municipal Code *13.36 Water and Sewer Service Extensions Outside of City Limits:*

> *The City of Ferndale has established a policy intended to restrict private-use water and sewer extensions outside of the City limits, except in those cases where an imminent health emergency exists. Extensions of water and sewer service outside of the City limits are prohibited when such extensions would result in the further development or expansion of nonessential public or private services or uses.*
>
> *If the City Council determines that an extension is warranted, such service will be permitted only on an individual contractual basis for specific property, which contract or agreement will specify the terms and conditions of such service in detail, including any exceptions allowed and any conditions imposed which may be different from the statement of policy of this chapter. The City shall not have an express or implied obligation to provide sewer and/or water service to any property outside the City limits, regardless of that property's location within an Urban Growth Area, in close proximity to services, or in an area that is otherwise served by the City. (Ord. 1777 § 1, 2013; Ord. 716 § 3, 1983).*

Details for potential developer extension/ULID facilities that are included in this section are conceptual; their infrastructure improvement projects are highly dependent on the nature of the development.

A. Potential Growth in the Sewer Collection System within the City limits

The City plans to extend the sewer collection system within the City limits as the opportunity arises, such as in conjunction with a road reconstruction project or a new development project. At this time, there are several known potential areas for expansion within the City's service area.

1. Sewer Extensions with Road Reconstruction (TIP project)

   Of the road projects identified on the City's 2016-2021 Six-Year Transportation Improvement Program (TIP), there are no candidates for installing new sewers in conjunction with the road reconstruction projects.

   Labounty Drive (Seahawk to Sunset) had been in a previous TIP and has a section that currently does not have a gravity sewer main. This potential extension was moved to the 7-20 year CIP. The extension will consist of an 8-inch to 12-inch gravity sewer lines and side sewers to service the existing properties currently on septic systems. (See Exhibit H for maps of these potential extension locations).

   Additional sewer extensions with road projects in the City's transportation improvement projects will also be possible, and will be evaluated during periodic updates to both plans.

2. Thornton Street Sewer Main Extension (inside City Limits).

   This extension will install approximately 4,000 feet of new 15-inch diameter PVC pipe east along Thornton Street from Malloy Ave. to I-5, then south to connect to the existing 18-inch gravity sewer at Second Street, south of the I-5/Portal Way Interchange. The project will relieve capacity issues on the Malloy Ave gravity trunk and re-route them to Portal Way trunk main which has sufficient reserve capacity. The extension will also provide a trunk main to the large undeveloped area of primarily Industrial and Commercial zoned territory within the City limits.

3. North Malloy (inside City Limits).

   This area was previously annexed by the City and includes approximately 170 acres that are between Malloy Road and I-5, south of Brown Road (see Exhibit B-3). The land use designations for this area are Industrial and Low Density Residential. The topography of this area generally slopes to the east. The portion north of this area Aldergrove Road was included in the Grandview feasibility study (see Section III.B.1). This area could flow to the existing 15-inch gravity trunk main on Portal Way east side of I-5 via a future Grandview Rd Trunk Main, pump station, and Portal Way force main (and across I-5).

   That area and the remaining area south of Aldergrove Road may also be able to be served by a sewer main flowing south parallel to the BNSF railroad, and connect to the Thornton Street Sewer Extension (see #2 above).

   A sewer extension to this area is anticipated to be funded by a developer extension contract or a ULID encompassing the benefited properties.

4. Thornton South Service Area (inside City Limits).

   This area was previously annexed by the City and includes approximately 95 acres that are south of Thornton Road. The land use designation for this area is Low Density Residential. The topography of this area has some moderately steep slopes that culminate in a low spot near the northwest corner of the area. The sewer extension consists of a gravity sewer and a pump station (at low spot in Thornton Road near the City Limits) and a force main to east. (See also Section II.B. Thornton North UGA). This pump station is a regional pump station and is sized to handle anticipated flows from other Thornton South development as well as Thornton North (see Exhibit B-3). Some low lying areas, if ever developed, may need their own small lift station(s).

   This sewer extension is being funded by a developer extension contract with City participation in the Thornton Regional Pump Station and a gravity sewer extension. This project was completed in spring 2016 and will be placed in service when the subdivision is approved.

5. West Slater (inside City Limits).

   This area was recently annexed by the City and includes approximately 25 acres located south of Slater Road (see Exhibit B-3). The land use designation for this area is Industrial. The topography of this area has several flat benches with steep slopes in

between. The existing developments can be served be gravity connections to the existing 8-inch sewer main in Slater Road.

A portion of the land in this subarea is held in trust by the United States Government for the benefit of the Lummi Nation. The City also anticipates that an agreement would be made to utilize the City's water and sewer systems already available in the area. A review of the impacts of this level of development has been completed and the results are summarized in a Technical Memorandum, attached to this Plan as Exhibit M.

6. Riverbend (inside City Limits).

   This area includes approximately 13 acres located south of Newkirk Road on the east side of the City. The City of Ferndale Comprehensive Plan land use designation for this area is High Density Residential. This area was annexed in 2012. The topography of this area is relatively flat and the obvious alignment down Newkirk Road may not provide a sufficient drop in elevation to provide enough slope for a typical 8-inch or 10-inch gravity sewer. A larger diameter pipe does not need as much slope, or a small pump station could be installed to address the flat topography. Another alternative that could be explored is to obtain easements as needed across one or more properties to the west of Riverbend area that would enable the sewer to connect to a deeper manhole on Portal Way, if the elevations do not work for a gravity sewer along the Newkirk alignment.

7. Sewer Extension Inquiry for Smith Road

   Previously the City received an inquiry regarding the possibility of extending sewer service to a residential property with a failing septic system on West Smith Road. The property is within the City limits and is zoned for general business, and the nearby area is zoned light industrial. The extension is expected to consist of about 600 LF of 8-inch sewer main and two new manholes. One construction challenge for this extension is that it crosses under the I-5/Smith Road interchange and will therefore require the pipe to be installed in a casing that is bored under the road, adding expense to the project. A developer extension contract will be the most expeditious funding mechanism for this project. However, given the benefit the surrounding properties would gain from having the bore already completed when the sewer is further extended, the developer could be eligible for a latecomer reimbursement agreement.

8. Other Developer Extensions / Local Improvement Districts

   There are several properties remaining within the City limits that could be subdivided or grouped to create a development. For any new development that would require extension of sewer mains, the property owner will be required to enter into a developer extension agreement with the City whereby the owner becomes responsible for all design, construction, and inspection costs associated with the new branch sewer line. Design and construction will be required to meet City development standards. At the time the new line goes into operation, the City will be granted ownership of, and operation and maintenance responsibilities for all new sewer facilities associated with the development.

   A local improvement district or utility local improvement district (LID/ ULID) can be a funding alternative for areas with multiple owners and where significant infrastructure

improvements are needed. The process involves a vote of those who will be assessed, but also allows the assessment to be paid off over a period of time (up to twenty years).

B. Potential Growth in Sewer System within the Unincorporated Urban Growth / Urban Reserve 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 / Urban Reserve Area, with the exception of emergencies (City Code 13.36). The City will only expand the sewer collection system into the UGA once an area has been annexed into the City. See City of Ferndale Annexation Blueprint (March 18, 2013) for a map of how annexation phasing may occur.

The City may, however, extend sewer infrastructure outside of the incorporated City limits in order to efficiently serve areas that are within the City limits. An example of this is the Southwest Sewer Interceptor, which includes a section of sewer main installed in the unincorporated area of Imhoff Road that lies outside and between the City limits.

The hydraulic analysis performed in support of this plan has confirmed that the City of Ferndale maintains a sewer capacity sufficient to serve projected growth to 2036. While specific conveyance projects to individual parcels have not been included in the plan, the City has determined that the unincorporated UGA areas can be adequately served with the construction of projects as described below. The cost of such improvements will be borne by development unless or until the City adds the project as a capital facility improvement.

Exhibit B-3 shows the future areas to be served by City sewer. The areas are grouped by how they were incorporated into the hydraulic model. Below is a summary description of the areas and the projects required to provide sewer service.

1. Grandview Area Sewer (East-City Limits and West-UGA)

   The options for extending sewer service to this area for commercial development are outlined in a feasibility study provided to the City. This study was included in the previous Sewer Plan (2011) and included again (with no revisions) as Exhibit G. Subsequent to 2011, a portion of the area (most of the East area) has been annexed into the City. The remaining area is still UGA. The improvements required for sewer service to these areas are still interdependent, and discussed below.

   The Grandview East area sewer extension will include over 10,000 LF of 8-inch and 12-inch gravity trunk sewer mains and sewer mains, over 5,000 LF of 4-inch force main, and a new pump station.

   For the Grandview West area, several alternatives were reviewed. The alternative most likely to be implemented has the main interceptor and force main alignment along Portal Way and uses the Portal Way overpass to cross Interstate 5. This project will require over 12,000 LF of 8-inch sewer main and 15-inch gravity trunk main, over 8,700 LF of 12-inch force main, and a new pump station.

   Under either alternative, the property owner(s) will be required to enter into a developer extension agreement with the City whereby the owner becomes responsible for all design,

construction, and inspection costs associated with the new branch sewer line. At the time the new line goes into operation, the City will be granted ownership of, and operation and maintenance responsibilities for all new sewer facilities associated with the development.

2. Brown Urban Growth Area

   This area includes approximately 315 acres located south of Brown Road, north of Aldergrove Road west of Malloy Road and east of Church Road. The City of Ferndale Comprehensive Plan land use designation for this area is Low Density Residential, and is expected to be annexed in the 16-21 year timeframe (planning estimate per the City of Ferndale Annexation Blueprint; Annexation Phasing Plan 2013-2034). The western 255 acres is UGA Reserve and would be eligible for annexation beyond year 2029. The topography of the area shows it sloping to the east, and as a result, the City anticipates that the area could be served by an 8-inch to 10-inch gravity sewer down to a trunk main in Malloy Road.

3. Aldergrove Urban Growth Areas (West, Central, and East)

   These areas include approximately 460 acres located south of Aldergrove Road, north of Thornton Street, west of Malloy Road, and east of Church Road. The City of Ferndale Comprehensive Plan land use designation for these areas is Low Density Residential. The central area plus the area east of Church Road in the west area is expected to be annexed in the 8-15 year timeframe. The remaining West Area is expected to be annexed in the 0-7 year timeframe. The west and central Areas slope relatively steeply to the east and south, so an 8-inch or 10-inch gravity sewer would be sufficient to serve these areas. The actual point of connection to the existing sewer will depend on topography and the development layout.

   The East Aldergrove Area is expected to be annexed in the 8-15 year timeframe. The topography of this area is generally sloping to the east so the area could be served by an 8-inch or 10-inch gravity sewer connection to either a future pump station and force main in Malloy Road or a main running south along the BNSF railroad (if easements could be obtained).

4. Mid-Church Urban Growth Area (at Stoneyfield)

   This area includes approximately 35 acres located west of Church Road. The City of Ferndale Comprehensive Plan land use designation for this area is Low Density Residential. This area is expected to be annexed in the 6-10 year timeframe. The topography of these areas is sloping to the south-east so one would anticipate the area could be served by an 8-inch or 10-inch gravity sewer connection to the existing sewer collection system. The actual point of connection will depend on topography and the development layout.

5. Thornton North Urban Growth Area.

   This area includes approximately 120 acres located mostly north of Thornton Road, near the west City limit. The City of Ferndale Comprehensive Plan land use designation for this area is Low Density Residential. This area is expected to be annexed in the 0-7 year timeframe. Given the size and expected population density and given that the topography slopes to the southwest, it is expected that this area can be served by an 8-inch or 10-inch gravity sewer main. This sewer main would flow to the new Thornton Road Pump Station described above in III.A.4. *Thornton South (inside City Limits*).

7. Mountain View Urban Growth Area

   This area includes approximately 172 acres located north of Mountain View Road. The City of Ferndale Comprehensive Plan land use designation for this area is Low Density Residential. About 22 acres in the north-east area is UGA and is expected to be annexed in the 0-7 year timeframe. The topography of this area is relatively steep and sloping to the south. A portion of the 22 acres could be served by a gravity sewer to the west.

   The remaining area includes 150 acres that are UGA Reserve and would be expected to be annexed well beyond year 2029. These areas also slope to the south and one would anticipate they could be served by an 8-inch or 10-inch gravity sewer connection to the 12-inch sewer main in Mountain View Road. This trunk would continue east and connect to the existing sewer system in Main Street.

8. Douglas Urban Growth Area

   This area includes approximately 63 acres located north of Douglas Road and south of Main Street. The City of Ferndale Comprehensive Plan land use designation for this area is Low Density Residential and the middle 25 acres is expected to be annexed in the 0-7 year timeframe. The remaining area is UGA Reserve. The topography of the north portion of this area is relatively steep and sloping strongly to the south-east. The south portion of this area has a more gradual slope to the south-east. For the model, it was assumed that the area would be served by an 8-inch or 10-inch gravity sewer connection to a trunk sewer in Douglas Road. However, depending on how the area develops, a portion of the north area may connect to a trunk sewer in Church Road. This alternative does not impact the model results.

9. Schell Creek Urban Growth Area

   This area includes approximately 88 acres located east of Imhoff Road and northwest of the WWTP. Schell Creek runs through the area. The City of Ferndale Comprehensive Plan land use designation zoning for this area is Residential-Unspecified and it is expected to be annexed in the 0-7 year timeframe. The topography of the north portion of this area is relatively flat and is characterized by wetlands. The existing developments in this area can be served by the Southwest Sewer Interceptor in Imhoff Road. The remaining area is unlikely to be developed and the City may use the area for future wetland mitigation programs.

10. East Slater Urban Growth Area

    This area includes approximately 130 acres located east of I-5 and includes the I-5/Slater Interchange. The land use designation for this area is UGA Reserve, with the exception of Washington State Department of Transportation (WSDOT)-owned properties within the interchange itself. The WSDOT-controlled properties are within the Ferndale UGA. This entire area will likely be converted to UGA by the end of 2016. The topography of this area slopes moderately to the northwest and may be served by a gravity sewer crossing under I-5. Because the flow from this area will flow by gravity to Pump Station #17, the capacity of this station, and the other downstream stations that re-pump the flow (Pump Stations #2 and #4), will need to be analyzed, and the pump stations upgraded if necessary.

IV. SEWER RATE STRUCTURE AND REVENUE PLANNING

A. Requirements for Connection to the City Sewer System

The requirements for connecting to the City sewer system are listed in the City's municipal Code Chapter 13.20. Developed properties that lie within the City limits are required to connect to the sewer.

There are existing septic systems within the City limits that were allowed to be installed in areas that did not have sewer collection mains (see Exhibit E-2). When public sewer becomes available, the properties served by septic systems must connect to the public sewer either when the on-site system fails, or when certain repairs, reconstruction, or improvements are made (see Code for details).

The City is considering additional conditions under which connection to the public sewer will be required when new sewers are installed, and have recently added an incentive program to encourage septic system owners to connect in a timely manner.

B. Revenue Planning

The City performs a review of the sewer rate schedule regularly to determine that these charges are sufficient to generate revenue to offset the cost of all necessary operation and maintenance of the City sewer system. In the event that this review indicates a necessary revision of user charges, the City amends the rates by formal ordinance of the City council.

With the substantial updating of the Sewer Capital Improvement Plan for this Comprehensive Sewer Plan, the City will incorporate the revised projected capital expenditures into its rate calculations. The result will be recommendations regarding sewer rate adjustments aimed at bringing revenues in line with annual operating and current and future capital obligations.

Additionally, recommendations regarding the connection charge for new customers connecting to the system will be prepared and reviewed by the Council before implementation.

The City will also investigate grants, loans, and possibly bonds to fund the Sewer Capital Improvement Projects in the near term. The City procured a bond in 2014 for major capital improvements and intends to apply for a State Revolving Fund Loan (Ecology) or procure bonds for the Phase III WWTP upgrade circa 2019-2020.

C. Sewer Rate Structure

The City sewer service rates and charges outlined below shall be subject to change by ordinance of the City council as conditions warrant.

1. Sewer Service Rates

The City bills for sewer service on a bi-monthly schedule. The calculation of bi-monthly sewer charges is based on water meter usage for metered customers, and is a flat rate for non-metered customers. The current Water and Sewer Rates and Fees for the City are attached as Exhibit F, which includes the details for the sewer rates.

2. Sewer Connection Fee

The City currently assesses $ 7,293 per Equivalent Residential Unit (ERU) for the base Sewer Connection Fee. Additional fees may also apply. The City also charges fees for inspection in accordance with the current Fee Code and Fee Summary (Ordinance #1605).

The Fee Code and Fee Summary Schedule, and Water and Sewer Rates and Fees are incorporated here by reference. The current schedules (2016) are included in Exhibit F.

3. Cost per Service

The City's cost per service currently is about $665 per ERU/year in terms of debt service and operation and maintenance costs. This cost includes $321 per year in operation and maintenance costs. Debt service costs are $344 per year. Debt service will decrease by $100 per ERU/year once the 2005 bonds are paid off in 2016. See Table 14 below. Future estimated costs are also shown (in future dollars). Future costs assume a 3 percent rate of inflation.

Table 14. Yearly Cost Per Sewer Service

	Yearly Cost per Equivalent Residential Unit (ERU)				
Year	**2016**	**2021**	**2026**	**2031**	**2035**
Expense	2016 dollars	2021 dollars	2026 dollars	2031 dollars	2035 dollars
Debt Service	$344	$246	$223	$202	$91
Operations & Maintenance and Administration	$321	$343	$366	$391	$413
Total	**$665**	**$588**	**$589**	**$593**	**$504**

D. Funding Capacity

The City expects to have sufficient revenue to fund the City's sewer system operations and maintenance, debt payment, and future sewer capital improvement projects.

The City's wastewater fund annual revenue is currently about $3,600,000 from utility rates and connection fees. The City's wastewater fund total revenue is conservatively anticipated to be in the range of $115,000,000 to $135,000,000 over the next 20 years (2016 – 2035 inclusive). This timeframe includes the Phase III WWTP capacity upgrade.

Sewer service fees and connection fees revenue are projected to increase at a 3% per year due to inflation and another 2% per year due to customer growth.

During this same time period, expenses are anticipated to be in the range of $114,000,000 to $134,000,000.

Operations and maintenance expenditures are currently about $1,600,000 per annum. Operations and maintenance costs are projected to increase at about 5% per year due to inflation and growth (3% due to inflation; some budget line items have no growth). Total operations and maintenance costs are expected to be in the range of $42,000,000 to $48,000,000 over the next 20 years (2016 – 2035 inclusive).

Capital expenditures are currently about $2,000,000 per annum. Planned capital expenditures are expected to be in the range of $48,000,000 to $58,000,000 over the next 20 years (2016 – 2035 inclusive).

The remaining expenses include existing and future debt repayment.

A summary of the anticipated revenues and expenditures for the City's wastewater system is shown below in Table 15.

Table 15. Revenue and Expenses Summary 2016-2035

	Low Estimate	Mean Estimate	High Estimate
Revenue	$ 115,000,000	$ 125,000,000	$ 135,000,000
Expenses			
O & M/Admin	$ 42,000,000	$ 45,000,000	$ 48,000,000
Capital Plan	$ 48,000,000	$ 53,000,000	$ 58,000,000
Debt Service	$ 24,000,000	$ 26,000,000	$ 28,000,000
Total Expenses	$ 114,000,000	$ 124,000,000	$ 134,000,000

The City, therefore, has a sufficient revenue stream to fund operations and maintenance, debt service, and capital improvements and to obtain new bonds. Additional funds can be allocated/reserved for emergency projects, unanticipated projects, and/or sewer extensions. However, it is the City's stated policy that developers fund sewer extensions to unserved areas. The City's existing sewer collection and treatment systems have sufficient capacity (with planned improvements) to provide sewer service to growth within the City limits and UGA for the next twenty years.

V. FUTURE IMPROVEMENT PROJECTS

This section describes the major improvement projects that are scheduled for the next six years. The City has developed 6-year and 20-year sewer capital improvement plans, which are included in Exhibit H. The Exhibit includes the anticipated project schedule and estimated project costs. It should be noted that the Capital Improvement Plan in years 2021-2035 is based on the best information available at this time and may not include all future sewer capital projects. The CIP will continue to be refined and updated as more information becomes available.

A. Future Maintenance and Operational Improvements

1. Sewer Inspection Program

   The City has an ongoing sewer inspection program. As a part of the regular maintenance program for City facilities, staff will continue to video portions of the collector system annually in an effort to identify possible points of I & I into the system. Areas to video are targeted based on pump run times (as an indication of I & I severity) and the majority of the work will be performed during the wet season in order to see active leaks. The City is also able to inspect manholes with the camera as they pass through them. If repair work is deemed necessary, the City will perform the work as part of the regular maintenance program.

2. Smoke Testing Program

   The City plans to embark on a systematic smoke testing program within its collection systems to aid in identifying potential sources of I & I as a part of the ongoing facilities maintenance program. In the event that a potential significant I & I source is identified through the smoke testing program, the City will follow-up with a CCTV camera inspection of the subject area to determine if repair work is required. If repair work is deemed necessary, the City will perform the work as part of the regular maintenance program.

   The smoke testing program may also identify locations where there are stormwater or drainage connections such as roof drains or foundation drains to sewer mains. If such connections are identified, the City will notify the property owner, and require the connection be removed.

3. Sewer I & I Projects - Miscellaneous Sewer Line Repairs

   The age of City's sewer collection and force main systems range from new to over forty years old and approaching the end of their expected design life. As a part of ongoing regular maintenance on the system, the City monitors the existing underground sewer lines for signs of leakage and/or failure. As a part of this project, the City will perform sewer repair and/or replacement work as necessary to ensure a functional and environmentally safe system. The line repairs include both trenchless spot repairs as well as repairs that require excavation.

4. Sewer I & I Projects - Manhole Rehabilitation

   The City staff have observed I & I that originates in the sewer manholes. The City is inspecting manholes for deterioration and leaks as part of the ongoing sewer videoing program and will develop a priority list of manholes in need of rehabilitation.

B. Future Administrative, Financial and Planning Improvements

1. Emergency Response Plan

   Currently, the City has an existing Emergency Response Plan that outlines City priorities and activities in response to an emergency event such as natural disasters, vandalism, catastrophic equipment failures, etc. The City will update the existing Emergency Response Plan, as necessary, to ensure compliance with applicable federal regulations and the requirements of the Department of Homeland Security. The City will continue to conduct emergency response training exercises and drills with staff to enhance emergency preparedness. The City intends to prepare a sewer-specific Emergency Response Plan in 2016.

2. Geographic Information System (GIS) Development / Maintenance

   In 2010 the City began development of a sewer system GIS to aid in planning, administration, and operation and maintenance record keeping for the City's sewer facilities. To date, the GIS includes surveyed manhole and pump station locations, most pipe locations, and some data on pipe size and material, in addition to the general City information including topography, property parcel, roads, zoning, and land use planning. As part of the ongoing development of this program, the City will continue to augment and update the GIS to include additional information on the sewer facilities.

3. Sewer Service Rate Increases

   The City will implement recommended incremental rate increases resulting from the City's in-house financial rate study. The rate increases will assure that the City is adequately recovering the true costs of running the system, including paying back all existing and anticipated loan funds. By adequately recovering the true costs for system operation and maintenance, the City staff will be able to perform adequate, routine maintenance activities, which will add to the service life of the system. Additionally, implementing the recommended rate increases outlined in the rate study will allow the City to maintain the appropriate reserves required for emergencies, if revenues meet regular expenses.

4. Develop an Inflow and Infiltration Reduction Program

   As part of this activity, the City will prepare an inflow and infiltration reduction program. The program will include a sewer video inspection plan, a smoke testing plan, a spot repair and manhole grouting implementation plan, and a plan for deploying other I&I mitigation measures.

C. Future Sewer Capital Improvement Projects

1. Pump Station Upgrades – Ongoing

   The City has completed several pump replacements and upgrades in the last six years and has several currently in progress. The City plans to continue replacing and/or upgrading aging pump stations. The proposed schedule for these replacements / upgrades is included in the City's Sewer Capital Improvement Plan (see Exhibit H).

   Each pump station will be evaluated to determine the specific upgrades required. Upgrades will typically include new pumps and new controls at the least. Flow monitoring may be performed at some pump stations to verify capacity requirements in relation to predicted needs. Replacement of the aged pump and control equipment will result in increased reliability, reduced emergency call-outs, and reduced equipment operation costs.

2. Miscellaneous Sewer Line Replacement and Repair

   It is the City's policy to review the underground utility needs when it prepares to do any major work on City streets. As part of this planning process, the projects on the current 2011-2016 Six-Year Transportation Improvement Program (TIP) projects were evaluated to determine the associated sewer collection system needs. These projects include:

TIP: Thornton Street - Vista to Malloy	CIPP- slipline 1,725 ft of 8-inch diameter RCP; replace manholes
TIP: Legoe Avenue	Capacity is adequate; CIPP- slipline 1,350 ft of 10-inch RCP; replace manholes
TIP: Ferndale Terrace	Replace 1,700 ft 6-8 in clay with 8-inch PVC

   The results of the hydraulic model highlighted several areas where the sewer collection system is under capacity or nearing capacity (flow is 85% or more of maximum capacity). Details on the analysis and results are included in Exhibit I. The model also showed several areas with pipes that are adversely sloped. This is based on the best available information from the City's sewer survey and should be confirmed before proceeding to the project level. The major projects generated by the model were also identified by staff as problem areas.

Malloy Ave from Golden Eagle to Thornton Street	CIPP- slipline 3,500 ft of 8-inch diameter RCP; replace manholes **Add 4,000 ft 15-inch diameter interceptor (Thornton Street Sewer Extension)**
LaBounty Drive between I-5 to MH 3564	1,200 ft; increase to 24 -inch diameter

   The City has identified several sewer line replacement projects from the ongoing sewer collection system video inspections. The projects below represent areas with poor flows, separated joints, and/or excessive gravel getting into the pipes.

Pipe Bellies (several locations)	Replace 700 ft of 8 -inch diameter

3. Pump Station Decommissioning

The City identified pump stations where gravity sewer pipelines could be installed to bypass the pump stations in the previous Comprehensive Plan. The pump stations could then be removed and decommissioned. One has been decommissioned (PS #21 Ariel Court) since that report. Three additional pump stations have been identified as candidates for decommissioning. The three stations scheduled for decommissioning are PS #11 - Aquarius / Apollo, PS #15 Smith Rd / Bellaire Estates, and PS #19 Malloy Village.

PS #10 Aquarius/ Apollo serves a larger area, and will need new easements for the gravity line from the pump station location to the gravity collection system in Parkland Drive. There are capacity issues in the downstream collection system that must be addressed before this pump station can be decommissioned. These include:

- Malloy Avenue from Golden Eagle to Thornton (3,700 feet)
- Thornton at Malloy Avenue (300 feet)
- Malloy Avenue from Thornton to Oxford (900 feet)
- Miscellaneous upgrades in residential areas (approximately 1,400 feet; increase pipe diameter on minimum slope sections to increase capacity)

As mentioned above, the first three collection system projects are already required for existing and future projected needs, and the additional flow from the PS #10 service area does not significantly increase the needed improvements. The fourth project includes the pipes between the pump station and Malloy Avenue identified by the hydraulic model as having insufficient capacity for the future predicted flows. These are primarily 8-inch pipes installed at their minimum slope of 0.4%. Those segments can be replaced with 10-inch pipes to achieve sufficient capacity.

It should be noted that the hydraulic model also showed insufficient future capacity in a 170-ft section of Shannon Avenue (just north of Thornton St) if PS #10 was not re-routed and decommissioned and additionally was upgraded to meet future projected needs. The projected cost for collection system improvements would be more for the Parkland Dr option, but decommissioning the pump station has the added benefit of reducing ongoing maintenance and operational costs.

Decommissioning PS #15 is relatively straight forward; requiring about 830 ft of 8-inch sewer pipe installed about 12-14 feet deep and two new manholes, but will likely require extensive dewatering. Decommissioning this pump station will eliminate existing and long term operation and maintenance costs related to the station. It also reduces peak slug flows from the pump station discharge, which is currently significantly oversized, and adversely impacts downstream capacity during modeled peak hourly flows.

The ability to decommission PS #11 and PS #19 is dependent on the installation of the Thornton Street Sewer Extension and obtaining easements across private property. With an easement adjacent to the railroad right-of-way, a gravity sewer could be extended south from PS #19 to connect to the Thornton Street Sewer Extension. PS #11 could then be routed east, across private property to connect to the new south gravity line, or follow City roads south and east to connect to the Thornton Street Sewer Extension.

5. Sewer Cure-in-Place Pipe-Sliplining Projects (CIPP-Sliplining)

   Many of the older sewer mains in Ferndale are reinforced concrete pipe or vitreous clay pipe with joints every 10 feet. These pipe materials are more susceptible to the corrosive effects of sewer gasses. In addition, the two sewer siphons on Main Street and some of the pump station force mains are cast iron or ductile iron, which are also susceptible to corrosion if the pipe is not cement-lined, or if the lining is compromised.

   CIPP-Sliplining involves inserting a pliable liner into a cleaned sewer pipe, and then expanding it with water or steam to conform to the inside of the pipe and cure. The City has identified numerous pipes that would be candidates for CIPP sliplining instead of complete pipe replacement. Several specific projects have been identified for CIPP rehabilitation in the next 6 years, and an annual budget to address the repair and rehabilitation of the oldest pipes in the City's system is included in the Capital Improvement Plan.

   The first candidates for this technique are the two parallel sewer siphons (8-inch and 12-inch concrete pipe) on Main Street. During recent road construction work, a hole was discovered in the 8-inch pipe and repaired. The City will obtain a sonar condition assessment for both pipes before proceeding with lining one or both of the siphons.

6. Developer Extension Projects

   The City regularly reviews applications by Developers to extend City sewer facilities. The City requires the Developer to provide engineered plans prepared in accordance with the City Standards, and requires regular inspections to ensure installation is according to the approved plans.

7. Utility Local Improvement Projects

   The City will review any petition from property owners for extension of sewer service. Two potential areas that might petition for service are the low density rural residential UGA on the west side of the City, the recently annexed area south of Slater Road, and the recently annexed area along Portal Way at Grandview

   Under certain conditions, the City may install new facilities for specific areas under the Utility Local Improvement District (ULID). ULID-funded projects are paid for by the property owners within the ULID, either in a lump sum or over time (with interest).

8. Wastewater Treatment Plant Upgrade

   The Phase III WWTP upgrade is tentatively scheduled for 2017-2019. See the facility plan for evaluation of upgrade alternatives.

VI. SUPPLEMENTAL INFORMATION

A. Public Water System Information

The City owns and operates a public water system within its boundaries (ID #24850 M). The City's Water System Comprehensive Plan was approved by DOH in 2010. An updated Water System Comprehensive Plan is being prepared concurrent with this sewer plan. See http://www.cityofferndale.org/government/departments/public-works/water/city-water-system-plan .
There are also several small Group A and Group B water systems that operate within and near the City's boundaries. These systems, along with numerous private wells, are shown in Exhibit E.

As shown in Exhibit E, there are no private or public wells near the City Wastewater Treatment Plant (WWTP). PUD No. 1 of Whatcom County has a Nooksack River water intake, treatment facilities, and pump station located just north of the City's facilities.

The City's water treatment plant and primary pump station are located in an enclosed building that is located about 550 feet from the wastewater lagoons. Otherwise, there is a substantial distance between the location of City water distribution structures and the City's domestic wastewater treatment facilities. PUD No. 1 of Whatcom County has water treatment facilities at Plant No. 1, which are also located about 550 feet from the lagoons and are unenclosed. However, this facility does not produce potable water; it produces industrial use quality water, of which a portion is treated further and used as potable water. The PUD's 24-inch high pressure force main traverses north and then east, in line with Douglas Road.

The City's water supply comes from two City-owned deep aquifer wells (prior to 2012, the City's water source was the Nooksack River). These two wells are located about 0.7 miles northwest of the wastewater treatment plant. The source water has about 600 mg/L total dissolved solids, about 260 mg/L alkalinity, about 170 mg/L hardness, and pH of about 8.2. The higher alkalinity (i.e., compared to <80 mg/L for the pretreated Nooksack River water) has allowed the WWTP operators to eliminate lime addition that was previously needed during summer nitrification). Drinking water consists of a blend of reverse osmosis treated water and greensand treated water. The reverse osmosis concentrate waste stream is discharged to the WWTP. It consists of high mineral content groundwater (i.e., minerals, including alkalinity, are concentrated by a factor of about 10) and antiscalant. Greensand treatment backwash water, which flows to the wastewater treatment plant, may be somewhat higher in suspended solids and will be high in manganese precipitates.

B. Service Area Physical Characteristics

The City of Ferndale is located on the Interstate-5 corridor, approximately 6 miles north of Bellingham and 13 miles south of the Canadian Border. The City straddles the Nooksack River. More information on the topography, hydrology, and soils of the area can be found in Exhibit N – Service Area Physical Characteristics has maps of the entire service area showing streets, topography, surface drainage, and soils. No proposed streets are shown, as there are no proposed new streets in the 6-year transportation plan.

C. Water Quality Management Plan Compliance

This Plan is in compliance with the adopted water quality management plan under the Federal Water Pollution Control Act as amended. The treated effluent has been in compliance with the

requirements of the Lower Nooksack River TMDL for Fecal Coliform (28 cfu/100 mL monthly geometric mean; 400 cfu/100 mL average weekly).

D. Environmental Policy Act Compliance

This Plan is in compliance with the State Environmental Policy Act (SEPA). A non-project SEPA Mitigated Determination of Non-significance (MDNS) was issued on March 16, 2016. The proposal is a non-project action to update the City of Ferndale's existing comprehensive plan (adopted 1997, updated 2005, with additional annual amendments to certain elements) in accordance with Washington State requirements and in coordination with Whatcom County.

E. Nearby Wastewater Treatment Facilities

Other wastewater facilities within the Nooksack River watershed or in Whatcom County and within twenty miles of Ferndale include:

Permit Type	Facility Name	Permit Number	Address	City	Zipcode
Municipal NPDES IP	BELLINGHAM STP	WA0023744	200 MCKENZIE AVE	Bellingham	98225
	BIRCH BAY STP	WA0029556	7096 POINT WHITEHORN RD	Blaine	98230-9675
	EVERSON STP	WA0020435	101 PARK DRIVE	Everson	98247
	Lighthouse Point Water Reclamation Facility	WA0022641	272 Marine Drive	Blaine	98230-9328
	LYNDEN STP	WA0022578	800 S 6TH ST	Lynden	98264
	WA PARKS LARRABEE WWTP	WA0023787	249 CHUCKANUT DR	Bellingham	98229
Industrial to ground	COUNTY CONSTRUCTION RECYCLERS INC	ST0007429	1964 E HEMMI RD	Everson	98247
SWDP IP	HANNEGAN PROPERTIES LLC	ST0007285	6069 HANNEGAN RD	Bellingham	98226-9702
	Perdue Foods LLC - Lynden Hatchery	ST0501276	6323 GUIDE MERIDIAN RD	Lynden	98264
Industrial NPDES IP	Bellingham Airport Woodwaste Landfill	WA0032239	4255 MITCHELL WAY NO 2	Bellingham	98226-9157
	BP CHERRY POINT REFINERY	WA0022900	4519 GRANDVIEW RD	Blaine	98230
	BROOKS MFG	WA0030805	2120 PACIFIC ST	Bellingham	98229
	DARIGOLD LYNDEN PLANT	WA0002470	8424 DEPOT RD	Lynden	98264-1400
	GEORGIA PACIFIC WEST BELLINGHAM	WA0001091	300 W LAUREL ST	Bellingham	98225
	HILLTOP WOODWASTE LANDFILL	WA0031984	5733 EVERSON GOSHEN RD	Everson	98247
	INTALCO ALUMINUM CORP FERNDALE	WA0002950	4050 MOUNTAIN VIEW RD	Ferndale	98248
	LEHIGH NORTHWEST CEMENT CO	WA0001198	741 MARINE DRIVE	Bellingham	98225
	OESER CO	WA0030813	730 MARINE DR	Bellingham	98225-1530
	Phillips 66 Company Ferndale Refinery	WA0002984	3901 UNICK RD	Ferndale	98248
	PRAXAIR INC	WA0030350	4466 ALDER GROVE ROAD	Ferndale	98248-9619
	PUGET SOUND ENERGY WHITEHORN	WA0030601	4930 BROWN RD	Blaine	98230
	Puget Sound Energy, Ferndale Generating Station	WA0031291	5105 LAKE TERRELL RD	Ferndale	98248
	PUGLIA ENGINEERING INC	WA0031348	201 HARRIS AVE BLDG A	Bellingham	98225
	WA DFW BELLINGHAM HATCHERY	WA0031500	1700 SILVER BEACH RD	Bellingham	98226-2400
	Whatcom Cnty Cedarville Landfill	WA0501490	CEDARVILLE RD N OF MT BAKER HWY	Bellingham	98226
Industrial (IU) to	Active Berry Packers LLC	ST0045505	204 1ST ST	Lynden	98264
POTW/PRIVATE	BELLINGHAM COLD STORAGE	ST0007426	2825 ROEDER AVE	Bellingham	98225-2053
SWDP IP	BORNSTEIN SEAFOODS INC	ST0007304	1001 HILTON AVE	Bellingham	98225-2908
	Cesco Solutions Inc	ST0045533	2215 MIDWAY LN	Bellingham	98226
	Fairweather Foods	ST0007392	406 2ND ST	Lynden	98264-1407
	FLORA INC	ST0007438	805 E BADGER RD	Lynden	98264
	HOME PORT SEAFOODS	ST0007362	2875 ROEDER AVE HOME PORT	Bellingham	98225
	JUSTESEN INDUSTRIES	ST0007319	1090 YEW AVE	Blaine	98230-9222
	KING & PRINCE SEAFOOD CORP	ST0007318	710 SQUALICUM WAY	Bellingham	98225
	MT BAKER PRODUCTS	ST0007253	2929 ROEDER AVE	Bellingham	98225-2065
	NATURES PATH FOODS USA INC	ST0007416	2220 NATURES PATH WAY	Blaine	98230
	North American ATK	ST0007428	2020 E BAKERVIEW RD	Bellingham	98226
	OLYMPIC PIPELINE CO	ST0007420	3201 ARBOR CT	Bellingham	98226
	PSE ENCOGEN GENERATING STATION	ST0007336	915 CORWALL AVE	Bellingham	98225
	Q SEA SPECIALTY SERVICES LLC	ST0007440	2825 ROEDER AVE - SUITE 7	Bellingham	98225
	RECOMP OF WA	ST0007289	1524 SLATER RD	Ferndale	98248
	Trans Ocean Products, Inc.	ST0007354	350 W ORCHARD DR	Bellingham	98225
	TRIDENT SEAFOOD BELLINGHAM	ST0007303	2825 ROEDER AVE	Bellingham	98225

F. SEPA

The City of Ferndale issued the following DNS for the non-project SEPA

Community Development Department
P.O. Box 936, 2095 Main Street, Ferndale, WA 98248 - (360) 685-2368

DETERMINATION OF NON-SIGNIFICANCE

Description of Proposal: The proposal is a non-project action to update the City of Ferndale's existing comprehensive plan (adopted 1997, updated 2005, with additional annual amendments to certain elements) in accordance with Washington State requirements and in coordination with Whatcom County. One change to the Official Land Use Map is included, modifying the Land Use designation and zoning for approximately one acre of land at Legoe Avenue from Medium Density Residential to High Density Residential, rezoning the property to Residential Multi-Family.

Overall, the Comprehensive Plan update plans for 6,833 new residents and 4,000 new employees within the City limits. The plan is intended to modify the existing plan by making it more visual, adding a companion multi-media presentation to each element, converting the document based on the expectation that it will be read primarily online or on a screen, adding breakout sections, infographics, hyperlinks and similar elements, and generally reducing the text within the document.

The City also plans to more closely link the various elements together to ensure that they refer to one another in terms of both referencing Growth Management Act requirements as well as enabling decision makers to easily consider multiple projects at one time through a consolidated master capital project map. In some cases, the City has studied growth in certain areas that may exceed the basic allocations provided by Whatcom County. The purpose of these modeling exercises is to ensure that capital projects can either be expanded over time, or are built with sufficient capacity to support projects that are more intensive than could be anticipated by the basic allocations.

The plan includes the conversion of approximately 100 acres at the northeast quadrant of Slater Road and Interstate Five from Urban Growth Area Reserve to

Urban Growth Area in anticipation of rapid growth in this area – generally the result of planned development on lands controlled by the Lummi Nation as well as current development within the City of Bellingham at Bakerview Road. No additional UGA expansions are planned as part of the current update.

This strategy is intended to protect existing neighborhoods while allowing for (and describing) a variety of infill development approaches and a gradual increase in overall residential density.

Subsequent changes to plan and codes will conform to and implement this Comprehensive Plan.

Proponent: City of Ferndale. Contact: Jori Burnett, Community Development Director

Location of Proposal: Citywide

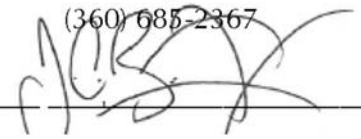
Lead Agency: City of Ferndale

The lead agency has determined that the proposed project does not have a probable significant adverse impact on the environment. An environmental impact statement (EIS) is not required under RCW 43.21C.030(2)(c). This decision was made after review of a completed environmental checklist and other information on file with the lead agency, as well as written comments received during the comment period. This information is available for review by the public upon request.

No mitigation measures were identified.

This DNS is issued under WAC 197-11-350. A 14-day comment period was provided beginning on February 24, 2016 and ending March 9, 2016. Notice of the intent to issue the MDNS was published, posted on the project site, and circulated to interested state and local agencies. No written comments were received during the comment period. No mitigation measures were modified from the original Intent to Issue DNS.

RESPONSIBLE OFFICIAL: Jori Burnett
P.O. Box 936
Ferndale, WA 98248
(360) 685-2367

Date: _March 11, 2016_ Signature: 

VII. GLOSSARY OF TERMS AND ABBREVIATIONS

Average dry weather flow	The average non-storm flow over 24 hours during the dry months of the year (May through September). It is composed of the average sewage flow and the average dry weather inflow/infiltration.
Average wet weather flow	The average flow over 24 hours during the wet months of the year (October through April) on days when no rainfall occurred on that or the preceding day.
Biosolids	Any solids that have settled or have been separated from water or wastewater during a treatment process, such as sedimentation, flotation, and agglomeration.
BOD (Biochemical Oxygen Demand)	A measure of the quantity of oxygen used by microorganisms that consume organic substances. The test measures uptake during oxidation of the carbon and nitrogen based substances and is commonly reported as a "five-day" value reflecting the test period.
CBOD (Carbonaceous Biochemical Oxygen Demand)	A measure of the quantity of oxygen used by microorganisms that consume organic carbon compounds. The test measures uptake during oxidation of the carbon based substances and is commonly reported as a "five-day" value reflecting the test period.
Clean Water Act (CWA)	Also known as the Federal Water Pollution Control Act (33 U.S.C. 1251 et seq.).
Collection main	In collection systems, this is a larger pipe in which smaller branch and submain sewers are connected. The collection main may also be called a main or trunk sewer.
Collection system	In a wastewater system, a collection system is a system of pipes which receives and conveys sewage and/or storm water.
Combined sewers	A sewer that carries both sewage and stormwater runoff.
Complete-Mix Basin	A basin in which the wastewater is rapidly and continuously mixed to create homogeneity throughout the reactor. No settling occurs.
Cost-effective alternative	An alternative control or corrective method identified after analysis as being the best available in terms of reliability, performance, and costs.

Cure-in-Place Pipe - Sliplining CIPP- Sliplining	CIPP-Sliplining involves inserting a pliable liner into a cleaned sewer pipe, and then expanding it with water or steam to conform to the inside of the pipe and cure.
Denitrification	The biological conversion of nitrate nitrogen to nitrogen gas in the absence of oxygen (anaerobic conditions).
Detention Time	The period of time that flowing water or wastewater is retained in a tank, lagoon, or basin. It is calculated by dividing the average daily flow rate by the water volume in the tank.
Discharge, direct or indirect	The release of wastewater or contaminants to the environment. A direct discharge of wastewater flows from a land surface directly into surface waters, while an indirect discharge of wastewater flows into surface waters by way of a wastewater treatment system.
Disinfection	The selective destruction of pathogens. A process applied to treated wastewater effluent, reclaimed water, and residuals that reduces pathogens to levels established for public health protection.
Dissolved Oxygen (DO)	The oxygen dissolved in water or wastewater. Its concentration is typically measured in milligrams per liter (mg/l) or in percent saturation.
DOE	Washington State Department of Ecology.
Domestic wastewater	Human-generated sewage that flows from homes and businesses.
Effluent	Treated water, wastewater, or other liquid flowing out of a treatment facility.
Effluent limits	The maximum concentrations of pollutants in treated wastewater effluent that will not result in an operating permit violation.
EPA	United States Environmental Protection Agency.
Fecal coliform bacteria	A group of organisms common to the intestinal tracts of humans and animals. The presence of fecal coliform bacteria in water, wastewater, or biosolids is an indicator of pollution and possible contamination by pathogens.
Force main	A pipeline leading from a pumping station that transports wastewater under pressure.
GMA	Growth Management Act

GPD	A measurement of flow rate expressed in gallons per day.
HDPE	High-density polyethylene pipe
I & I	Infiltration and inflow
Infiltration	The penetration of water from the land surface into the soil, or the penetration of water from the soil into a sewer system by such means as defective pipes, pipe joints or connections, or manhole walls.
Inflow	Flows of extraneous water into a wastewater conveyance system from sources other than sanitary sewer connections, such as roof leaders, basement drains, manhole covers, and cross-connections from storm sewers.
Influent	Wastewater or other liquid flowing into a reservoir, basin, or treatment plant.
Interceptor sewers	The portion of a collection system that connects main and trunk sewers with the wastewater treatment plant, thereby controlling the flow into the plant.
Lateral sewers	Pipes that receive sewage from homes and businesses and transport that sewage to trunks and mains.
Main sewer	This is a larger pipe in which smaller branch and submain sewers are connected. It may also be called a trunk sewer.
MG	Million gallons, a measure of liquid volume.
MGD	A measurement of flow rate expressed in millions of gallons per day.
mg/L	A measurement of concentration in milligrams per liter sometimes expressed as parts per million (ppm).
National Pollutant Discharge Elimination System (NPDES)	Section 402 of the U.S. Clean Water Act, which prohibits discharge of pollutants into navigable waters of the United States unless a special permit is issued by EPA, a state, or (where delegated) a tribal government on an Indian reservation.
NBOD (Nitrogenous Bio-chemical Oxygen Demand)	A measure of the quantity of oxygen used by microorganisms that consume organic nitrogen compounds.
NPDES	National Pollutant Discharge Elimination

NPDES Permit	Permit issued under the National Pollution Discharge Elimination System, which establishes reporting requirements and other conditions for discharge of pollutants to receiving waters.
On-site treatment system	A DOH permitted facility receiving less than 100,000 gpd of sewage from residential sources.
Outfall	The exit point, usually a pipe or pipes where flow is discharged from the wastewater system into receiving water and which is engineered to ensure dispersion and dilution of the effluent in the receiving waters.
Partial-mix basin	A basin in which wastewater is aerated and mixed but which allows for settling of suspended solids.
Pathogens	Microorganisms that can cause disease in other organisms or humans, animals, and plants. Pathogens include bacteria, viruses, fungi, or parasites found in sewage, in runoff from farms or city streets, and in water used for swimming. Pathogens can be present in municipal, industrial, and nonpoint source discharges.
Peak flow	The maximum flow expected to enter a facility.
Primary treatment	Treatment occurring prior to secondary treatment (e.g., mechanical screening).
Pump station	A pump station is used when sewer trunk lines have conveyed flows to a low-lying area. The pump station lifts the wastewater up to a point where it can flow by gravity to a wastewater treatment plant or another pump station
PVC	polyvinyl chloride pipe
Raw sewage	Untreated wastewater.
RCW	Revised Code of Washington
Regulator	A structure that controls the flow of wastewater from two or more input pipes (trunk lines) to a single output (usually a larger interceptor line). Regulators can be used to restrict or halt flow, thus causing wastewater to be stored in the conveyance system until it can be handled by the treatment plant.
Screen	A mechanical device used to remove solids in a flow stream.

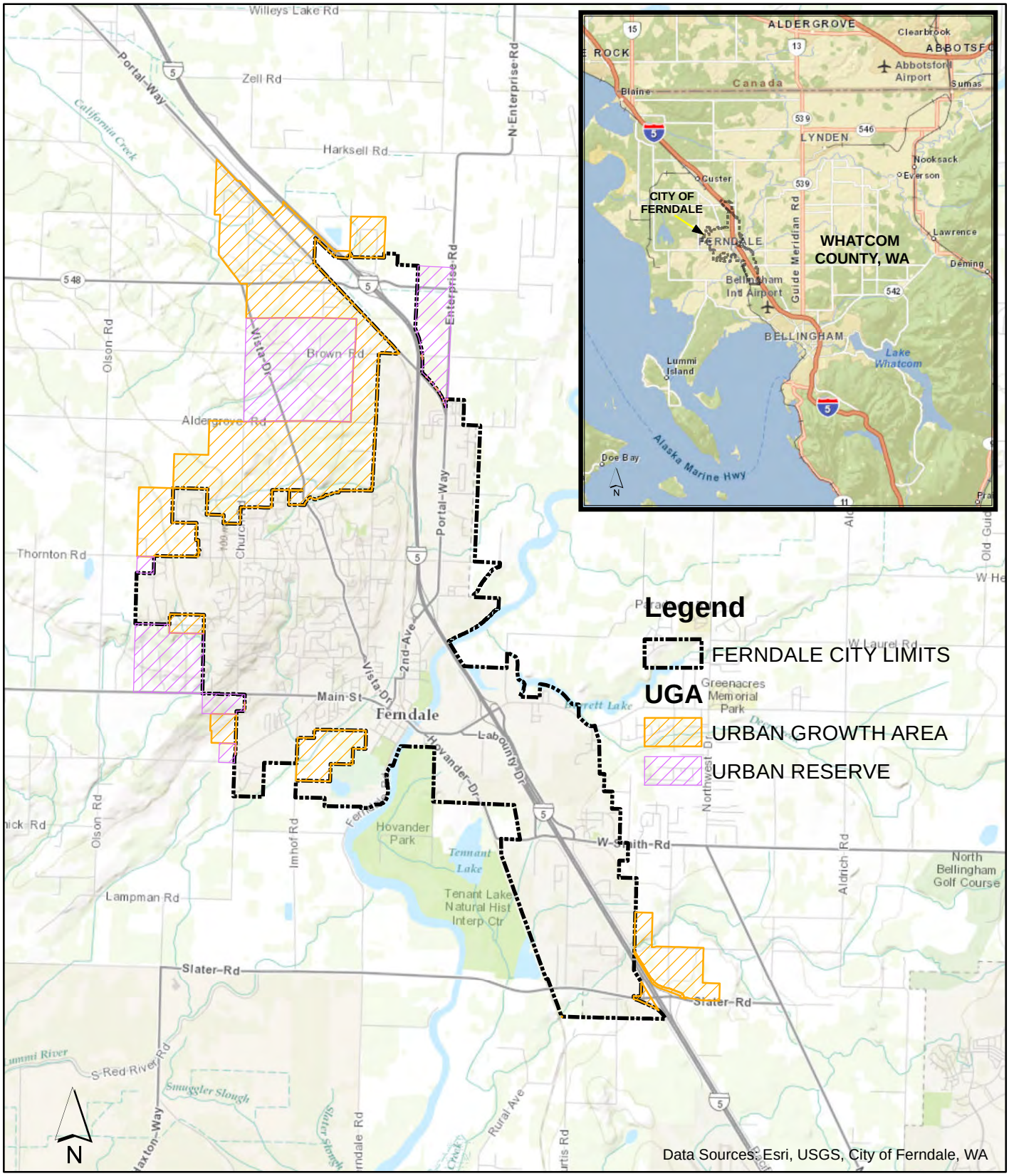
Secondary treatment	The minimum level of wastewater treatment required for WWTPs prior to discharge to the environment. Treatment includes biological oxidation, clarification, and disinfection.
SEPA	State Environmental Policy Act
Sewer Zone	The land area tributary to a collection system point that includes all sources of the wastewater at issue.
Side sewer	A privately owned and maintained sewer which connects the plumbing system of the building to the public sewer pipes.
State Environmental Policy Act (SEPA)	A state law (Chapter 43.21C RCW) that requires state agencies and local governments to consider environmental impacts when making decisions about certain activities, such as development proposals over a certain size, and comprehensive plans. As part of this process, environmental impacts are documented and opportunities for public comment are provided.
Stormwater	Water that is generated by rainfall and is often routed into drain systems in order to prevent flooding.
Telemeter	To transmit to a distant receiving station by radio or other electronic means.
Treatment	Chemical, biological, or mechanical procedures applied to industrial or municipal wastewater or to other sources of contamination to remove, reduce, or neutralize contaminants.
Trunk sewer	This is a larger pipe in which smaller branch and submain sewers are connected. It may also be called a main sewer.
TSS (Total Suspended Solids)	Small particles that either float on the surface or are suspended in water.
WAC	Washington Administrative Code
Wastewater collection system	The piping and pumping system used for the collection and conveyance of domestic, commercial, and industrial wastewater.
Water quality criteria	Standards used to protect of water for drinking, swimming, raising fish, farming or industrial use.
WWTP (Wastewater Treatment Plant)	A DOE permitted water pollution control facility intended to remove pollutants from wastewater and provide disinfection before discharge.

VIII. EXHIBITS

EXHIBIT A. VICINITY, ZONING, AND COMPREHENSIVE PLANNING MAP
EXHIBIT B. SEWER COLLECTION SYSTEM MAPS
EXHIBIT C. I & I ANALYSES
EXHIBIT D. SEWER FLOW SCHEMATIC
EXHIBIT E. ADJACENT WATER PURVEYORS
EXHIBIT F. SEWER RATES AND FEE SCHEDULE
EXHIBIT G. GRANDVIEW AREA SEWER FEASIBILITY STUDY
EXHIBIT H. SEWER CAPITAL IMPROVEMENT PLAN
EXHIBIT I. HYDRAULIC SEWER MODEL CAPACITY ANALYSIS
EXHIBIT J. PUMP STATION DATA
EXHIBIT K. WWTP EXISTING SCHEMATIC DIAGRAM
EXHIBIT L. WWTP NPDES PERMIT
EXHIBIT M. SLATER AREA DEVELOPMENT TECH MEMO
EXHIBIT N. AREA PHYSICAL CHARACTERISTICS

EXHIBIT A

Vicinity, Zoning, and Comprehensive Planning Map



1 inch = 1 miles

Wilson Engineering, LLC

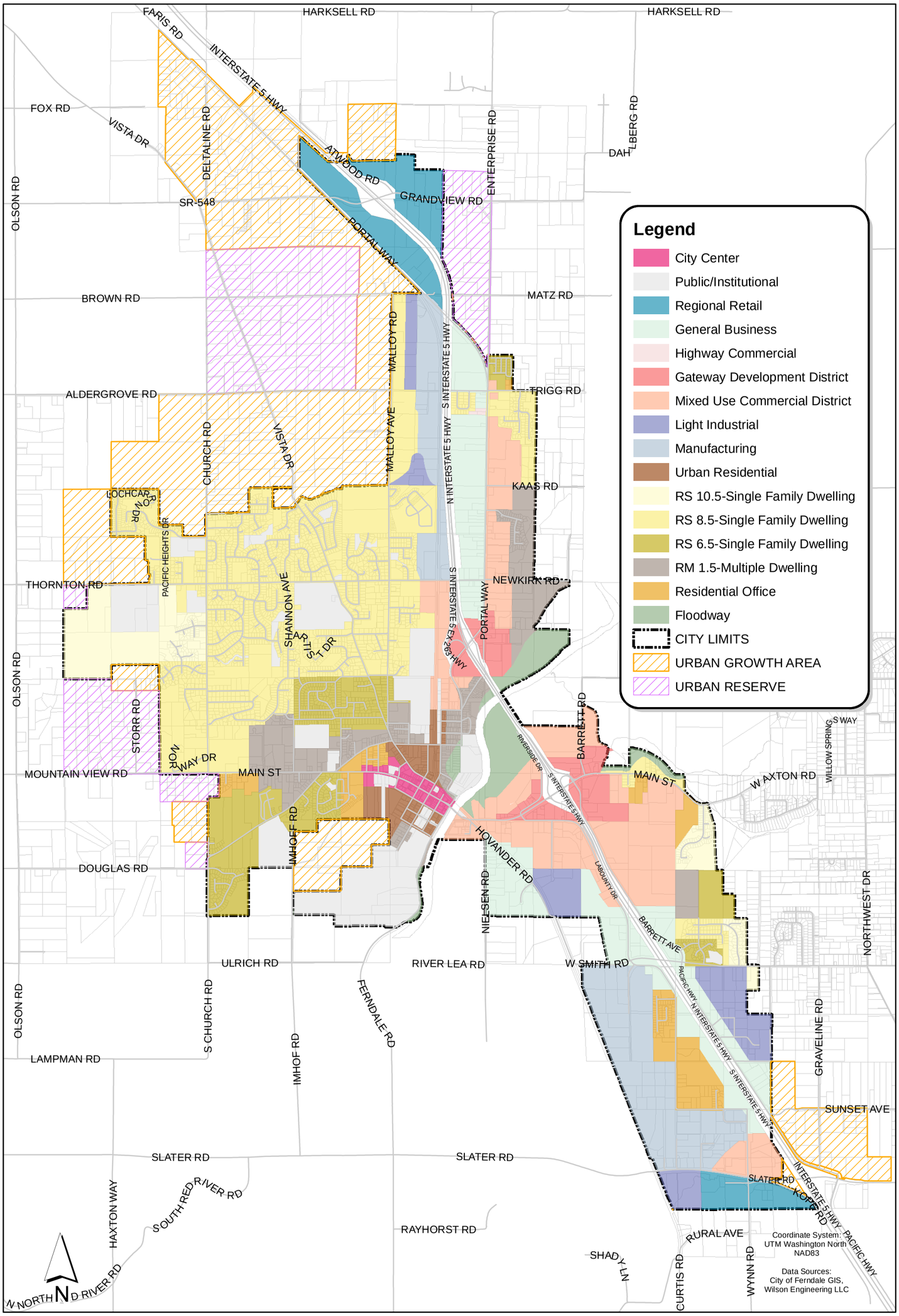
Wilson SURVEY/ENGINEERING
WILSON ENGINEERING, LLC
805 DUPONT STREET
BELLINGHAM, WA 98225
(360) 733-6100 FAX (360) 647-9061
www.wilsonengineering.com

CITY OF FERNDALE, WA

WHATCOM COUNTY WASHINGTON

EXHIBIT A
VICINITY MAP

DATE	SHEET
MAY 2016	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

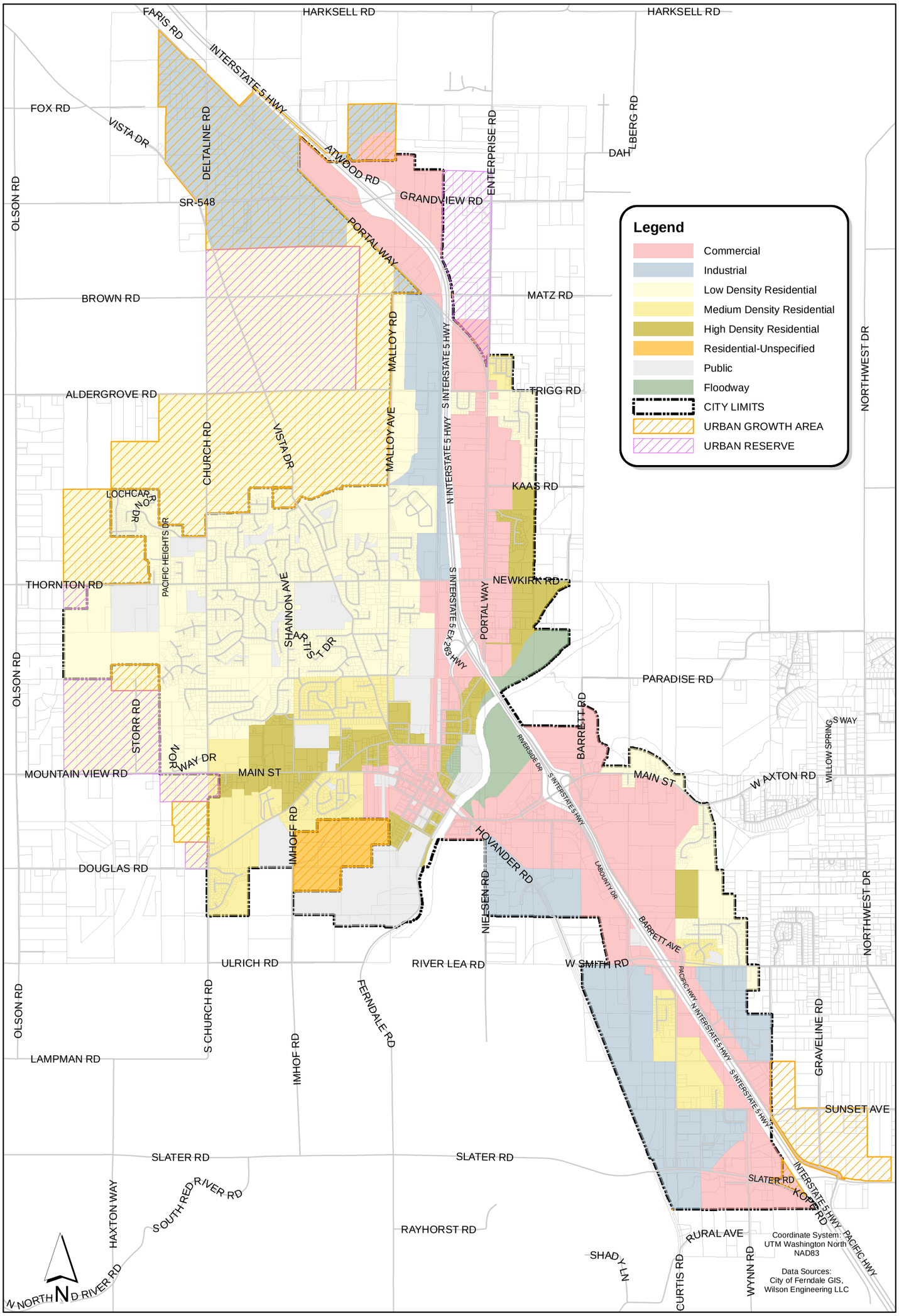
CITY OF FERNDALE, WA

WHATCOM COUNTY WASHINGTON

EXHIBIT A

Zoning Map

DATE	SHEET
MAY 2016	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

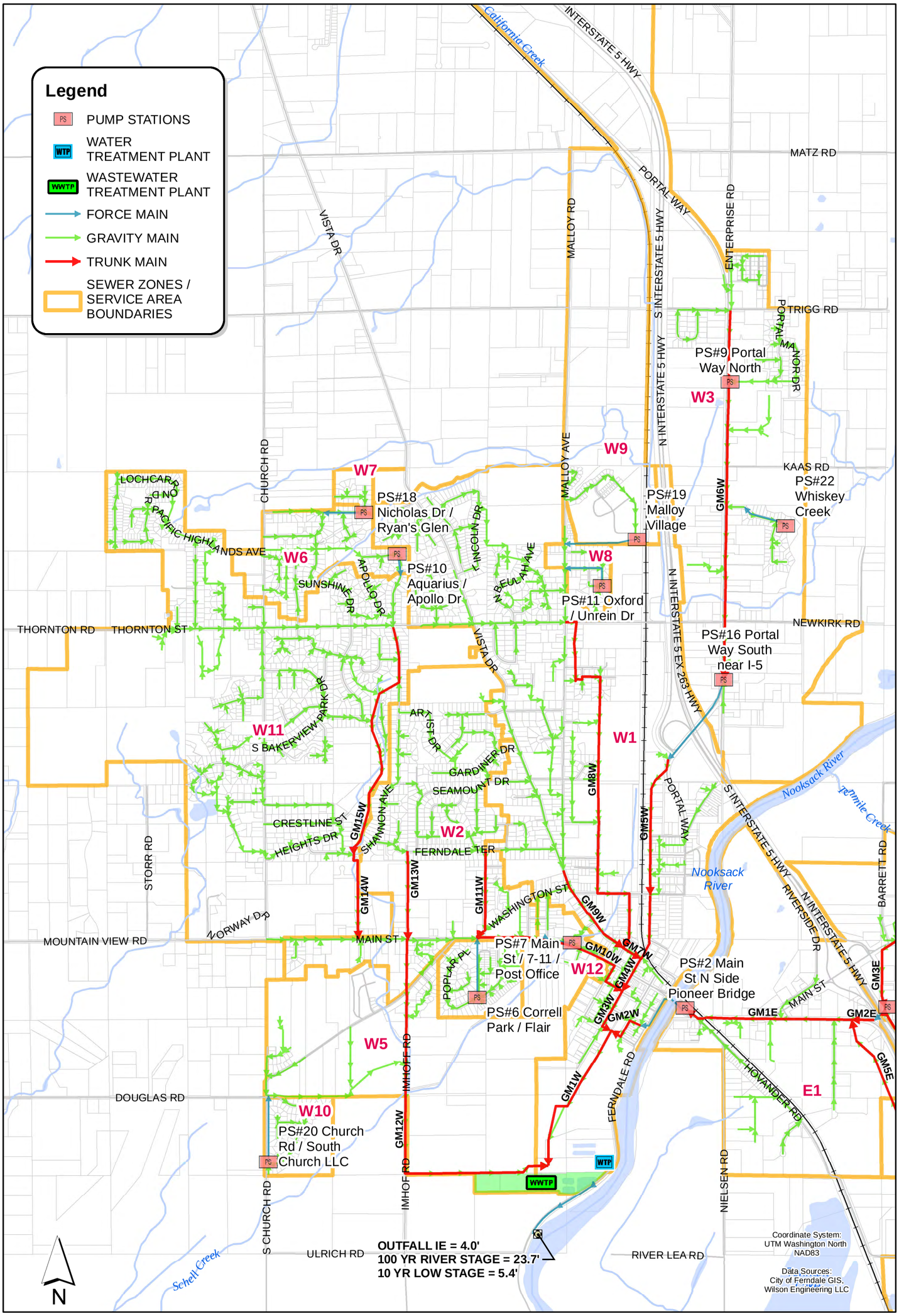
EXHIBIT A

Comprehensive Plan Land Use

DATE	SHEET
MAY 2016	3
SCALE 1:31,680	OF 3
JOB NUMBER 2014-036	

EXHIBIT B

Sewer Collection System Maps



1 in = 1,600 ft

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

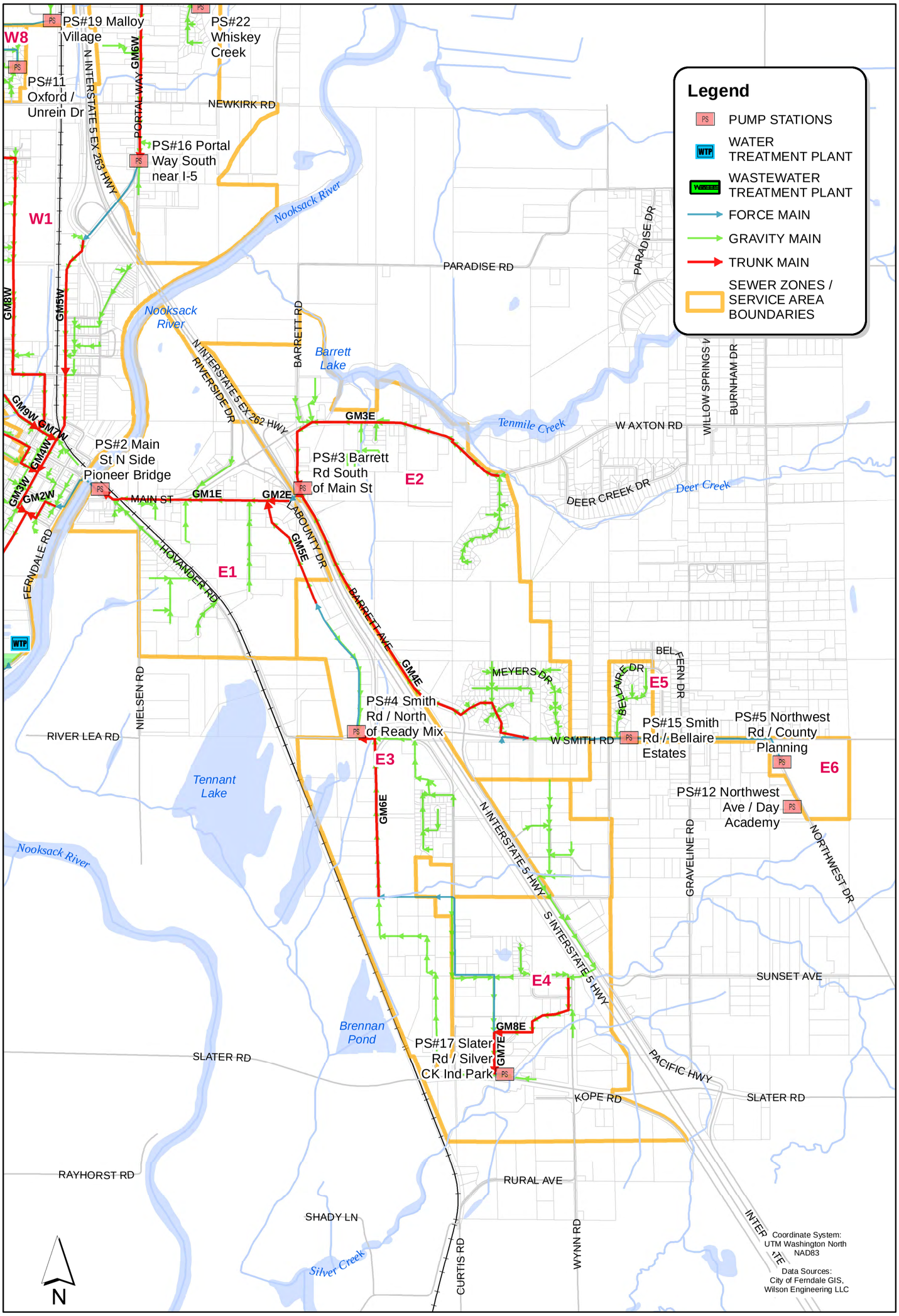
CITY OF FERNDALE, WA

WHATCOM COUNTY WASHINGTON

EXHIBIT B-1

Existing Sanitary Sewer Collection System

DATE	SHEET
SEP 2014	1
SCALE 1:19,200	OF 2
JOB NUMBER 2014-036	



1 in = 1,600 ft

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

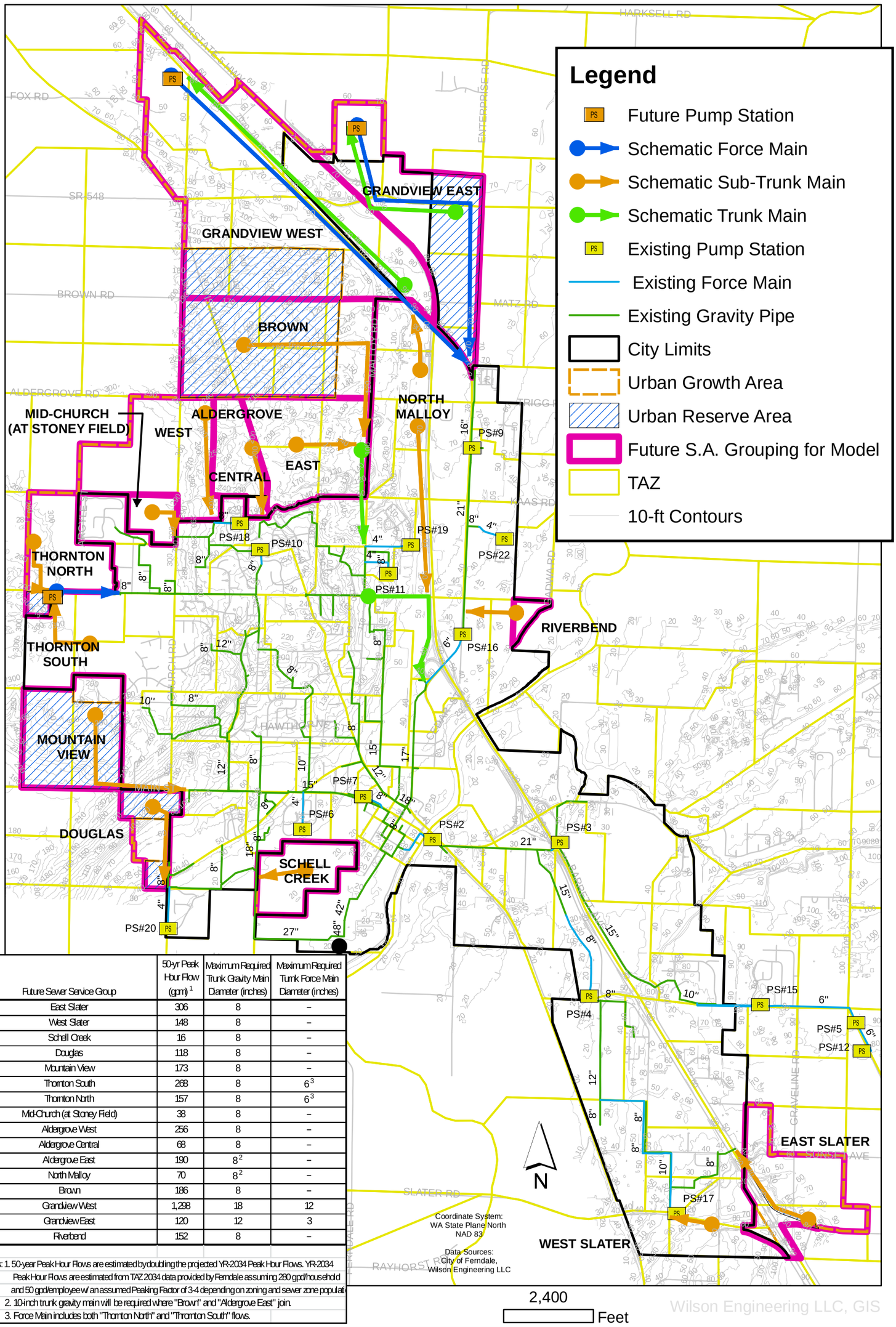
CITY OF FERNDALE, WA

WHATCOM COUNTY WASHINGTON

EXHIBIT B-2

Existing Sanitary Sewer Collection System

DATE	SHEET
SEP 2014	2
SCALE 1:19,200	OF 2
JOB NUMBER 2014-036	



Future Sewer Service Group	50-yr Peak Hour Flow (gpm) [1]	Maximum Required Trunk Gravity Main Diameter (inches)	Maximum Required Trunk Force Main Diameter (inches)
East Slater	306	8	–
West Slater	148	8	–
Schell Creek	16	8	–
Douglas	118	8	–
Mountain View	173	8	–
Thornton South	268	8	6 [3]
Thornton North	157	8	6 [3]
Mid-Church (at Stoney Field)	38	8	–
Aldergrove West	256	8	–
Aldergrove Central	68	8	–
Aldergrove East	190	8 [2]	–
North Malloy	70	8 [2]	–
Brown	186	8	–
Grandview West	1,298	18	12
Grandview East	120	12	3
Riverbend	152	8	–

Notes: 1. 50-year Peak Hour Flows are estimated by doubling the projected YR-2034 Peak Hour Flows. YR-2034 Peak Hour Flows are estimated from TAZ 2034 data provided by Ferndale assuming 280 gpd/household and 50 gpd/employee w/ an assumed Peaking Factor of 3-4 depending on zoning and sewer zone populati
2. 10-inch trunk gravity main will be required where "Brown" and "Aldergrove East" join.
3. Force Main includes both "Thornton North" and "Thornton South" flows.

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 B-3

Ferndale Sewer - Model Loading for Future Sewer Service

DATE	SHEET
MAY 2016	1
SCALE 1:30,000	OF 1
JOB NUMBER 2014-036	

EXHIBIT C

I & I Analyses

EXHIBIT C

INFLOW & INFILTRATION ANALYSIS

Summary of Past Reports and Improvement Projects Undertaken

The most recent I & I report prepared in April 2013 showed that I & I is seasonal (during wet months), and is increasing at less than 2% per annum, which is less than the annual growth rate. EPA's criterion 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. The City sewer system is still within the listed EPA guidelines for infiltration, but exceeds the guidelines for inflow during portions of large storm events.

Recent influent data from 2011-2015 (see attached figure) shows that peak day flows (due to increased inflow) are typically less than 4 MGD and only once exceeded 5 MGD.

The 2008 Infiltration and Inflow Assessment indicated an approximate 3% or less annual increase in Infiltration and Inflow (I & I), which is less than or equal to the population increase. 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 increases 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 entitled, "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 LF 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 LF 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 inventoried (including surveying of manhole coordinates and measurements inside manholes) and a GIS database and map created. The recommendation for sewer system flow modeling and calibration was implemented during the completion of this Comprehensive Sewer Plan. One of the recommendations - implementation of a regular program of sewer line video inspection has yet to be implemented.

Sewer Flow Monitoring and I&I Analysis

City sewer flow monitoring was conducted from April 27 – May 26, 2010 at six locations. The time frame of the May 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 of the January flow monitoring is representative of the seasonal peak flow conditions for the year.

The six locations monitored include:

- Influent at PS #2 on Main Street (includes all of City zoned commercial/industrial east of Nooksack River)
- Vista Drive between 2nd and 3rd Streets (includes Vista Dr and Malloy Ave areas)
- Bass Drive and 2nd Avenue (includes all of Portal Way area)
- Cherry Street west influent (includes large portion of central City residential areas, also includes Vista/Malloy areas and Portal Way area)
- Cherry Street east influent (includes City east of Nooksack River via PS#2 and small residential local area)
- East of Imhof Rd near the treatment plant along the Southwest Sewer Interceptor (includes majority of northwest and west City residential areas)

Results of the sewer flow monitoring give more inference into the volume of infiltration and inflow. The average conditions for the May and January monitoring periods including flow, wastewater flow, infiltration, and inflow are presented in Table 1 at the end of this Exhibit. Table 1 also presents the portion of I/I flows as a percentage of the total flow over the monitoring periods. Figures 1 and 2 show the same information presented in Table 1 in graphical format for each location monitored. It is important to note that by definition of the terms used in this analysis and values presented in Table 1, the inflow includes increased base flow above the baseline infiltration flow used for the analysis; i.e., increased delayed infiltration after a storm event is included as inflow.

During January the WWTP total night time flow rate ranged from 500 GPM to 750 GPM during periods of limited rain and up to 1,600 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).

The peak rainfall event during the January flow monitoring period occurred January 20-21st and totaled 1.29-inches in a 30-hr period. The 24-hr rainfall was 1.14-inches. The peak hourly moving average inflows to each monitoring location and increase in total flow over average flow during this rainfall event are as follows:

- Vista Dr = 1,250 gpm (2.55 times average)
- Bass & 2nd = 325 gpm (2.15 times average)
- PS#2 Influent = data not available for storm event
- Cherry St East = 675 gpm (2.19 times average)
- Cherry St West = 2,175 gpm (2.42 times average)
- Imhof Rd = 775 gpm (1.89 times average)

- WWTP Total Influent = 3,680 gpm (2.28 times average)

This indicates that the Vista Dr area has relatively high I&I compared to the other sub-areas of the City. This is supported by City staff observations circa 2011 of the area having many joint separations and sections of bad pipe, etc..

Future I&I Rehabilitation Considerations

As part of the manhole and infrastructure data collection, the manholes were visibly inspected and any condition issues were noted. This data collection led to qualitatively and often quantitatively identifying manholes with significant infiltration, so that rehabilitation can be included in the Capital Improvement Plan. The current Capital Improvement Plan: contains line items for annual Sewer I&I Projects. These include smoke testing, sewer video inspection, annual sewer slipline projects and specific pipe and manhole replacement projects.

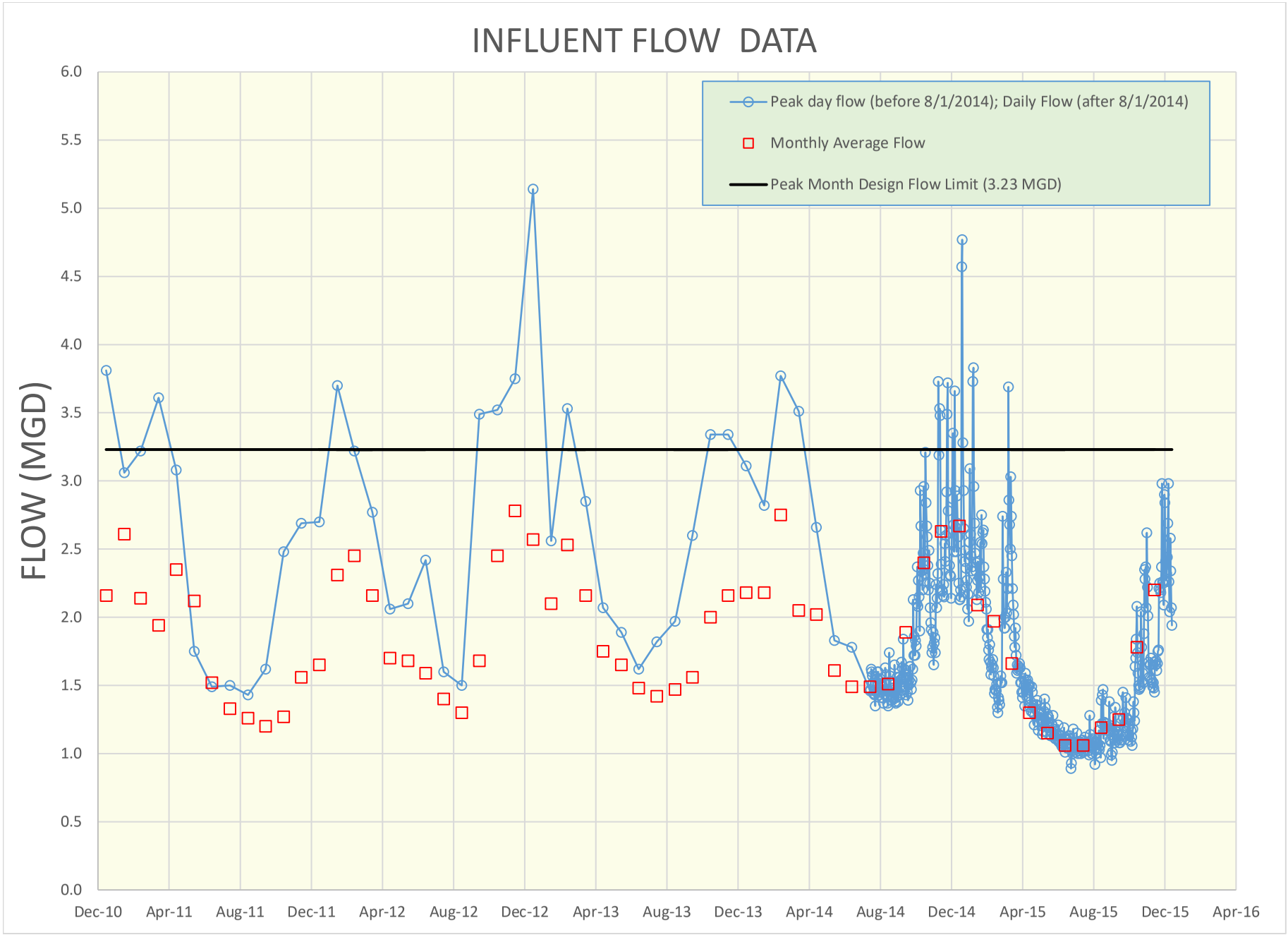

INFLUENT FLOW DATA
FLOW (MGD)
6.0
5.5
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
Dec-10
Apr-11
Aug-11
Dec-11
Apr-12
Aug-12
Dec-12
Apr-13
Aug-13
Dec-13
Apr-14
Aug-14
Dec-14
Apr-15
Aug-15
Dec-15
Apr-16
Peak day flow (before 8/1/2014); Daily Flow (after 8/1/2014)
Monthly Average Flow
Peak Month Design Flow Limit (3.23 MGD)

Table 1. City of Ferndale - Infiltration & Inflow based on Sewer Flow Monitoring

	April 27 - May 26, 2010					January 12 - February 7, 2011				
Site	Average Flow (1) (gpm)	Infiltration Flow (2) (gpm)	Wastewater Flow (3) (gpm)	Inflow (4) (gpm)	I/I Portion of Total Flows (%)	Average Flow (1) (gpm)	Infiltration Flow (2) (gpm)	Wastewater Flow (3) (gpm)	Inflow (4) (gpm)	I/I Portion of Total Flows (%)
Vista Dr b/w 2nd & 3rd Ave [1]	294	132 (45%)	141	21 (7%)	52%	491	205 (42%)	141	145 (29%)	71%
Bass & 2nd [2]	96	42 (44%)	51	3 (3%)	47%	151	63 (42%)	48	40 (26%)	68%
PS #2 Influent [3]	251	131 (52%)	89	31 (13%)	65%	270	165 (55%)	90	15 (15%)	70%
Cherry Street East [4,5]	268	142 (53%)	95	31 (12%)	65%	308	197 (64%)	96	15 (5%)	69%
Cherry Street West	537	267 (50%)	210	60 (11%)	61%	899	424 (47%)	238	237 (27%)	74%
Imhof Rd nr WWTP	234	117 (50%)	105	12 (5%)	55%	409	205 (50%)	103	101 (25%)	75%
Wastewater Treatment Plant	1,038	551 (53%)	395	92 (9%)	62%	1,612	789 (49%)	424	399 (25%)	74%

Terms & Equations:

(1) Average flow is the monitoring period observed average flow.

(2) Infiltration flow is estimated by the average of the observed "dry-weather" low flows (night-time) over selected periods; May 13-17, 2010 and Jan 31-Feb 3, 2011. The daily low flows are estimated by using a 1-hr moving average.

(3) Wastewater flow is the monitoring period observed daily average, estimated by subtracting the average daily minimum flow (1-hr moving average) from the average daily flow.

(4) Inflow is the monitoring period observed average inflow, estimated by (1) Average Flow - (2) Infiltration Flow - (3) Wastewater Flow.

Notes:

1. Vista Dr data for May is suspect; velocity readings are erroneous. May data shown is based on Average Flow at Vista being 54.6% of Average Flow at Cherry St West (equals percentage for Jan data) and Wastewater Flows being equal to those observed in January.
2. Bass & 2nd data for May 3 (noon) - May 26, 2010 is erroneous. May data shown is based on monitoring data from April 27 - May 3 (noon), 2010.
3. PS#2 Influent data for Jan is erroneous due to failed sensor. Jan data shown is based on level logger monitoring in the PS#2 wetwell from Jan 31-Feb 7, 2011.
4. May monitoring data collection interval of 5-min is too large for accurate representation of data at Cherry St East because of the frequent pump runs at PS#2. Thus, original May data is suspect and January data collection interval at Cherry St East is 30-sec (1-min at all other sites for January). May data shown is adjusted accordingly to match flow trends observed from Jan data.
5. All I&I calculations for Cherry Street East are the same as for the other sites, except hourly moving averages are not used at Cherry St East because of frequent (every 20-min typical) and high pumping rates from nearby PS#2.

Figure 1
City of Ferndale - May 2010 Sewer Flow Monitoring
I & I Analysis

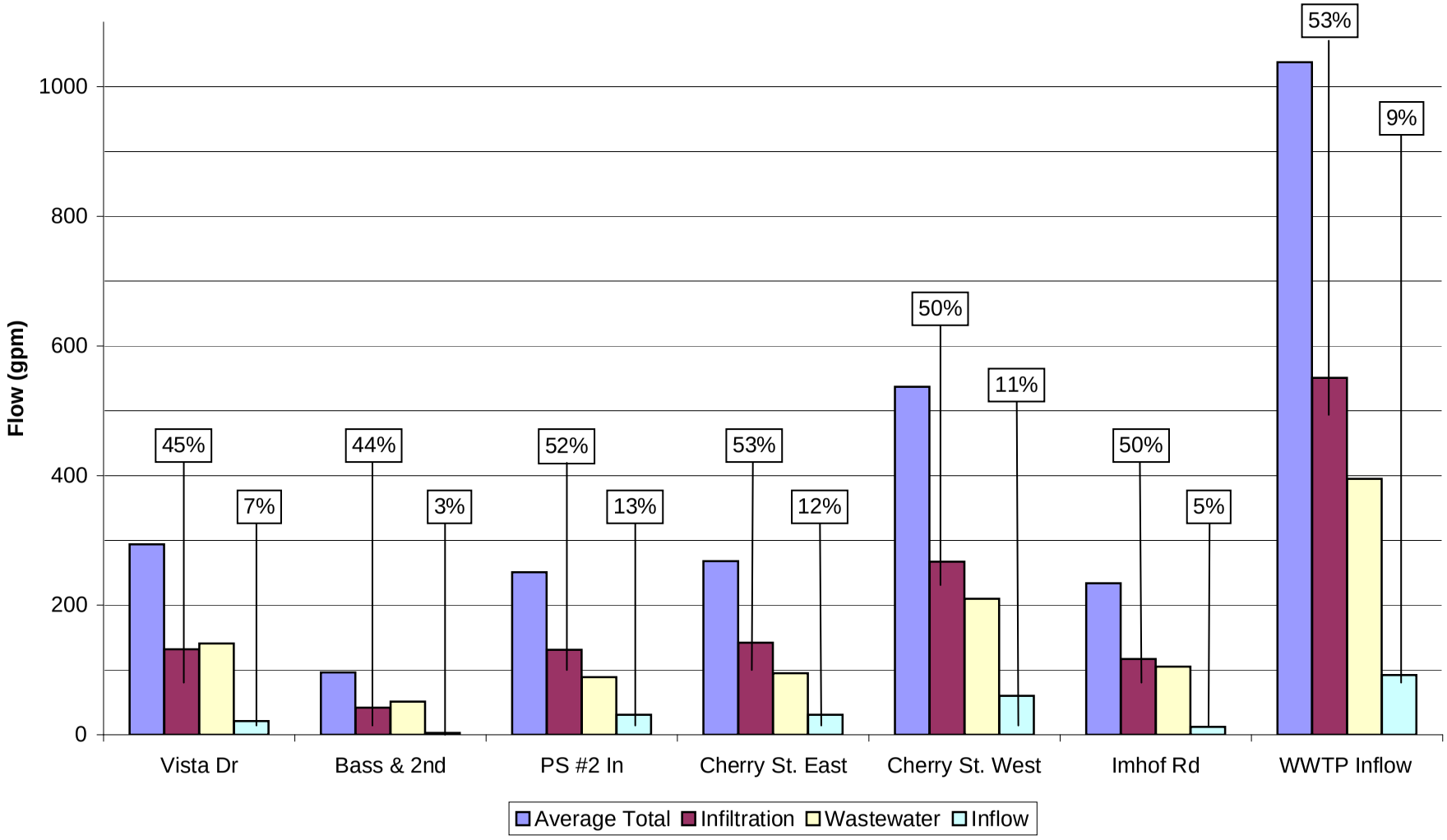


Figure 2
City of Ferndale - January 2011 Sewer Flow Monitoring
I & I Analysis

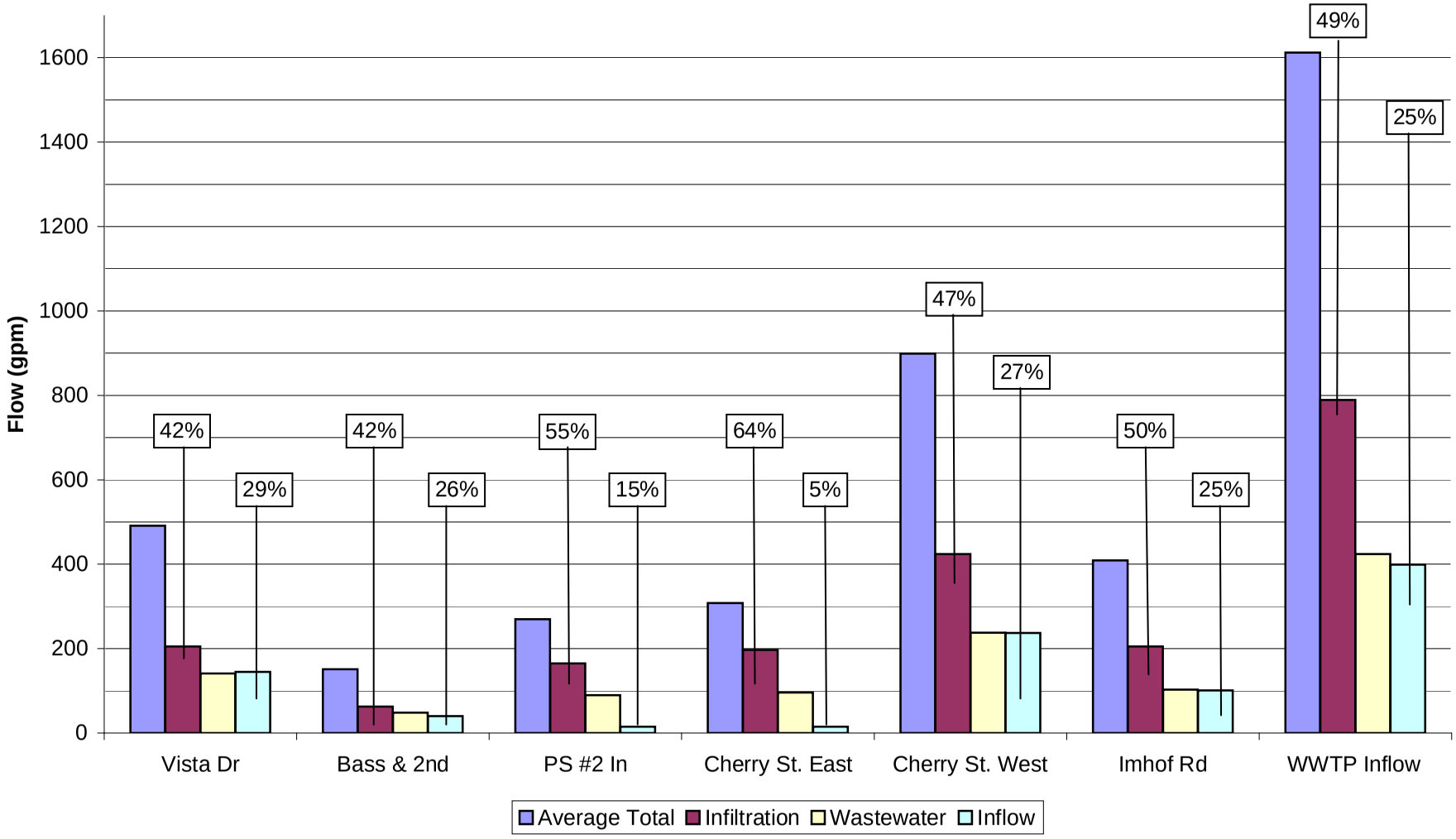
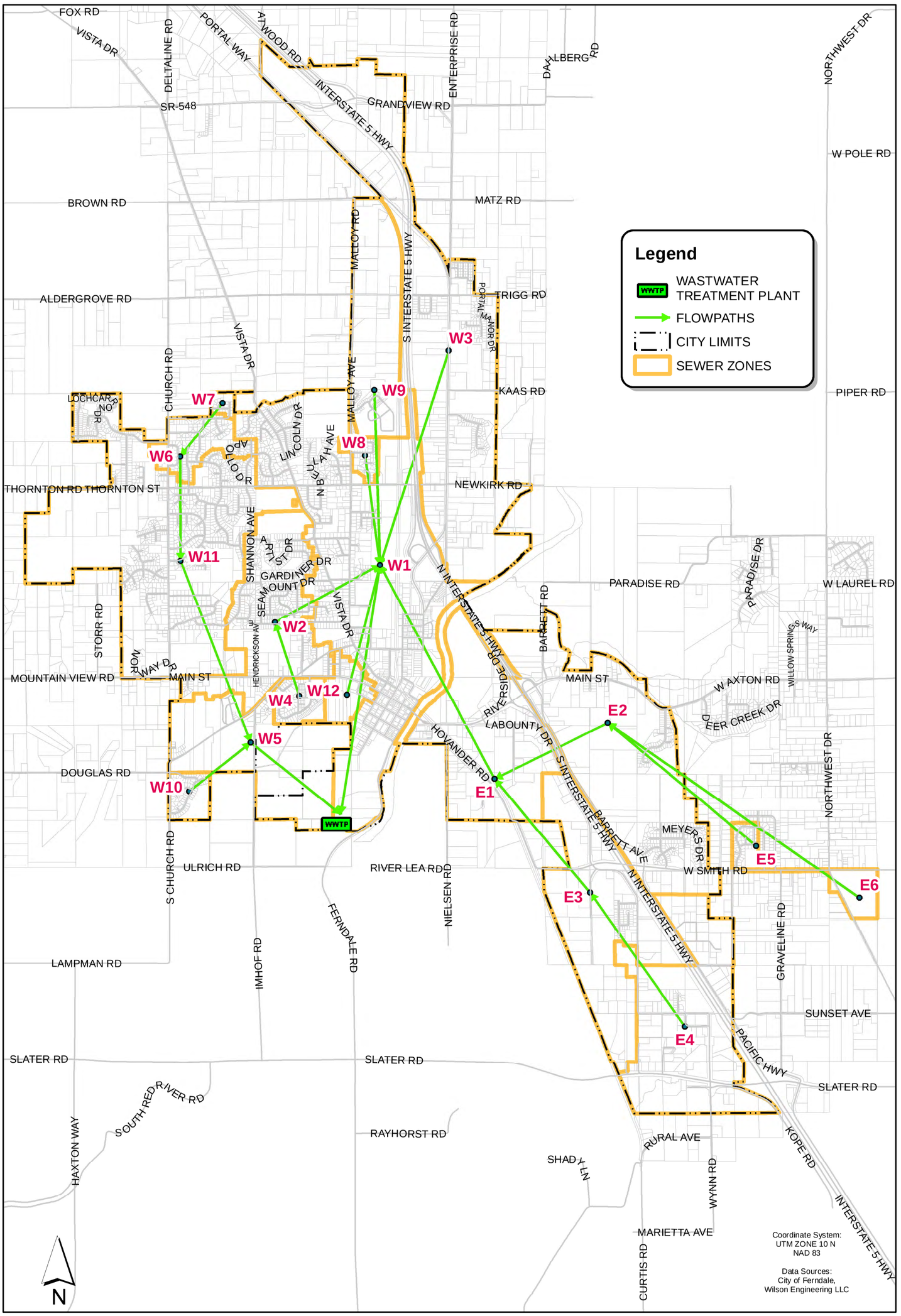


EXHIBIT D

Sewer Flow Schematic



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

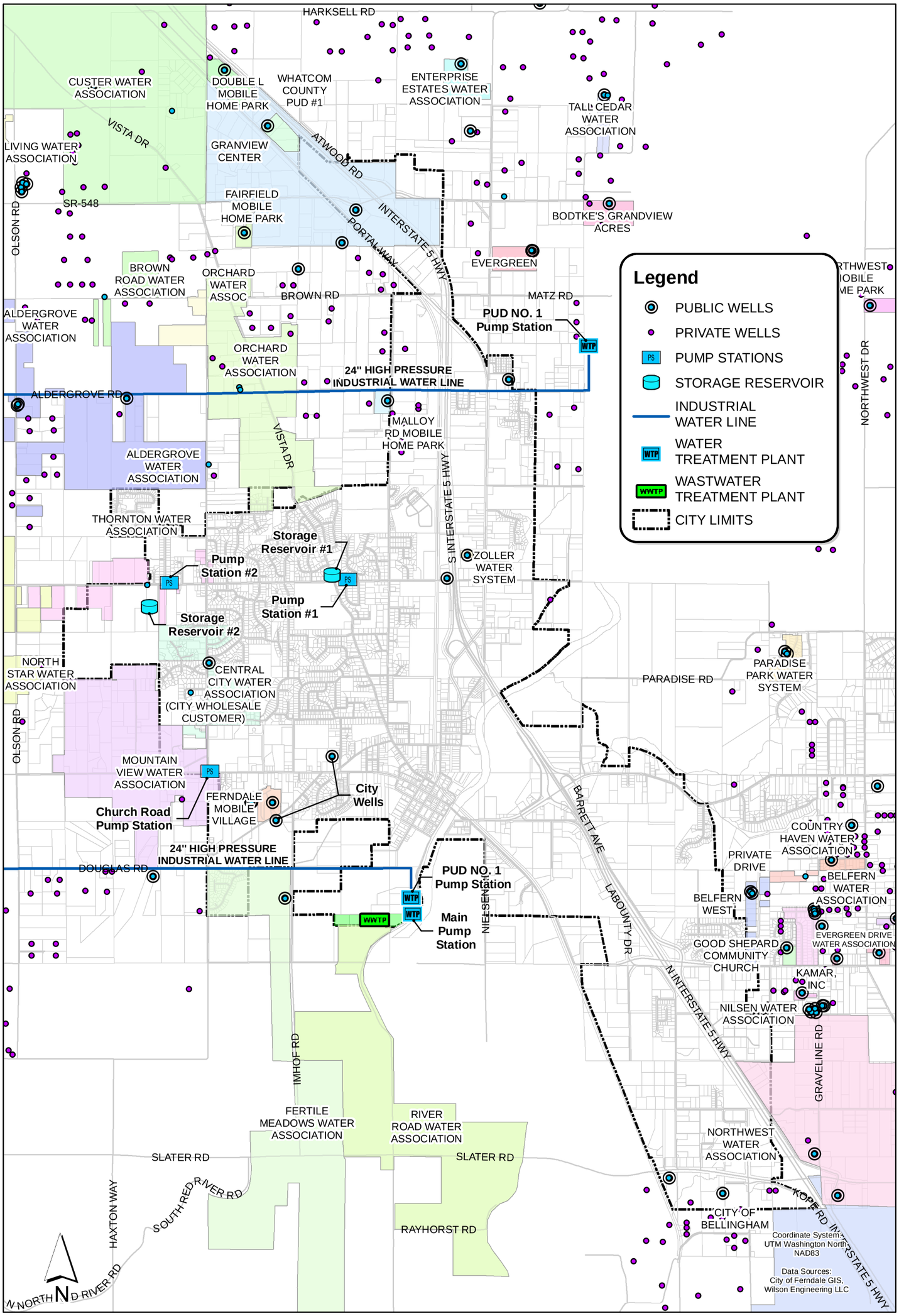
EXHIBIT D

Sewer Zones & Schematic Flow Paths

DATE	SHEET
SEP 2014	1
SCALE	OF
1:31,680	1
JOB NUMBER	
2014-036	

EXHIBIT E

Adjacent Water Purveyors and Septic Systems



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

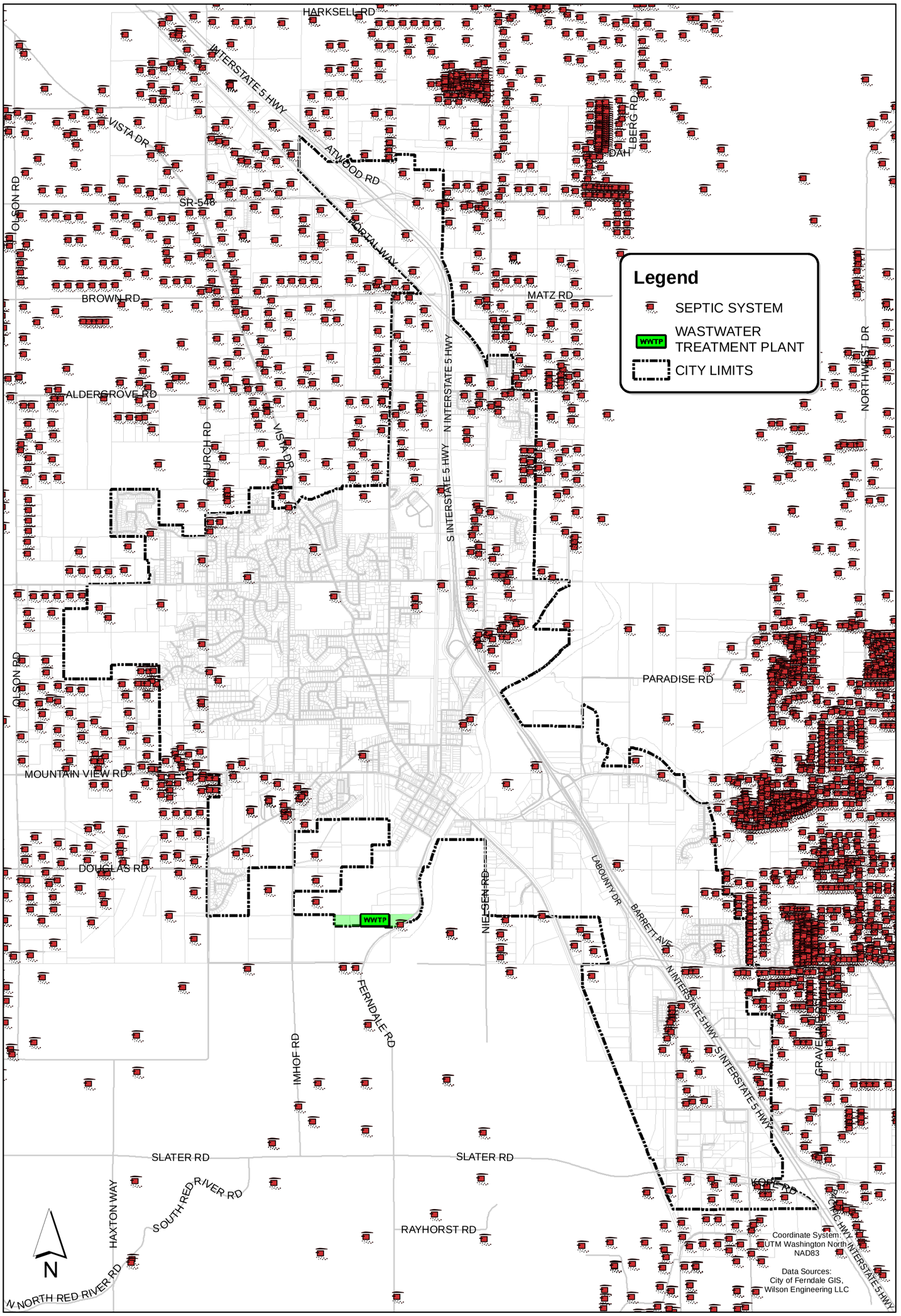
CITY OF FERNDALE, WA

WHATCOM COUNTY WASHINGTON

EXHIBIT E

Adjacent Water Purveyors

DATE	SHEET
NOV 2014	1
SCALE 1:31,680	OF 1
JOB NUMBER 2014-036	



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 E-2

Vicinity Septic Systems

DATE	SHEET
MAY 2016	1
SCALE	OF
1:31,680	1
JOB NUMBER	
2014-036	

EXHIBIT F

Sewer Rates and Fee Schedule

City of Ferndale

WATER AND SEWER RATES AND FEES (Ord.#1921)

STORM DRAINAGE FEES (Ord.# 1922)

RATES ARE EFFECTIVE FOR BILLINGS SENT OUT APPROXIMATELY DECEMBER 31, 2015

WATER RATES: BI-MONTHLY CHARGES

(1 UNIT = 100 CUBIC FEET (748 GALLONS) OF WATER)

- **Single Family Residential & Residential Duplexes – Single Meter**

Base fee:		$14.81	Rate Assistance Base Fee:		$11.11
Consumption:	1-25 units	$3.47/unit	Rate Assistance Consumption:	1-25 units	$2.60/unit
	26-50 units	$3.84/unit		26-50 units	$2.88/unit
	51-150 units	$4.53/unit		51-150 units	$3.40/unit
	151+ units	$3.84/unit		151+ units	$2.88/unit

- **Multiple Family Residential (Three or more units served through a single meter)/Commercial/Non-Residential (Schools-Churches)/Industrial – Single Meter**

Base fee:		$14.81 Up to 1 inch meter
		$46.44 Over 1 inch meter
Consumption:	1-25 units	$3.47/unit
	26-50 units	$3.84/unit
	51-150 units	$4.53/unit
	151+ units	$3.84/unit

SEWER RATES: BI-MONTHLY CHARGES BASED ON WATER METER USAGE

(1 UNIT = 100 CUBIC FEET (748 GALLONS) OF WATER)

- **Single Family Residential/Duplexes/Multi-Family Residences/Multi-unit Commercial/ Commercial/Non-Residential (Schools-Churches) /Industrial:**

Base fee:		$26.21	Rate Assistance Base Fee:		$19.66
Consumption:	1-25 units	$5.94/unit	Rate Assistance Consumption:	1-25 units	$4.45/unit
	26-50 units	$6.62/unit		26-50 units	$4.96/unit
	51-150 units	$7.80/unit		51-150 units	$5.85/unit
	151+ units	$6.62/unit		151+ units	$4.96/unit

- **Non-Metered Residential/Commercial Flat Rate - $97.57**

SUMMER USE: When the water is such that a portion does not flow into the sewer system due to irrigation during the irrigation season, which is defined as the billing period beginning approximately June 1 and ending approximately October 1, the sewer charges shall be based upon the average water use for the previous four bi-monthly billing periods (winter average). If reliable data cannot be obtained for at least two bi-monthly billing periods, the average shall be the City-wide average of 1,200 cubic feet per every two months.

STORM DRAIN FEES: BI-MONTHLY CHARGES

- **Single Family Residential/Duplex Residence (metered separately)**
  $26.16/Bi-Monthly
- **Multiple-Family Residences (3+units)**
  $13.08/Bi-Monthly per apt.
- **Commercial/Industrial/Public Use (Schools-Churches) (metered separately)**
  Option #1 $26.16/Bi-Monthly per 10,000 square feet of parcel
  Option #2 $52.32/Bi-Monthly for every 10,000 square feet of impervious surface
  (Plans must be presented to the Finance Director for approval)
- **Mixed Use Structures**
  $26.16/Bi-Monthly per commercial unit for every 10,000 square feet of parcel
  Plus $26.16/Bi-Monthly for residential unit, 3+unit $13.08/Bi-Monthly per unit

- 9% utility tax is included in water, sewer and storm drain rates(Ord.# 1921)
- Customers outside the City Limits shall have a 50% surcharge added to their water/sewer charges, and connection fees. (Ord.# 1921)

EXHIBIT G

Grandview Area Sewer Feasibility Study

Wilson
SURVEY/ENGINEERING

TO:	Janice Margela, Public Works Director, City of Ferndale
FROM:	Andy Law, Melanie Mankamyer, Curt Schoenfelder
SUBJECT:	Grandview Sewer Extension Alternatives - REVISED
JOB NO.:	2010-049
DATE:	October 20, 2010

Purpose

The purpose of this analysis is to show the best available options for providing sanitary sewer service to the Grandview Road area at the north end of the City of Ferndale UGA. Four alternatives were examined and are described briefly below. The areas evaluated for service are ULID #10 West, ULID #10 East, ULID #9, the commercial Zone west of Portal Way and the Urban reserve west of Malloy Avenue. These terminologies are only preliminary and should not be taken to imply actual ULIDs.

Alternatives

ULID #10 East - Grandview to ULID #7 via Portal Way ($2.60 Million total project cost)
This alternative provides sewer serve to ULID #10 east of I-5. Only one option is proposed for ULID #10 East because it appears to be the best option. Demand for sewer service is lower in this area than ULID #10 West and so the cost per unit of flow is relatively high.

ULID #10 West - Alternative 1A: Portal Way across I-5 to ULID#7 to Trigg Rd via Portal Way ($3.55 Million total project cost)
This provides sewer service to ULID #10 west of I-5, the north portion of the UGA west of Portal Way (north of between Brown Rd and SR-548) and the north part of ULID #9. The proposed sewer connects to the existing 15-inch diameter sewer on Portal Way. The sewer main can be hung in the existing I-5 underpass along Portal Way which eliminates the need for a crossing underneath I-5. The Portal Way 15-inch sewer may prove inadequate for this use in 30 to 50 year's time, but will suffice until then, at which time a diversion may become necessary. The ULID #7 Pump Station will have to be upgraded from 7.5 HP to 15 HP at some point (probably in 15 to 20 Years), however the force main capacity should be adequate for 30 to 50 year's time.

ULID #10 West - Alternative 1B: Portal Way through development from Brown Rd to Aldergrove Rd and across I-5 to ULID #7 & Portal Way ($3.94 Million total project cost)
This alternative is the same as Alternative 1A except with the main continuing south through the north part of ULID #9 to Aldergrove Rd and east along Trigg Rd to the same connection point at the existing 15-inch diameter sewer on Portal Way. This requires an additional railroad crossing and crossing I-5.

ULID #10 West - Alternative 2: Portal Way through ULID #9 via Malloy Ave ($6.20 Million total project cost)

This provides sewer service to ULID #10 west of I-5, ULID #9 and all the UGA west of Portal Way and Malloy Avenue. It also involves replacing existing undersized 8-inch main along Malloy Ave from Willow Court to Golden Eagle Drive and connecting to existing 15-inch. The half-mile of 15-inch sewer main downstream of the connection is sloped such that it should have capacity for the projected 50-yr flows. The alternative requires installation of two additional pump stations and a 750 LF bore, however it does use existing City ROW (Malloy Avenue).

ULID #10 West – Alternative 3: Portal Way and Railroad Grade to Portal & I-5 ($4.43 Million total project cost)

This provides sewer service to ULID #10 west of I-5and ULID #9. All of the UGA west of Portal Way and Malloy Avenue could also be served as well with an increase in sewer main diameter and some additional sewer branch lines. The feasibility of this option is unknown due to the lack of City ROW. However, if an agreement could be worked out with the railroad and one or two additional easement could be obtained, this alternative would be a superior to Alternative 2 because using the railroad grade eliminates two pump stations and one length of pipe boring. One crossing under the railroad would be needed. One additional benefit is that all subdivisions west of the railroad could use gravity sewer systems. The Alternative 3 cost estimate does not sufficiently address all of the added coordination and accommodations required by BNSF and WSDOT for installing pipes parallel to their facilities.

Schematic maps and “planning level” profiles for the first three of these alternatives are attached. The remaining alternative (not shown in a map) is to simply follow the railroad grade to the Portal Way on-ramp to I-5.

Planning level cost estimates for all four alternatives are attached.

The pipes for ULID #10 West Alternative #1 were sized to accommodate a small portion of the UGA area outside of proposed developed area, and therefore a small portion of the developer extension costs potentially could be eligible for a Latecomer Reimbursement Agreement. However, since Alternative #1 discharges into the Portal Way gravity main, it has a severe limitation on additional connections and could not accommodate the rest of the UGA without substantial upgrades to Portal Way and Pump Station #2.

The capacity of ULID #10 West Alternative #2 does accommodate all of the westerly UGA and would therefore a larger portion of the developer extension costs could potentially be eligible for a Latecomer Reimbursement Agreement. This option also more costly because it adds two pump stations, a half mile of new gravity and force mains, and replaces nearly a mile of undersized pipe.

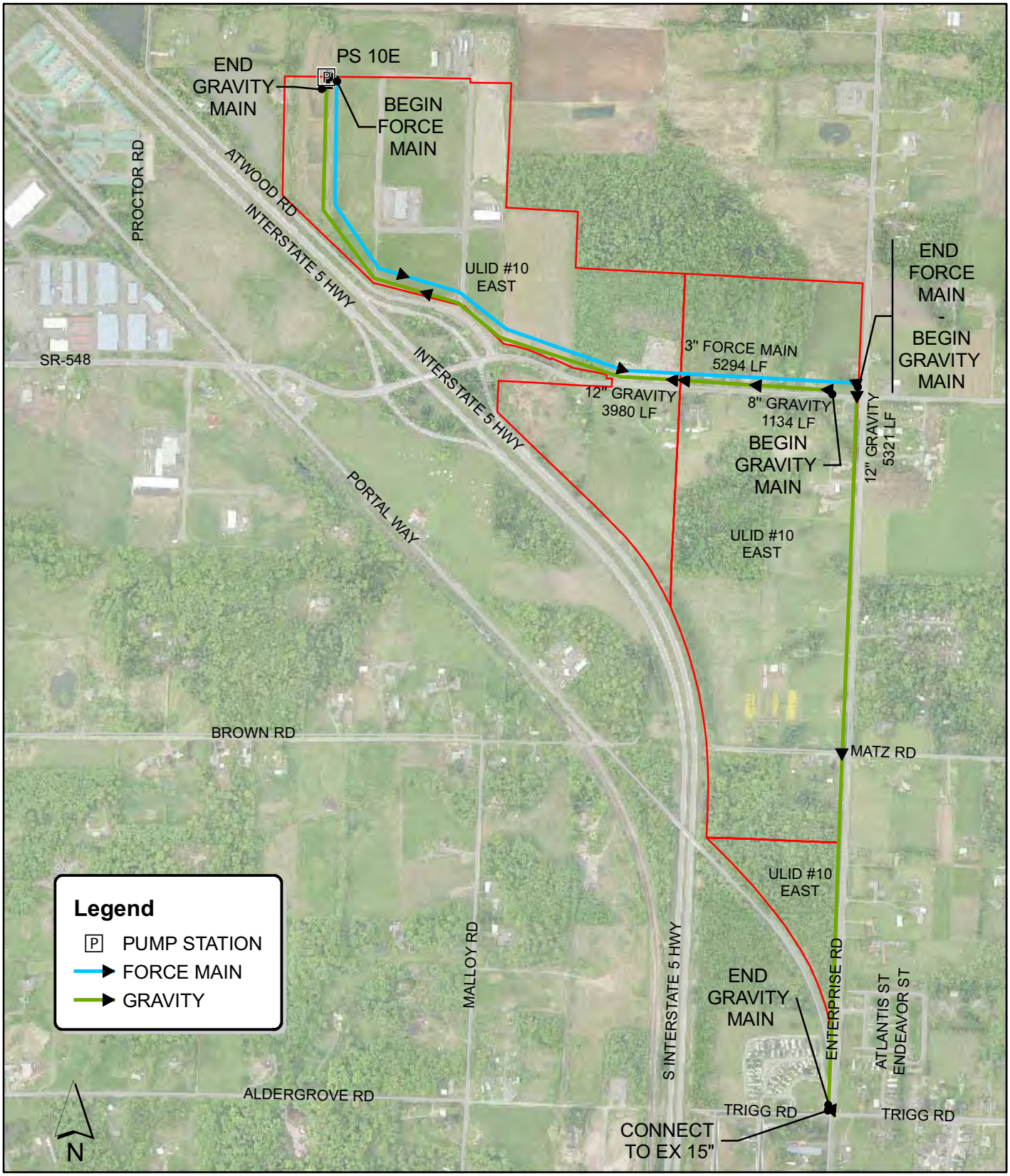
Derivation of Design Flows

Design flows for gravity sewer piping and forcemain sewer piping are based on a 50-year planning horizon and sewer pump station design flows are based on a 20-year planning horizon (per the Department of Ecology Criteria for Sewage Works Design) . City of Ferndale Planning Department population projections for Year 2034 were used to estimate flows for the 20-year planning horizon. The 50-year flows were estimated by doubling the 20-year flows. Average Daily Flow was converted to Peak Hour Flow by multiplying by a factor of 4.0.

Land Use	Units	Average Daily Flow Per Unit (GPD)
Single Family Housing	House	250
Service Business	Employee	100
Manufacturing	Employee	25
Retail Business	Employee	250
Wholesale Business	Employee	25
Construction Business	Employee	25

Source Area	Peak Hour Flow - 2034 (GPM)	Peak Hour Flow - 2060 (GPM)
ULID #10 East	70	140
ULID #10 West	361	722
ULID #9	38	76
Commercial Zone West of Portal Way	218	436
Urban Reserve West of Malloy	195	390

The 50-year design flow for ULID #10 West may be an overestimate (i.e., doubling flow may not be appropriate for this area as development may slow substantially after 20 years). The estimated costs for the ULILD #10 West alternatives could be reduced by using less conservative design flows and thus smaller diameter pipe. The cost savings might be on the order of 10 percent.



1 inch = 1,000 feet

DATA SOURCE: CITY OF FERNDALE

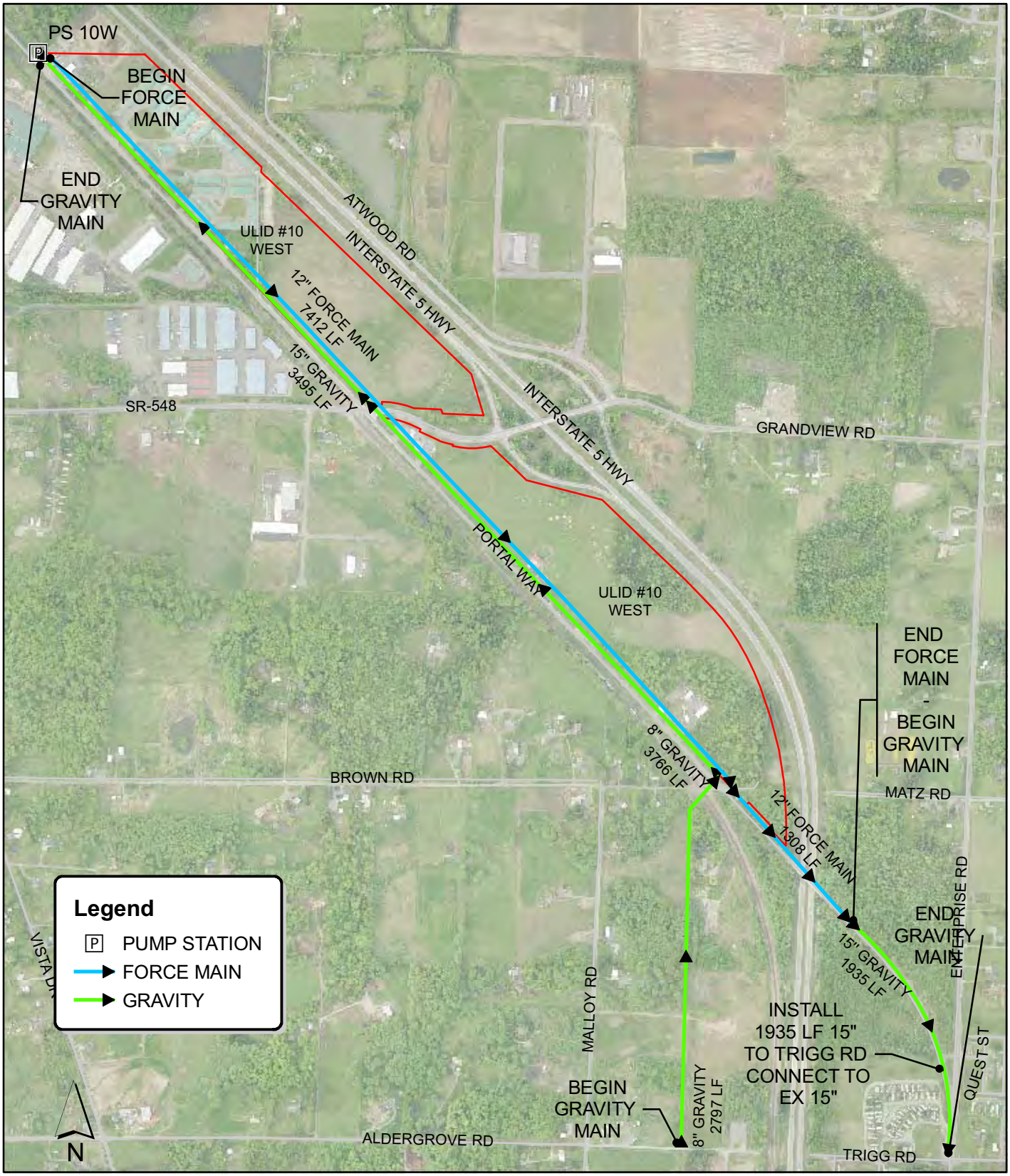
Wilson SURVEY/ENGINEERING
WILSON ENGINEERING, LLC
805 DUPONT STREET
BELLINGHAM, WA 98225
(360) 733-6100 FAX (360) 647-9061
www.wilsonengineering.com

CITY OF FERNDALE

WHATCOM COUNTY WASHINGTON

Grandview Sewer Extension
ULID #10 East

DATE	SEPT 2010
SCALE	1 in = 1,000 ft
JOB NUMBER	2010-049
SHEET	1
OF	1



1 inch = 1,000 feet

DATA SOURCE: CITY OF FERNDALE

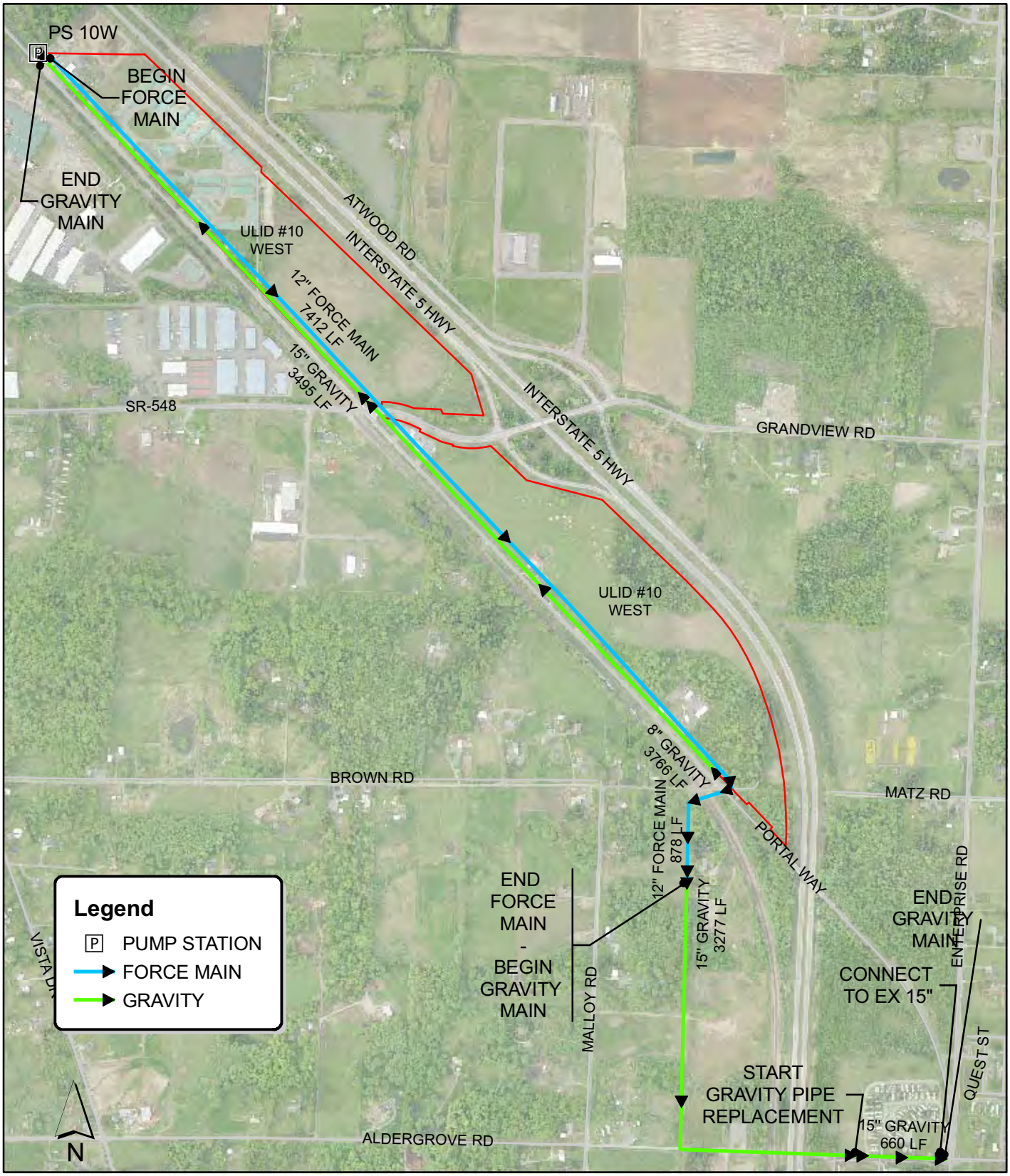
Wilson SURVEY/ENGINEERING
WILSON ENGINEERING, LLC
805 DUPONT STREET
BELLINGHAM, WA 98225
(360) 733-6100 FAX (360) 647-9061
www.wilsonengineering.com

CITY OF FERNDALE

WHATCOM COUNTY WASHINGTON

Grandview Sewer Extension
ULID #10 West - Alternative 1A

DATE	SHEET
OCT 2010	1
SCALE	OF
1 in = 1,000 ft	1
JOB NUMBER	
2010-049	



1 inch = 1,000 feet

DATA SOURCE: CITY OF FERNDALE

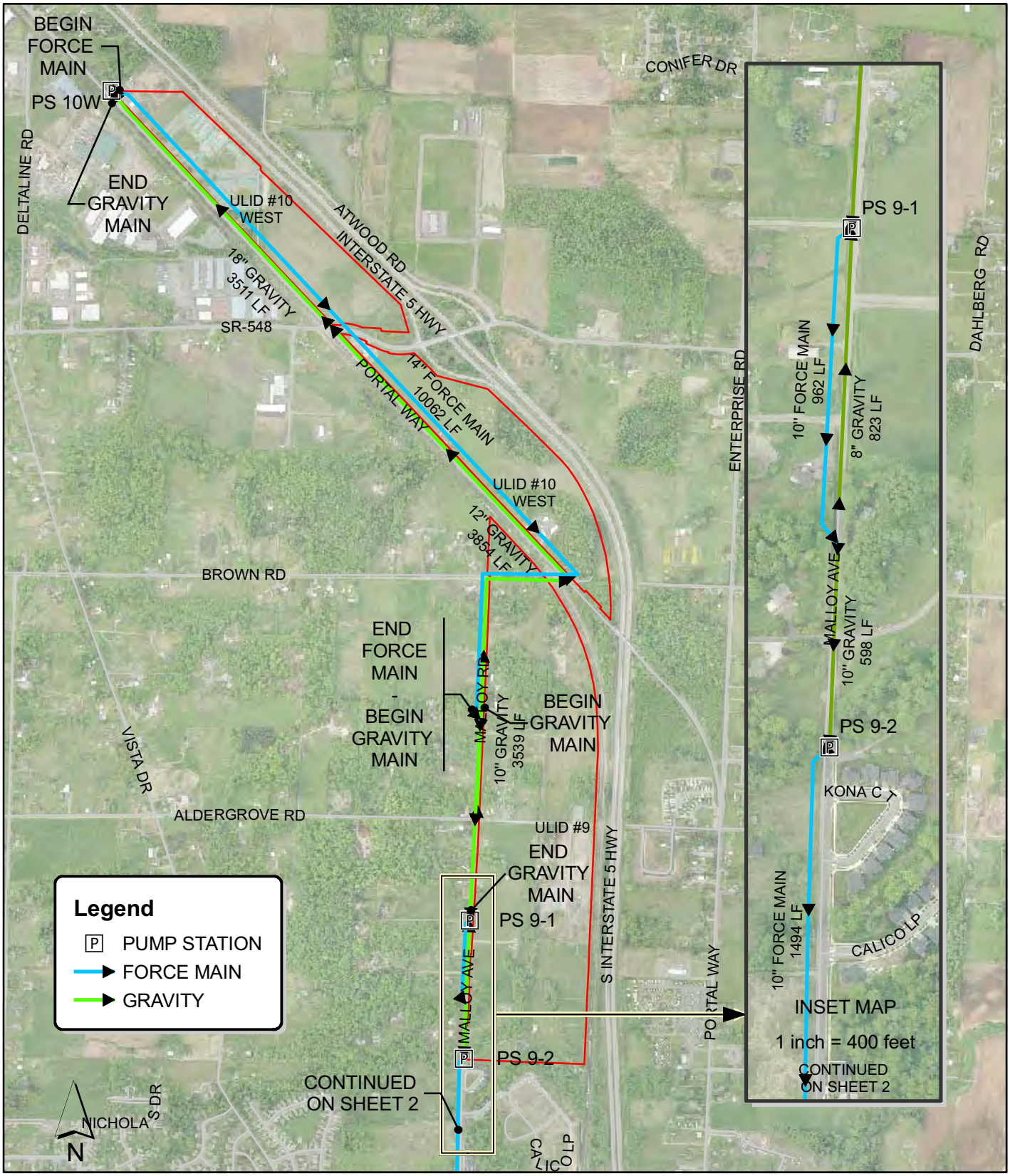
Wilson SURVEY/ENGINEERING
WILSON ENGINEERING, LLC
805 DUPONT STREET
BELLINGHAM, WA 98225
(360) 733-6100 FAX (360) 647-9061
www.wilsonengineering.com

CITY OF FERNDALE

WHATCOM COUNTY WASHINGTON

Grandview Sewer Extension
ULID #10 West - Alternative 1B

DATE	SHEET
OCT 2010	1
SCALE	OF
1 in = 1,000 ft	1
JOB NUMBER	
2010-049	



1 inch = 1,500 feet

DATA SOURCE: CITY OF FERNDALE

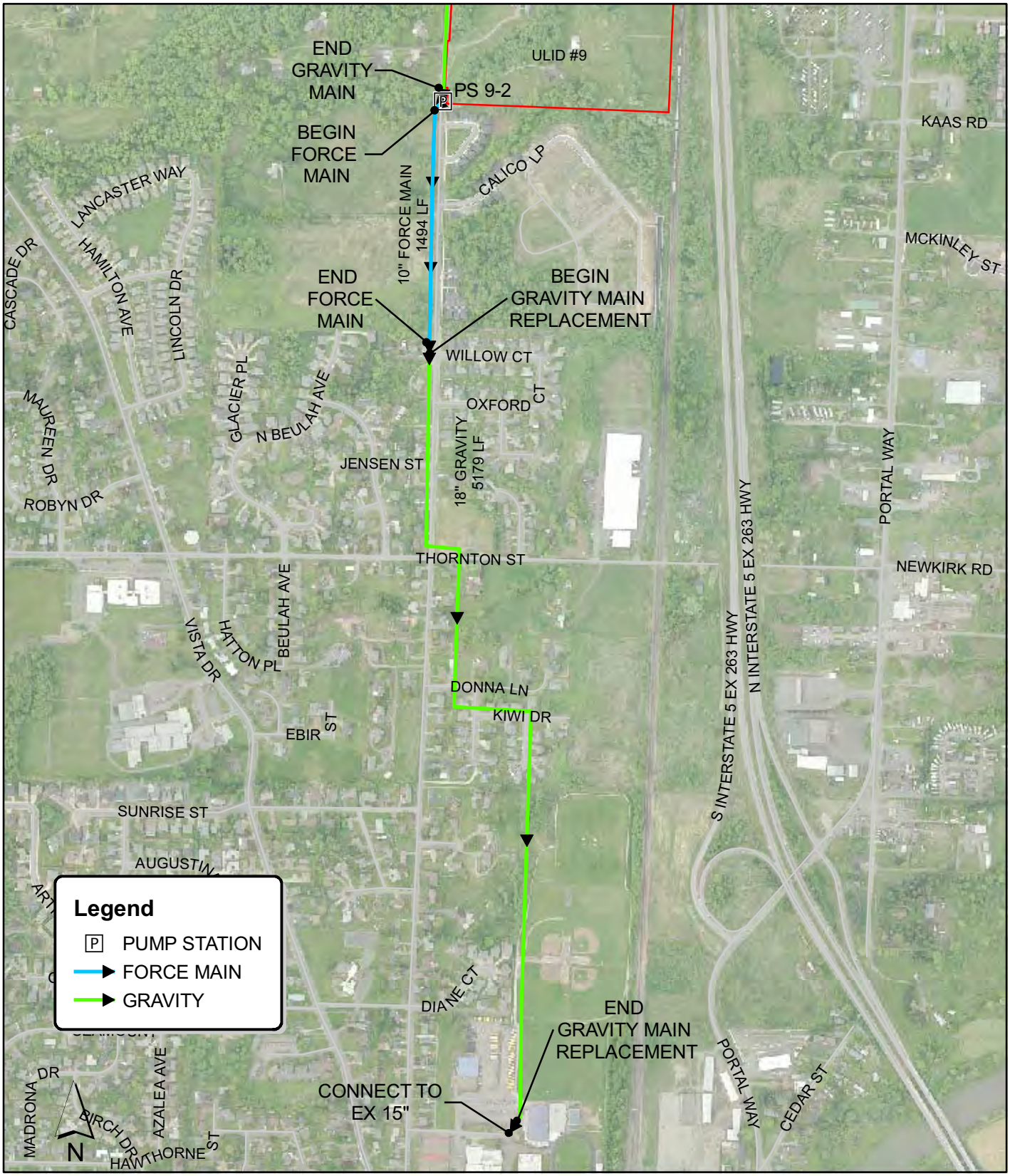
Wilson SURVEY/ENGINEERING
WILSON ENGINEERING, LLC
805 DUPONT STREET
BELLINGHAM, WA 98225
(360) 733-6100 FAX (360) 647-9061
www.wilsonengineering.com

CITY OF FERNDALE

WHATCOM COUNTY WASHINGTON

Grandview Sewer Extension
ULID #10 West - Alternative 2

DATE	SHEET
SEPT 2010	1
SCALE	OF
1 in = 1,500 ft	2
JOB NUMBER	
2010-049	



1 inch = 800 feet

DATA SOURCE: CITY OF FERNDALE

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

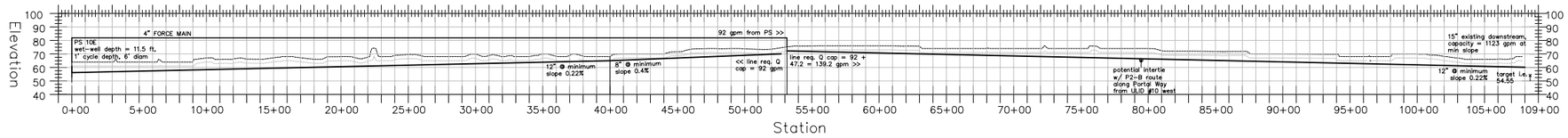
WHATCOM COUNTY WASHINGTON

Grandview Sewer Extension
ULID #10 West - Alternative 2

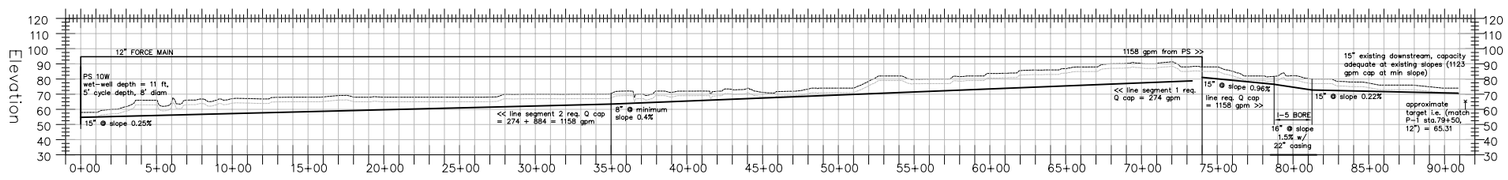
DATE	SHEET
OCT 2010	2
SCALE	OF
1 in = 800 ft	2
JOB NUMBER	
2010-049	

NO.	REVISIONS	BY	DATE

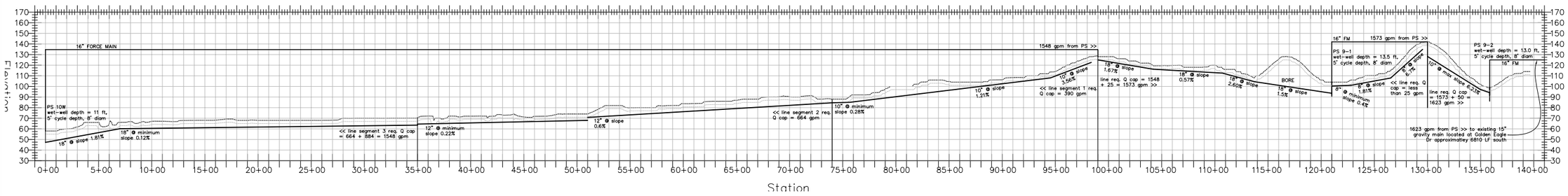
P1 PROFILE – ULID #10 EAST



P2–B PROFILE – ULID #10 WEST ALT.1



P2–A PROFILE – ULID #10 WEST ALT.2



500 0 500 1000
SCALE FEET
HORIZONTAL SCALE

50 0 50 100
SCALE FEET
VERTICAL SCALE

NOTE: PROFILES SHOWN ARE FOR PRELIMINARY PIPE SIZING AND COST ESTIMATING ONLY. SLOPES SHOWN ARE FOR PRELIMINARY ANALYSIS ONLY. ALL INFORMATION SHOWN IS NOT FOR FINAL DESIGN OR CONSTRUCTION.

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 JGS
CHECKED BY

CITY OF FERNDALE

FERNDALE WASHINGTON

GRANDVIEW SANITARY SEWER EXTENSION

PROFILES

DATE SEP 2010
SCALE AS SHOWN
JOB NUMBER 2010-049

SHEET 1 OF 1

CITY OF FERNDALE

20-Oct-10

Grandview Sewer Extension - Project Cost Estimates

Engineer's Estimate - Summary

	DESCRIPTION	YEAR 2010 - ESTIMATED TOTAL COST
	ULID #10 East - Grandview to ULID #7 via Enterprise Rd	$ 2,600,533
	ULID #10 West - Alternative 1A: Portal Way across I-5 to ULID#7 to Trigg Rd via Portal Way	$ 3,555,420
	ULID #10 West - Alternative 1B: Portal Way through development from Brown Rd to Aldergrove Rd and across I-5 to ULID#7 & Portal Way	$ 3,938,922
	ULID #10 West - Alternative 2: Portal Way through ULID#9 via Malloy Ave	$ 6,203,883
	ULID #10 West - Alternative 3: Portal Way and Railroad Grade through ULID#9 to Portal Way & I-5	$ 4,431,690

CITY OF FERNDALE

14-Sep-10

Grandview Sewer Extension - Project Cost Estimate

ULID #10 East - Grandview to ULID #7 via Enterprise Rd

	DESCRIPTION	UNIT	QUANTITY	UNIT PRICE	TOTAL PRICE
1	**Pump Station (4 HP, Duplex Submersible Pump Station)**				
	46 GPM @ 85-ft TDH (Force main sized for 92 gpm)				
	Submersible Pump Station (2 pumps, FRP sump, MINI CAS, power cables, moisture sensors, discharge elbows, guide rails, lifting hardware, delivery and 1 day of on-site startup)	LS	1	$ 13,000	$ 13,000
	New concrete wet well (11.5 ft deep, 6 ft dia) (including seals, grout and gaskets)	LS	1	$ 2,400	$ 2,400
	Pump Station Electrical Panel	LS	1	$ 25,000	$ 25,000
	Excavate Wetwell Site	LS	1	$ 2,000	$ 2,000
	Telemetry Connections	LS	1	$ 5,000	$ 5,000
	Wet Well Top Slab with Hatches	LS	1	$ 2,800	$ 2,800
	Valve Vault w/ Piping	LS	1	$ 6,000	$ 6,000
	Generator	LS	1	$ 25,000	$ 25,000
				Sub-total =	$ 81,200
2	**Piping (Force Main)**				
	Gravel Bedding (3ft wide by 1 ft deep)	CY	560	$ 25	$ 14,000
	Bank Run Gravel Backfill (3ft wide by 2 ft deep)	CY	1,120	$ 20	$ 22,400
	4-inch HDPE Forcemain (including fittings)	LF	5,295	$ 20	$ 105,900
	Combination Air Release/Vacuum Valve	EA	2	$ 2,500	$ 5,000
	Blowoff	EA	4	$ 500	$ 2,000
	Pigging Station / FM Cleanout	EA	5	$ 1,500	$ 7,500
	4-inch Gate Valves	EA	10	$ 1,000	$ 10,000
	Utility Crossings	EA	10	$ 500	$ 5,000
	Restoration	LS	1	$ 12,000	$ 12,000
				Sub-total =	$ 183,800
3	**Gravity Piping**				
	8-in Gravity Main, PVC	LF	1,135	$ 40	$ 45,400
	12-in Gravity Main, PVC	LF	9,305	$ 46	$ 428,030
	Manhole (less than 10 ft deep)	EA	31	$ 4,000	$ 123,200
	Manhole (10-14 ft deep)	EA	4	$ 5,300	$ 21,200
	Dewatering	LF	10,440	$ 12	$ 125,280
	Sawcutting	LF	20,880	$ 0.50	$ 10,440
	Shoring	SF	90,480	$ 0.50	$ 45,240
	Bank Run Gravel Backfill	TN	12,791	$ 11	$ 140,696
	Crushed Surfacing Top Course	TN	687	$ 21	$ 14,421
	Asphalt Removal and Resurfacing	SY	6,960	$ 26	$ 180,960
				Sub-total =	$ 1,134,867
4	**Miscellaneous**				
	Traffic Control	LS	1	$ 62,940	$ 62,940
	Construction Survey	LS	1	$ 41,996	$ 41,996
	Construction Stormwater Control	LS	1	$ 27,997	$ 27,997
	Utility Relocations and other miscellaneous	FA	1	$ 69,993	$ 69,993
				Sub-total =	$ 202,927
	Total				**$ 1,602,794**
	Mobilization (8%)	LS	1	$128,224	**$128,224**
	Contingencies (15%)	LS	1	$240,419	**$240,419**
	Sales Tax (8.5%)	LS	1	$136,237	**$136,237**
	Engineering (topo, design, construction phase) (25%)	LS	1	$492,859	**$492,859**
	Grand-Total				**$ 2,600,533**

CITY OF FERNDALE

20-Oct-10

Grandview Sewer Extension - Project Cost Estimate

ULID #10 West - Alternative 1A: Portal Way across I-5 to ULID#7 to Trigg Rd via Portal Way

	DESCRIPTION	UNIT	QUANTITY	UNIT PRICE	TOTAL PRICE
1	**10W Pump Station (20 HP, Duplex Submersible Pump Station)**				
	617 GPM @ 53-ft TDH (Force main sized for 1,234 gpm)				
	Submersible Pump Station (2 pumps, FRP sump, MINI CAS, power cables, moisture sensors, discharge elbows, guide rails, lifting hardware, delivery and 1 day of on-site startup)	LS	1	$ 32,900	$ 32,900
	New concrete wet well (11 ft deep, 8 ft dia) (including seals, grout and gaskets)	LS	1	$ 5,000	$ 5,000
	Pump Station Electrical Panel	LS	1	$ 25,000	$ 25,000
	Excavate Wetwell Site	LS	1	$ 2,000	$ 2,000
	Telemetry Connections	LS	1	$ 5,000	$ 5,000
	Wet Well Top Slab with Hatches	LS	1	$ 4,200	$ 4,200
	Valve Vault w/ Piping	LS	1	$ 6,000	$ 6,000
	Generator	LS	1	$ 40,000	$ 40,000
				Sub-total =	$ 120,100
2	**Piping (Force Main)**				
	Gravel Bedding (3ft wide by 1 ft deep)	CY	969	$ 25	$ 24,236
	Bank Run Gravel Backfill (3ft wide by 2 ft deep)	CY	1,939	$ 20	$ 38,778
	12-inch HDPE Forcemain (including fittings)	LF	8,725	$ 34	$ 296,650
	Combination Air Release/Vacuum Valve	EA	3	$ 2,500	$ 7,500
	Blowoff	EA	5	$ 500	$ 2,500
	Pigging Station / FM Cleanout	EA	9	$ 1,500	$ 13,500
	12-inch Gate Valves	EA	12	$ 3,000	$ 36,000
	Utility Crossings	EA	12	$ 500	$ 6,000
	Restoration	LS	1	$ 12,000	$ 12,000
				Sub-total =	$ 437,164
3	**Gravity Piping**				
	8-in Gravity Main, PVC	LF	6,505	$ 40	$ 260,200
	15-in Gravity Main, PVC	LF	5,430	$ 48	$ 260,640
	Direct Bore 8-in Gravity w/ 12" casing HDPE (RR xing)	LF	100	$ 190	$ 19,000
	Manhole (less than 10 ft deep)	EA	30	$ 4,000	$ 119,133
	Manhole (10-14 ft deep)	EA	10	$ 5,300	$ 53,000
	Dewatering	LF	11,935	$ 11	$ 131,285
	Sawcutting	LF	23,870	$0.50	$ 11,935
	Shoring	SF	103,437	$0.50	$ 51,718
	Bank Run Gravel Backfill	TN	20,033	$ 11	$ 220,358
	Crushed Surfacing Top Course	TN	785	$ 21	$ 16,486
	Asphalt Removal and Resurfacing	SY	7,957	$ 26	$ 206,873
				Sub-total =	$ 1,350,629
4	**Miscellaneous**				
	Traffic Control	LS	1	$ 82,640	$ 82,640
	Construction Survey	LS	1	$ 57,237	$ 57,237
	Construction Stormwater Control	LS	1	$ 38,158	$ 38,158
	Permitting for Crossings	LS	1	$ 10,000	$ 10,000
	Utility Relocations and other miscellaneous	FA	1	$ 95,395	$ 95,395
				Sub-total =	$ 283,429
	Total				**$ 2,191,322**
	Mobilization (8%)	LS	1	$175,306	**$175,306**
	Contingencies (15%)	LS	1	$328,698	**$328,698**
	Sales Tax (8.5%)	LS	1	$186,262	**$186,262**
	Engineering (topo, design, construction phase) (25%)	LS	1	$673,832	**$673,832**
	Grand-Total				**$ 3,555,420**

CITY OF FERNDALE

20-Oct-10

Grandview Sewer Extension - Project Cost Estimate

ULID #10 West - Alternative 1B: Portal Way through development from Brown Rd to Aldergrove Rd and across I-5 to ULID#7 & Portal Way

	DESCRIPTION	UNIT	QUANTITY	UNIT PRICE	TOTAL PRICE
1	**10W Pump Station (20 HP, Duplex Submersible Pump Station)**				
	579 GPM @ 51-ft TDH (Force main sized for 1158 gpm)				
	Submersible Pump Station (2 pumps, FRP sump, MINI CAS, power cables, moisture sensors, discharge elbows, guide rails, lifting hardware, delivery and 1 day of on-site startup)	LS	1	$ 32,900	$ 32,900
	New concrete wet well (11 ft deep, 8 ft dia) (including seals, grout and gaskets)	LS	1	$ 5,000	$ 5,000
	Pump Station Electrical Panel	LS	1	$ 25,000	$ 25,000
	Excavate Wetwell Site	LS	1	$ 2,000	$ 2,000
	Telemetry Connections	LS	1	$ 5,000	$ 5,000
	Wet Well Top Slab with Hatches	LS	1	$ 4,200	$ 4,200
	Valve Vault w/ Piping	LS	1	$ 6,000	$ 6,000
	Generator	LS	1	$ 40,000	$ 40,000
				Sub-total =	$ 120,100
2	**Piping (Force Main)**				
	Gravel Bedding (3ft wide by 1 ft deep)	CY	910	$ 25	$ 22,750
	Bank Run Gravel Backfill (3ft wide by 2 ft deep)	CY	1,820	$ 20	$ 36,400
	12-inch HDPE Forcemain (including fittings)	LF	8,190	$ 34	$ 278,460
	Direct Bore 12-in FM w/ 18" casing HDPE (RR xing)	LF	100	$ 300	$ 30,000
	Combination Air Release/Vacuum Valve	EA	3	$ 2,500	$ 7,500
	Blowoff	EA	5	$ 500	$ 2,500
	Pigging Station / FM Cleanout	EA	9	$ 1,500	$ 13,500
	12-inch Gate Valves	EA	11	$ 3,000	$ 33,000
	Utility Crossings	EA	12	$ 500	$ 6,000
	Restoration	LS	1	$ 12,000	$ 12,000
				Sub-total =	$ 442,110
3	**Gravity Piping**				
	8-in Gravity Main, PVC	LF	3,770	$ 40	$ 150,800
	15-in Gravity Main, PVC	LF	7,082	$ 48	$ 339,936
	Direct Bore 16-in Gravity w/ 22" casing HDPE (I-5 and 1~ RR xing)	LF	350	$ 885	$ 309,750
	Manhole (less than 10 ft deep)	EA	26	$ 4,000	$ 104,693
	Manhole (10-14 ft deep)	EA	10	$ 5,300	$ 53,000
	Dewatering	LF	10,852	$ 12	$ 130,224
	Sawcutting	LF	21,704	$0.50	$ 10,852
	Shoring	SF	94,051	$0.50	$ 47,025
	Bank Run Gravel Backfill	TN	18,081	$ 11	$ 198,889
	Crushed Surfacing Top Course	TN	714	$ 21	$ 14,990
	Asphalt Removal and Resurfacing	SY	7,235	$ 26	$ 188,101
				Sub-total =	$ 1,548,262
4	**Miscellaneous**				
	Traffic Control	LS	1	$ 76,168	$ 76,168
	Construction Survey	LS	1	$ 63,314	$ 63,314
	Construction Stormwater Control	LS	1	$ 42,209	$ 42,209
	Permitting for Crossings	LS	1	$ 30,000	$ 30,000
	Utility Relocations and other miscellaneous	FA	1	$ 105,524	$ 105,524
				Sub-total =	$ 317,215
	Total				**$ 2,427,687**
	Mobilization (8%)	LS	1	$194,215	**$194,215**
	Contingencies (15%)	LS	1	$364,153	**$364,153**
	Sales Tax (8.5%)	LS	1	$206,353	**$206,353**
	Engineering (topo, design, construction phase) (25%)	LS	1	$746,514	**$746,514**
	Grand-Total				**$ 3,938,922**

CITY OF FERNDALE **20-Oct-10**

Grandview Sewer Extension - Project Cost Estimate

ULID #10 West - Alternative 2: Portal Way through ULID#9 via Malloy Ave

	DESCRIPTION	UNIT	QUANTITY	UNIT PRICE	TOTAL PRICE
1	**10W Pump Station (20 HP, Duplex Submersible Pump Station)**				
	774 GPM @ 50-ft TDH (Force main sized for 1548 gpm)				
	Submersible Pump Station (2 pumps, FRP sump, MINI CAS, power cables, moisture sensors, discharge elbows, guide rails, lifting hardware, delivery and 1 day of on-site startup)	LS	1	$ 32,500	$ 32,500
	New concrete wet well (11 ft deep, 8 ft dia) (including seals, grout and gaskets)	LS	1	$ 5,000	$ 5,000
	Pump Station Electrical Panel	LS	1	$ 25,000	$ 25,000
	Excavate Wetwell Site	LS	1	$ 2,000	$ 2,000
	Telemetry Connections	LS	1	$ 5,000	$ 5,000
	Wet Well Top Slab with Hatches	LS	1	$ 4,200	$ 4,200
	Valve Vault w/ Piping	LS	1	$ 6,000	$ 6,000
	Generator	LS	1	$ 40,000	$ 40,000
				Sub-total =	$ 119,700
2	**Piping (Force Main) PS 10W**				
	Gravel Bedding (3ft wide by 1 ft deep)	CY	1,107	$ 25	$ 27,681
	Bank Run Gravel Backfill (3ft wide by 2 ft deep)	CY	2,214	$ 20	$ 44,289
	14-inch HDPE Forcemain (including fittings)	LF	9,965	$ 37	$ 368,705
	Direct Bore 14-in w/ 20-in casing HDPE (RR xing)	LF	100	$ 420	$ 42,000
	Combination Air Release/Vacuum Valve	EA	3	$ 2,500	$ 7,500
	Blowoff	EA	5	$ 500	$ 2,500
	Pigging Station / FM Cleanout	EA	10	$ 1,500	$ 15,000
	14-inch Gate Valves	EA	14	$ 4,500	$ 63,000
	Utility Crossings	EA	12	$ 500	$ 6,000
	Restoration	LS	1	$ 12,000	$ 12,000
				Sub-total =	$ 588,674
3	**9-1 Pump Station (15 HP, Duplex Submersible Pump Station)**				
	787 GPM @ 44-ft TDH (Force main sized for 1573 gpm)				
	Submersible Pump Station (2 pumps, FRP sump, MINI CAS, power cables, moisture sensors, discharge elbows, guide rails, lifting hardware, delivery and 1 day of on-site startup)	LS	1	$ 31,700	$ 31,700
	New concrete wet well (12 ft deep, 8 ft dia) (including seals, grout and gaskets)	LS	1	$ 5,200	$ 5,200
	Pump Station Electrical Panel	LS	1	$ 25,000	$ 25,000
	Excavate Wetwell Site	LS	1	$ 2,000	$ 2,000
	Telemetry Connections	LS	1	$ 5,000	$ 5,000
	Wet Well Top Slab with Hatches	LS	1	$ 4,200	$ 4,200
	Valve Vault w/ Piping	LS	1	$ 6,000	$ 6,000
	Generator	LS	1	$ 35,000	$ 35,000
				Sub-total =	$ 114,100
4	**Piping (Force Main) PS 9-1**				
	Gravel Bedding (3ft wide by 1 ft deep)	CY	107	$ 25	$ 2,681
	Bank Run Gravel Backfill (3ft wide by 2 ft deep)	CY	214	$ 20	$ 4,289
	10-inch HDPE Forcemain (including fittings)	LF	965	$ 31	$ 29,915
	Combination Air Release/Vacuum Valve	EA	2	$ 2,500	$ 5,000
	Blowoff	EA	2	$ 500	$ 1,000
	Pigging Station / FM Cleanout	EA	2	$ 1,500	$ 3,000
	10-inch Gate Valves	EA	2	$ 2,000	$ 4,000
	Utility Crossings	EA	5	$ 500	$ 2,500
	Restoration	LS	1	$ 1,200	$ 1,200
				Sub-total =	$ 53,584
5	**9-2 Pump Station (12 HP, Duplex Submersible Pump Station)**				
	812 GPM @ 40-ft TDH (Force main sized for 1623 gpm)				
	Submersible Pump Station (2 pumps, FRP sump, MINI CAS, power cables, moisture sensors, discharge elbows, guide rails, lifting hardware, delivery and 1 day of on-site startup)	LS	1	$ 31,500	$ 31,500
	New concrete wet well (11.5 ft deep, 6 ft dia) (including seals, grout and gaskets)	LS	1	$ 5,500	$ 5,500
	Pump Station Electrical Panel	LS	1	$ 25,000	$ 25,000
	Excavate Wetwell Site	LS	1	$ 2,000	$ 2,000
	Telemetry Connections	LS	1	$ 5,000	$ 5,000
	Wet Well Top Slab with Hatches	LS	1	$ 4,200	$ 4,200
	Valve Vault w/ Piping	LS	1	$ 6,000	$ 6,000
	Generator	LS	1	$ 32,000	$ 32,000
				Sub-total =	$ 111,200
6	**Piping (Force Main) PS 9-2**				
	Gravel Bedding (3ft wide by 1 ft deep)	CY	166	$ 25	$ 4,153
	Bank Run Gravel Backfill (3ft wide by 2 ft deep)	CY	332	$ 20	$ 6,644
	10-inch HDPE Forcemain (including fittings)	LF	1495	$ 31	$ 46,345
	Combination Air Release/Vacuum Valve	EA	3	$ 2,500	$ 7,500
	Blowoff	EA	4	$ 500	$ 2,000
	Pigging Station / FM Cleanout	EA	2	$ 1,500	$ 3,000
	10-inch Gate Valves	EA	2	$ 2,000	$ 4,000
	Utility Crossings	EA	2	$ 500	$ 1,000
	Restoration	LS	1	$ 12,000	$ 12,000
				Sub-total =	$ 86,642
7	**Gravity Piping**				
	8-in Gravity Main, PVC	LF	825	$ 40	$ 33,000
	10-in Gravity Main, PVC	LF	2,860	$ 44	$ 125,840
	12-in Gravity Main, PVC	LF	3,855	$ 46	$ 177,330
	18-in Gravity Main, PVC	LF	10,165	$ 52	$ 528,580
	Direct Bore 10-in Gravity w/ 16"casing HDPE (RR xing)	LF	100	$ 240	$ 24,000
	Direct Bore 18-in Gravity Main no casing, HDPE	LF	730	$ 480	$ 350,400
	Manhole (less than 10 ft deep)	EA	45	$ 4,000	$ 178,183
	Manhole (10-14 ft deep)	EA	6	$ 5,300	$ 31,800
	Dewatering	LF	10,366	$ 10	$ 103,660
	Sawcutting	LF	44,830	$0.50	$ 22,415
	Shoring	SF	151,749	$0.50	$ 75,875
	Bank Run Gravel Backfill	TN	21,423	$ 11	$ 235,648
	Crushed Surfacing Top Course	TN	2,114	$ 21	$ 44,388
	Asphalt Removal and Resurfacing	SY	13,203	$ 26	$ 343,287
				Sub-total =	$ 2,274,405
8	**Miscellaneous**				
	Traffic Control	LS	1	$ 120,520	$ 120,520
	Construction Survey	LS	1	$ 100,449	$ 100,449
	Construction Stormwater Control	LS	1	$ 66,966	$ 66,966
	Permitting for Crossings	LS	1	$ 20,000	$ 20,000
	Utility Relocations and other miscellaneous	FA	1	$ 167,415	$ 167,415
				Sub-total =	$ 475,351
	Total				**$ 3,823,657**
	Mobilization (8%)	LS	1	$305,893	**$305,893**
	Contingencies (15%)	LS	1	$573,549	**$573,549**
	Sales Tax (8.5%)	LS	1	$325,011	**$325,011**
	Engineering (topo, design, construction phase) (25%)	LS	1	$1,175,774	**$1,175,774**
	Grand-Total				**$ 6,203,883**

CITY OF FERNDALE

20-Oct-10

Grandview Sewer Extension - Project Cost Estimate

ULID #10 West - Alternative 3: Portal Way and Railroad Grade through ULID#9 to Portal Way & I-5

	DESCRIPTION	UNIT	QUANTITY	UNIT PRICE	TOTAL PRICE
1	**10W Pump Station (20 HP, Duplex Submersible Pump Station)**				
	579 GPM @ 56-ft TDH (Force main sized for 1158 gpm)				
	Submersible Pump Station (2 pumps, FRP sump, MINI CAS, power cables, moisture sensors, discharge elbows, guide rails, lifting hardware, delivery and 1 day of on-site startup)	LS	1	$ 32,900	$ 32,900
	New concrete wet well (11 ft deep, 8 ft dia) (including seals, grout and gaskets)	LS	1	$ 5,000	$ 5,000
	Pump Station Electrical Panel	LS	1	$ 25,000	$ 25,000
	Excavate Wetwell Site	LS	1	$ 2,000	$ 2,000
	Telemetry Connections	LS	1	$ 5,000	$ 5,000
	Wet Well Top Slab with Hatches	LS	1	$ 4,200	$ 4,200
	Valve Vault w/ Piping	LS	1	$ 6,000	$ 6,000
	Generator	LS	1	$ 40,000	$ 40,000
				Sub-total =	$ 120,100
2	**Piping (Force Main)**				
	Gravel Bedding (3ft wide by 1 ft deep)	CY	780	$ 25	$ 19,500
	Bank Run Gravel Backfill (3ft wide by 2 ft deep)	CY	1,560	$ 20	$ 31,200
	12-inch HDPE Forcemain (including fittings)	LF	7,415	$ 34	$ 252,110
	Combination Air Release/Vacuum Valve	EA	3	$ 2,500	$ 7,500
	Blowoff	EA	5	$ 500	$ 2,500
	Pigging Station / FM Cleanout	EA	7	$ 1,500	$ 10,500
	12-inch Gate Valves	EA	10	$ 3,000	$ 30,000
	Utility Crossings	EA	12	$ 500	$ 6,000
	Restoration	LS	1	$ 12,000	$ 12,000
				Sub-total =	$ 371,310
3	**Gravity Piping**				
	8-in Gravity Main, PVC	LF	3,770	$ 40	$ 150,800
	15-in Gravity Main, PVC	LF	13,795	$ 48	$ 662,160
	Direct Bore 16-in Gravity Main w/ 22" casing, HDPE	LF	200	$ 590	$ 118,000
	Manhole (less than 10 ft deep)	EA	49	$ 4,000	$ 194,200
	Manhole (10-14 ft deep)	EA	10	$ 5,300	$ 53,000
	Dewatering	LF	17,565	$ 12	$ 210,780
	Sawcutting	LF	14,130	$0.50	$ 7,065
	Shoring	SF	68,230	$0.50	$ 34,115
	Bank Run Gravel Backfill	TN	29,120	$ 11	$ 320,320
	Crushed Surfacing Top Course	TN	465	$ 21	$ 9,759
	Asphalt Removal and Resurfacing	SY	4,710	$ 26	$ 122,460
				Sub-total =	$ 1,882,659
4	**Miscellaneous**				
	Traffic Control	LS	1	$ 99,920	$ 99,920
	Construction Survey	LS	1	$ 71,222	$ 71,222
	Construction Stormwater Control	LS	1	$ 47,481	$ 47,481
	Permitting for Crossings	LS	1	$ 20,000	$ 20,000
	Utility Relocations and other miscellaneous	FA	1	$ 118,703	$ 118,703
				Sub-total =	$ 357,327
	Total				**$ 2,731,396**
	Mobilization (8%)	LS	1	$218,512	**$218,512**
	Contingencies (15%)	LS	1	$409,709	**$409,709**
	Sales Tax (8.5%)	LS	1	$232,169	**$232,169**
	Engineering (topo, design, construction phase) (25%)	LS	1	$839,904	**$839,904**
	Grand-Total				**$ 4,431,690**

EXHIBIT H

Sewer Capital Improvement Plan

RECOMMENDED 6 YR IMPROVEMENTS

Map ID	CIP Project #	Recommended Year of Implementation	CIP Project Name
S	80PS02	2016	Upgrade Pump Station #2 (Increase capacity, replace equipment, generator, controls) Design & CN
I	80G02b	2018	Malloy RCP Pipe Rehabilitation (CIPP Rehab with replacing 14 MHs)
E	90007a	2017	Pipe Belly Repair Project
Q	90007b	2017	Pipe Belly Repair Project
F	90007c	2017	Pipe Belly Repair Project
AA	90007d	2017	Pipe Belly Repair Project
AB	90007e	2017	Pipe Belly Repair Project
O	90020	2020	Main St Siphon lines (CIPP Rehab of 8-in and 12-in; add drain port/MH)
D	90023a	2017	DESIGN: Thornton extension to I-5 easement and south to Portal Way Roundabout (new 4000 LF 15-in PVC)
A	70010	2016-2019	Phase III WWTP Improvements
C	80G01	2016-2017	Labounty from I5 to MH 3564 (past Nordic Way, 1200 LF; no slope, has a hole; replace w/24-in)
B	80G04a	2018	PS #10 abandonment - required pipe upgrades - $$ INCLUDED IN 80PS10
X	80PS03	2017	Rehab Pump Station #3 (Replace equipment, generator, controls) Design & CN
Y	80PS10	2018	PS #10 Decommission (Includes projects #80G04a, 80PS10 and 90010; Projects 80G13 & 90023 to be completed first)
P	80PS15	2019	Pump Station #15 Decommission
W	80PS16a	2017	Upgrade Pump Station #16 (Increase capacity to match FM capacity, add generator, replace controls)
G	90010	2017	Apollo PS to Parkland Dr Bypass - $$ INCLUDED IN 80PS10
M	90017	2020	TIP: Legoe Avenue (Capacity is adequate; CIPP Rehab of 1350 LF of 10-in RCP, replace 2 MHs)
D	90023b	2018	CONST: Thornton extension to I-5 easement and south to Portal Way Roundabout (new 4000 LF 15-in PVC)
K	80G02a	2017	Vista Dr Clay Pipe Rehab (CIPP Rehab)
Z	90019	2019	TIP: Ferndale Terrace (replace 1,700 LF of 6-in & 8-in clay w/ 8-in PVC)
R	80PS11-19-D	2020	Pump Stations #11 and #19 Decommission
L	90015	2021	TIP: Thornton Road - Vista to Malloy (CIPP Rehab of 1,725 LF of 8-in RCP, with replacing 8 MHs)
AF	90018	2021	LaBounty Drive - Seahawk to Sunset; 1520 LF of new 8-in PVC for unserved area. TIP or septic failures determine schedule
AM	90026	2021	North Malloy Industrial Area Sewer Extension Design

H, J,N, T,U, V Not used

RECOMMENDED 20 YR IMPROVEMENTS

Map ID	CIP Project #	Recommended Year of Implementation	CIP Project Name
AM	90026	2022	North Malloy Industrial Area Sewer Extension Construction
AG	80PS12	2023	PS #12 Upgrade - replace grinder pump station with Flygt pumps
AD	80PS17b	2024	Upgrade Pump Station #17 Retrofit (Increase capacity,
AC	80G15	2024	Main St East of I-5 (Upgrades 900 LF 10-in RCP; replace w/ 12-in PVC)
AH	80PS07	2025	Pump Station #7 Retrofit (replace pumps, equipment, controls ONLY)
AJ	80PS18	2025	Pump Station #18 - (replace aging pumps, equipment, controls)
AK	80G04b	2026	PS #10 abandonment - required pipe upgrades- 20-yr Capacity limits
AE	80PS16b	2027	Pump Station #16 - Increase capacity to buildout, new larger force main)
AI	80PS06	2028	Pump Station #6 Retrofit (replace aging pumps, equipment, controls)
AL	80G16	2034	Upgrade Trunk Main GM6E from Future Jail to PS #4 (3,000 LF from 12-in PVC to 15-in PVC)

Legend

- PUMP STATIONS
- WATER TREATMENT PLANT
- WASTWATER TREATMENT PLANT
- FORCE MAIN
- GRAVITY MAIN
- URBAN GROWTH AREA
- URBAN RESERVE
- CITY LIMITS
- PROPOSED GRAVITY MAIN
- PIPE PROJECT EXTENT
- PUMP STATION PROJECT

ATWOOD RD
INTERSTATE 5 HWY
GRANDVIEW R
PORTAL WAY
BROWN RD
MALLOY RD
MALLOY AVE
N INTERSTATE 5 HWY
S INTERSTATE 5 HWY
TRIGG RD
PS#9 Portal Way North
KAAS RD
PS#22 Whiskey Creek
PS#19 Malloy Village
PS#11 Oxford / Unrein Dr
PS#18 Nicholas Dr / Ryan's Glen
LOCHCARRON DR
VISTA DR
PACIFIC HEIGHTS DR
THORNTON RD
SHANNON AVE
ARTIST DR
NEWKIRK RD
PS#16 Portal Way South near I-5
S INTERSTATE 5 EX 263 HWY
PORTAL WAY
RIVERSIDE DR
N INTERSTATE 5 HWY
S INTERSTATE 5 HWY
BARRETT RD
MAIN ST
PS#7 Main St / 7-11 / Post Office
PS#6 Correll Park / Flair
PS#2 Main St N Side Pioneer Bridge
IMHOFF RD
HOVANDER RD
NELSEN RD
PS#20 Church Rd / South Church LLC
FERNDALE RD
Coordinate System: UTM Washington North NAD83
Data Sources: City of Ferndale GIS, Wilson Engineering LLC
N

1 in = 1,600 ft

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

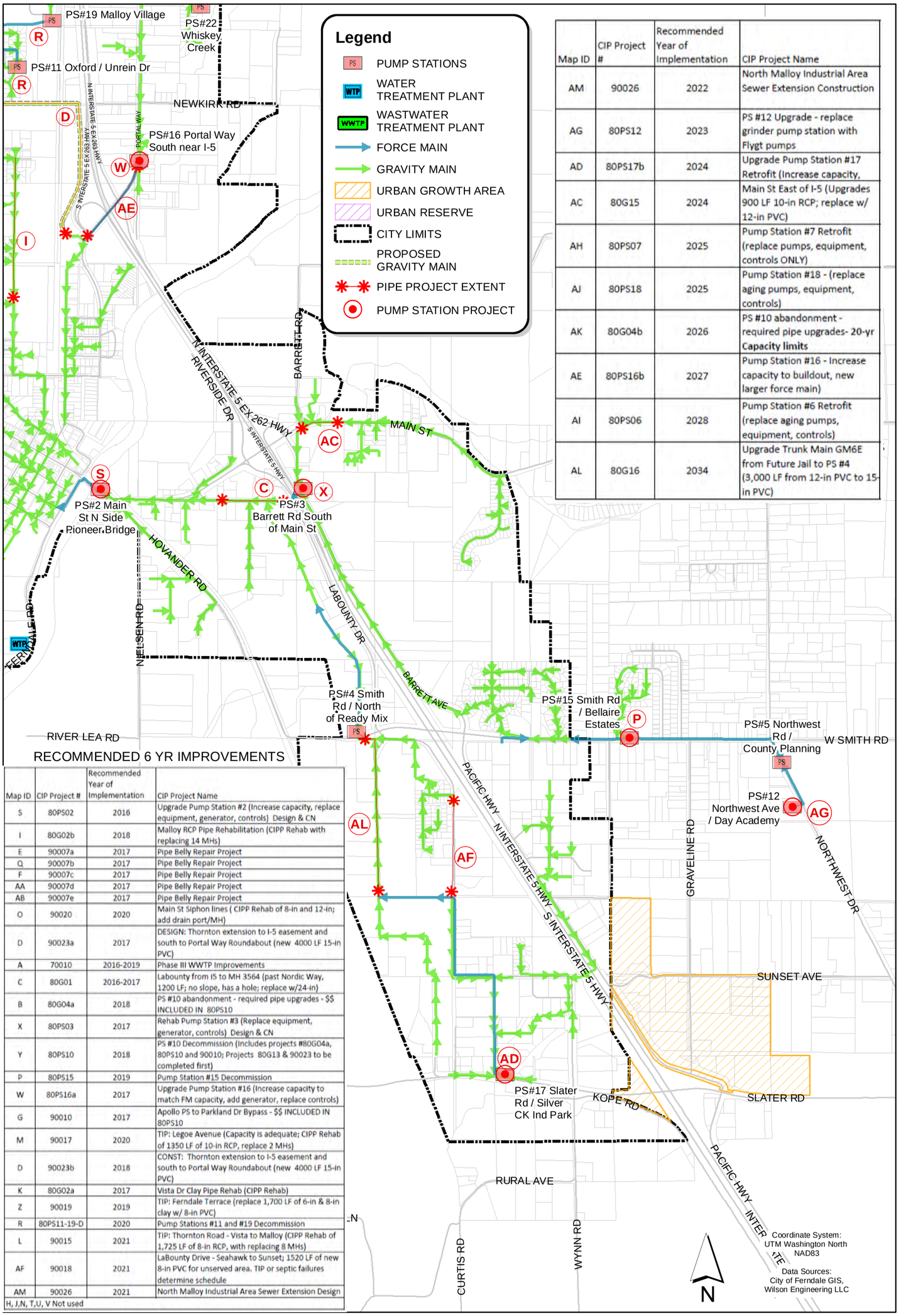
CITY OF FERNDALE, WA

WHATCOM COUNTY — WASHINGTON

EXHIBIT H

6 AND 20 YEAR CIP MAP

DATE	SHEET
MAY 2016	1
SCALE 1:19,200	OF 2
JOB NUMBER 2014-036	



Map ID	CIP Project #	Recommended Year of Implementation	CIP Project Name
AM	90026	2022	North Malloy Industrial Area Sewer Extension Construction
AG	80PS12	2023	PS #12 Upgrade - replace grinder pump station with Flygt pumps
AD	80PS17b	2024	Upgrade Pump Station #17 Retrofit (Increase capacity,
AC	80G15	2024	Main St East of I-5 (Upgrades 900 LF 10-in RCP; replace w/ 12-in PVC)
AH	80PS07	2025	Pump Station #7 Retrofit (replace pumps, equipment, controls ONLY)
AJ	80PS18	2025	Pump Station #18 - (replace aging pumps, equipment, controls)
AK	80G04b	2026	PS #10 abandonment - required pipe upgrades- 20-yr **Capacity limits**
AE	80PS16b	2027	Pump Station #16 - Increase capacity to buildout, new larger force main)
AI	80PS06	2028	Pump Station #6 Retrofit (replace aging pumps, equipment, controls)
AL	80G16	2034	Upgrade Trunk Main GM6E from Future Jail to PS #4 (3,000 LF from 12-in PVC to 15-in PVC)

RECOMMENDED 6 YR IMPROVEMENTS

Map ID	CIP Project #	Recommended Year of Implementation	CIP Project Name
S	80PS02	2016	Upgrade Pump Station #2 (Increase capacity, replace equipment, generator, controls) Design & CN
I	80G02b	2018	Malloy RCP Pipe Rehabilitation (CIPP Rehab with replacing 14 MHs)
E	90007a	2017	Pipe Belly Repair Project
Q	90007b	2017	Pipe Belly Repair Project
F	90007c	2017	Pipe Belly Repair Project
AA	90007d	2017	Pipe Belly Repair Project
AB	90007e	2017	Pipe Belly Repair Project
O	90020	2020	Main St Siphon lines (CIPP Rehab of 8-in and 12-in; add drain port/MH)
D	90023a	2017	DESIGN: Thornton extension to I-5 easement and south to Portal Way Roundabout (new 4000 LF 15-in PVC)
A	70010	2016-2019	Phase III WWTP Improvements
C	80G01	2016-2017	Labounty from I5 to MH 3564 (past Nordic Way, 1200 LF; no slope, has a hole; replace w/24-in)
B	80G04a	2018	PS #10 abandonment - required pipe upgrades - $$ INCLUDED IN 80PS10
X	80PS03	2017	Rehab Pump Station #3 (Replace equipment, generator, controls) Design & CN
Y	80PS10	2018	PS #10 Decommission (Includes projects #80G04a, 80PS10 and 90010; Projects 80G13 & 90023 to be completed first)
P	80PS15	2019	Pump Station #15 Decommission
W	80PS16a	2017	Upgrade Pump Station #16 (Increase capacity to match FM capacity, add generator, replace controls)
G	90010	2017	Apollo PS to Parkland Dr Bypass - $$ INCLUDED IN 80PS10
M	90017	2020	TIP: Legoe Avenue (Capacity is adequate; CIPP Rehab of 1350 LF of 10-in RCP, replace 2 MHs)
D	90023b	2018	CONST: Thornton extension to I-5 easement and south to Portal Way Roundabout (new 4000 LF 15-in PVC)
K	80G02a	2017	Vista Dr Clay Pipe Rehab (CIPP Rehab)
Z	90019	2019	TIP: Ferndale Terrace (replace 1,700 LF of 6-in & 8-in clay w/ 8-in PVC)
R	80PS11-19-D	2020	Pump Stations #11 and #19 Decommission
L	90015	2021	TIP: Thornton Road - Vista to Malloy (CIPP Rehab of 1,725 LF of 8-in RCP, with replacing 8 MHs)
AF	90018	2021	LaBounty Drive - Seahawk to Sunset; 1520 LF of new 8-in PVC for unserved area. TIP or septic failures determine schedule
AM	90026	2021	North Malloy Industrial Area Sewer Extension Design

H, J,N, T,U, V Not used

1 in = 1,600 ft

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 H

6 AND 20 YEAR CIP MAP

DATE MAY 2016

SCALE 1:19,200

JOB NUMBER 2014-036

SHEET 2 OF 2

City of Ferndale
2016-2021 Sewer Capital Improvement Program

Adoption Date: _____
Resolution Date: _____

Fund	CIP Num	Year Scheduled	Project Name	Total	2016	2017	2018	2019	2020	2021
General										
	80A02	2020	Emergency Response Plan	$ 45,667					$ 45,667	
	80A03	2016	Complete WWTP Facility Plan	$ 30,000	$ 30,000					
	90009	2016	Complete Sewer Comprehensive Plan Update	$ 20,000	$ 20,000					
			SUBTOTAL	$ 50,000	$ 50,000	$ -	$ -	$ -	$ 45,667	$ -
Misc & Maintenance										
	1M010	Annual	Smoke Testing (test 1/4 of City per year; cycle every 10 years)	$ 142,096				$ 45,972	$ 47,352	$ 48,772
	1M011	Annual	Sewer I&I Projects: Spot Repairs; MH grouting; MH Dishes (formerly 90008)	$ 514,675	$ 79,568	$ 81,955	$ 84,413	$ 86,946	$ 89,554	$ 92,241
				$ 656,771	$ 79,568	$ 81,955	$ 84,413	$ 132,918	$ 136,905	$ 141,013
Sewer Pump Stations										
	80PS02	2016	Upgrade Pump Station #2 (Increase capacity, replace equipment, generator, controls) Design & CN	$ 1,390,000	$ 1,390,000					
	80PS03	2016	Rehab Pump Station #3 (Replace equipment, generator, controls) Design & CN	$ 1,160,000	$ 1,160,000					
	80PS10	2018	PS #10 Decommission (Includes projects #80G04a, 80PS10 and 90010; Projects 80G13 & 90023 to be completed first)	$ 468,507			$ 468,507			
	80PS15	2019	Pump Station #15 Decommission	$ 402,848				$ 402,848		
	80PS16a	2017	Upgrade Pump Station #16 (Increase capacity to match FM capacity, add generator, replace controls)	$ 614,659		$ 614,659				
	80PS18a	2018	PS #18 - Replace controls	$ 35,000			$ 35,000			
	80PS11-19-D	2020	Pump Stations #11 and #19 Decommission	$ 740,422				$ 360,000	$ 380,422	
			SUBTOTAL	$ 4,811,436	$ 2,550,000	$ 614,659	$ 503,507	$ 762,848	$ 380,422	$ -
Sewer Collection										
	80G01	2016-2017	Labounty from I-5 to MH 3564 (past Nordic Way, 1200 LF; no slope, has a hole; replace w/24-in)	$ 644,491	$ 189,371	$ 455,121				
	80G02a	2017	Vista Dr Clay Pipe Rehabilitation (**CIPP Rehab** with replacing 8 MHs)	$ 322,354		$ 322,354				
	80G02b	2018	Malloy RCP Pipe Rehabilitation (**CIPP Rehab** with replacing 14 MHs)	$ 534,617			$ 534,617			
	80G03	Annual	Miscellaneous pipe upgrades / repairs	$ 1,160,287		$ 218,545	$ 225,102	$ 231,855	$ 238,810	$ 245,975
	80G04a	2018	PS #10 abandonment - required pipe upgrades - **$$ INCLUDED IN 80PS10**	$ 317,956			$ 317,956			
	90007a-e	2017	Pipe Belly Repair Project- five locations	$ 442,554		$ 442,554				
	90010		Apollo PS to Parkland Dr Bypass - **$$ INCLUDED IN 80PS10**	$ -						
	90015	2021	TIP: Thornton Street - Vista to Malloy **(CIPP Rehab** of 1,725 LF of 8-in RCP, with replacing 8 MHs)	$ 313,618						$ 313,618
	90017	2020	TIP: Legoe Avenue (Capacity is adequate; **CIPP Rehab** of 1350 LF of 10-in RCP, replace 2 MHs)	$ 143,286					$ 143,286	
	90018	2021	Labounty Drive - Seahawk to Sunset; 1520 LF of new 8-in PVC for unserved area. TIP or septic failures determine schedule	$ 329,260						$ 329,260
	90019	2019	TIP: Ferndale Terrace (replace 1,700 LF of 6-in & 8-in clay w/ 8-in PVC)	$ 478,201				$ 478,201		
	90020	2020	Main St Siphon lines (**CIPP Rehab** of 8-in and 12-in; add drain port/MH)	$ 274,632					$ 274,632	
	90023a	2017	DESIGN: Thornton extension to I-5 easement and south to Portal Way Roundabout (new 4000 LF 15-in PVC)	$ 169,373		$ 169,373				
	90023b	2018	CONST: Thornton extension to I-5 easement and south to Portal Way Roundabout (new 4000 LF 15-in PVC)	$ 1,272,950			$ 1,272,950			
	90026	2021	North Malloy Industrial Area Sewer Extension Design	$ 350,975						$ 350,975
			SUBTOTAL	$ 6,754,555	$ 189,371	$ 1,607,948	$ 2,350,625	$ 710,055	$ 656,729	$ 1,239,827
Wastewater Treatment Plant										
	70010a	2016	DESIGN: Phase III WWTP Improvements	$ 1,854,000	$ 206,000	$ 1,236,000	$ 412,000			

Fund	CIP Num	Year Scheduled	Project Name	Total	2016	2017	2018	2019	2020	2021
	70010b	2018	CONST: Phase III WWTP Improvements	$ 20,215,450			$ 13,042,225	$ 7,173,224		
			SUBTOTAL	$ 22,069,450	$ 206,000	$ 1,236,000	$ 13,454,225	$ 7,173,224	$ -	$ -
			GRAND TOTAL	$ 34,387,878	$ 3,074,938	$ 3,540,561	$ 16,392,771	$ 8,779,045	$ 1,219,723	$ 1,380,840

City of Ferndale
2022-2035 Sewer Capital Improvement Program

Adoption Date: _____
Resolution Date: _____

Fund	CIP Num	Year Scheduled	Project Name	Total	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035
General																		
	80A02	5 yr	Emergency Response Plan Update (5 year cycle)	$ 114,313				$ 52,941					$ 61,373					
	90009	6 yr	Sewer Comprehensive Plan Update	$ 400,672	$ 110,689						$ 132,168						$ 157,816	
			SUBTOTAL	$ 514,986	$ 110,689	$ -	$ -	$ 52,941	$ -	$ -	$ 132,168	$ -	$ 61,373	$ -	$ -	$ -	$ 157,816	$ -
Misc & Maintenance																		
	1M010	Annual	Smoke Testing (test 1/4 of City per year; cycle every 10 years)	$ 284,765							$ 68,067	$ 70,109	$ 72,212	$ 74,378				
	1M011	Annual	Sewer I&I Projects: Spot Repairs; MH grouting	$ 1,020,098	$ 59,703	$ 61,494	$ 63,339	$ 65,239	$ 67,196	$ 69,212	$ 71,288	$ 73,427	$ 75,629	$ 77,898	$ 80,235	$ 82,642	$ 85,122	$ 87,675
			SUBTOTAL	$ 1,304,863	$ 59,703	$ 61,494	$ 63,339	$ 65,239	$ 67,196	$ 69,212	$ 139,355	$ 143,535	$ 147,841	$ 152,277	$ 80,235	$ 82,642	$ 85,122	$ 87,675
Sewer Pump Stations																		
	80PS06	2028	Pump Station #6 Retrofit (replace aging pumps, equipment, controls)	$ 446,214							$ 446,214							
	80PS07	2025	Pump Station #7 Retrofit (replace pumps, equipment, controls ONLY)	$ 221,477				$ 221,477										
	80PS12	2023	PS #12 Upgrade - replace grinder pump station with Flygt pumps	$ 388,170		$ 388,170												
	80PS16b	2027	Pump Station #16 - Increase capacity to buildout, new larger force main)	$ 660,840						$ 660,840								
	80PS17b	2024	Upgrade Pump Station #17 Retrofit (Increase capacity, replace pumps,	$ 524,127			$ 524,127											
	80PS18	2025	Pump Station #18 - (replace aging pumps, equipment, controls)	$ 110,000				$ 110,000										
			SUBTOTAL	$ 2,350,829	$ -	$ 388,170	$ 524,127	$ 331,477	$ -	$ 660,840	$ 446,214	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Sewer Collection																		
	80G02	Annual	Annual Sewer CIPP-Rehabilitation	$ 3,466,353	$ 202,873	$ 208,959	$ 215,228	$ 221,685	$ 228,335	$ 235,185	$ 242,241	$ 249,508	$ 256,993	$ 264,703	$ 272,644	$ 280,824	$ 289,248	$ 297,926
	80G03	Annual	Miscellaneous pipe upgrades / repairs	$ 2,101,402	$ 122,987	$ 126,677	$ 130,477	$ 134,392	$ 138,423	$ 142,576	$ 146,853	$ 151,259	$ 155,797	$ 160,471	$ 165,285	$ 170,243	$ 175,351	$ 180,611
	80G04b	2026	PS #10 abandonment - required pipe upgrades- **20-yr Capacity limits**	$ 332,216					$ 332,216									
	80G15	2024	Main St East of I-5 (Upgrades 900 LF 10-in RCP; replace w/ 12-in PVC)	$ 441,813			$ 441,813											
	80G16	2034	Upgrade Trunk Main GM6E from Future Jail to PS #4 (3,000 LF from 12-in PVC to 15-in PVC)	$ 1,291,370													$ 1,291,370	
	90007	Annual	Repair high maintenance pipe sections (bellies, bad joints, etc.)	$ 990,387	$ 57,964	$ 59,703	$ 61,494	$ 63,339	$ 65,239	$ 67,196	$ 69,212	$ 71,288	$ 73,427	$ 75,629	$ 77,898	$ 80,235	$ 82,642	$ 85,122
	90026	2022	North Malloy Industrial Area Sewer Extension	$ 2,048,526	$ 2,048,526													
			SUBTOTAL	$ 10,672,066	$ 2,432,350	$ 395,339	$ 849,011	$ 419,415	$ 764,213	$ 444,957	$ 458,306	$ 472,055	$ 486,217	$ 500,803	$ 515,827	$ 531,302	$ 1,838,611	$ 563,659
Wastewater Treatment Plant																		
	70011	Annual	Annual Equipment Replacement	$ 3,152,104	$ 184,481	$ 190,016	$ 195,716	$ 201,587	$ 207,635	$ 213,864	$ 220,280	$ 226,888	$ 233,695	$ 240,706	$ 247,927	$ 255,365	$ 263,026	$ 270,917
	70015	2025	Biosolids Management	$ 335,979				$ 335,979										
			SUBTOTAL	$ 3,488,083	$ 184,481	$ 190,016	$ 195,716	$ 537,567	$ 207,635	$ 213,864	$ 220,280	$ 226,888	$ 233,695	$ 240,706	$ 247,927	$ 255,365	$ 263,026	$ 270,917
			GRAND TOTAL	$ 18,330,826	$ 2,787,222	$ 1,035,018	$ 1,632,193	$ 1,406,638	$ 1,039,044	$ 1,388,873	$ 1,396,323	$ 842,479	$ 929,126	$ 893,786	$ 843,990	$ 869,310	$ 2,344,574	$ 922,251

EXHIBIT I

Hydraulic Sewer Model Capacity Analysis

EXHIBIT I

HYDRAULIC SEWER MODEL CAPACITY ANALYSIS

This Exhibit describes the software and methods used for the Comprehensive Sewer Plan hydraulic capacity analysis.

1. HYDRAULIC MODELING SOFTWARE

InfoSewer for ArcGIS by MWHSoft was used for modeling the City of Ferndale sanitary sewer system infrastructure. The license purchased by Wilson Engineering for the modeling allows a model with up to 1,000 links (model links include pipes and pumps). It may be necessary ultimately for the City to purchase a license that allows more links if the model is to be used to simulate the entire City sewer system including all minor arterial sewer lines. Also for subsequent use of the model, it is recommended that an annual maintenance agreement be obtained from MWHSoft in order to access technical support and to receive model program updates.

InfoSewer is operated within a GIS platform (ArcGIS 10.0 in the case of this analysis). This allows full integration and full use of GIS shapefiles and geodatabases within the InfoSewer modeling program. GIS data editing is also capable within InfoSewer. Although GIS shapefiles can be viewed, referenced, and utilized with the InfoSewer model, actual model infrastructure and simulation data are stored in its own geodatabase. The model components can be built directly from imported GIS shapefiles but they are stored and maintained in the separate database. Thus, whenever the GIS data is updated the model data needs to be updated or vice-versa, the model data can be updated first but then the GIS data must be updated. Model software tools allow easy exchange between GIS and model databases. InfoSewer is capable of steady-state or extended period simulations. This capacity analysis for the Ferndale sewer system is performed using steady-state simulation.

2. MODEL NETWORK CONSTRUCTION

Manholes and Pipes

The City of Ferndale's existing Access database containing manhole information was used to develop a model of the sewer system. As-built drawings and information provided by City staff were used to fill in gaps of missing data as necessary. Older GIS shapefiles from the City were also referenced as required to help fill in missing data and provide guidance in areas that were otherwise unclear.

At the time of original model development Ferndale's manhole database contained complete information for approximately one-third of all City manholes. All other

manhole data consisted only of x and y coordinates and rim elevation. Complete information existed for the majority of main sewer trunk line manholes that were required to build the model. Where main sewer line manhole data was needed for the model, City staff collected the complete data. The model was then updated with the required complete data at a later date. At the time of completion of this analysis report, City staff had collected complete information for every manhole in Ferndale, and continues to collect new and update existing information as sewer projects are completed.

The manhole data required for the model includes:

- X and y coordinates
- Rim elevation
- Inlet and outlet invert elevations
- Inlet and outlet directions, pipe materials diameters
- Manhole diameter (no data; assumed all manholes 4-ft diameter for model)

It should be noted that this is NOT a complete list of the current information contained in the database, nor should the database be limited to this information for future data collection. Current database information includes visual observations of inflow and/or infiltration and other general conditions. This is important information and it should continue to be collected when possible.

The manhole database was converted to a GIS point shapefile for use in building the InfoSewer model database. Once the manholes were in GIS and imported into the InfoSewer model, the associated information was used to develop the major pipeline network within InfoSewer. In general, pipes larger than 8-inches in diameter and/or segments considered as trunk or arterial mains were included in the original model pipe network. Additional areas of the City's sewer system were added to the model as required to analyze certain potential projects, particularly analysis of sewer projects because of Traffic Improvement Plan projects.

Pump Stations

City pump station locations were identified from a combination of the manhole database, old GIS shapefiles, as-built AutoCAD drawing information, and site visits. Available pump station wet well and pumping capacity information was somewhat limited at the beginning of the project. As a result, site visits were conducted with City maintenance staff to obtain pumping station information including wet well dimensions, pump model numbers or serial numbers, pump control settings, force main size and discharge locations, general conditions and other staff observations. City maintenance staff provided available pump curves or serial numbers, which allowed obtaining pump curves from the pump supplier. Pump curves were obtained for 15 of the 17 pump stations; PS #7 and PS #12 could not be obtained.

Level logger monitoring was conducted at each pump station wet well for at least two days during the months of January and February 2011 in order to verify available pump capacity information. Pump station influent and pump discharge flow rates were then estimated based on known wet well dimensions and the observed level logger data. The hydraulic model pumping rates were adjusted to match approximately the estimated pumping capacities from the monitoring by calibrating force main pipes. Estimated observed pumping capacities are presented in Section 4 – Table 6 below.

All pumps on/off controls were estimated based on site visit observations and City staff noted control levels. While the model steady state simulation does not simulate using pump station wet well controls, it was assumed for the simulation that the wet wells were at the "on" level such that the maximum flow from the pumping cycle would be observed in the model.

3. MODEL SEWER FLOW LOADS

Model sewer flow loading was estimated using the City Traffic Analysis Zone (TAZ) information. TAZ data consists of GIS polygon shapefiles showing the TAZ boundaries and identification number. Population and employment data for each TAZ is contained in a spreadsheet and includes data for existing conditions (2008) and projected future growth conditions (2034). The data of particular interest for calculating the sewer loads for the hydraulic model were: total households, total employees, total students, and household population. It was assumed that additional sewer flows due to growth from 2010 (using 2008 data as existing) to 2014 is insignificant for the purposes of the analysis and no overall system wide sewer flow increases were used for this update of the plan. Although known developments have been evaluated and included in existing flows (i.e. Douglas Place Phase 2, Pioneer Terrace, Larsen's Church Hill Estates 2).

The sewer flow loading for the existing condition (2008 TAZ data) included only TAZ areas under Ferndale City jurisdiction, while the future condition (2034 TAZ data) included TAZ areas under Ferndale City and UGA jurisdiction (also County jurisdiction areas served by PS#5). Figure 1 shows the locations where UGAs and currently un-sewered areas within City limits were applied to the model for the future scenario analysis.

Sewer flow monitoring and pump station wet well monitoring was used to verify and modify the TAZ flow estimates as necessary as described in following sections.

Average Daily Flow – Calculated (TAZ)

The average daily wastewater flows were calculated based on the household, employee and student data for each TAZ and the Criteria for Sewage Works Design. The average number of persons per household was calculated from the available TAZ data. The data for 2008 indicated approximately 2.9 persons/household and in 2034 there is expected

to be approximately 2.8 persons/household. These numbers were multiplied by 100 gallons/day (GPD) for each person (per Criteria for Sewage Works Design) to estimate the average daily wastewater flow per household. The average daily flows for each unit used in calculating the flows from the TAZ data are presented in Table 1.

Table 1. Unit Flows for Calculating Average Daily Flow

Land Use	Units	2008 Average Daily Flow Per Unit (GPD)	2034 Average Daily Flow Per Unit (GPD)
Residential	Household	290	280
Business (incl Service, Retail, Wholesale, Construction, Manufacturing)	Employee	25	
School	Student	16	

For each TAZ area, the average daily flow equals the sum of the number of households, employees, and students each multiplied by their respective average daily flow per unit. The calculated flows were then assigned to appropriate nodes (manholes) in the model.

Average Daily Flow – Modification of Existing Flows Using Flow Monitoring Data (Model Calibration)

City sewer flow monitoring was conducted from April 27 – May 26, 2010 and January 12 – February 6, 2011 at six locations. The six locations monitored include: influent at PS #2 on Main Street, Vista Drive between 2nd and 3rd Streets, Bass Drive, and 2nd Avenue, Cherry Street west influent and east influent, and east of Imhof Rd near the treatment plant along the southwest sewer interceptor. The time frame of the May flow monitoring is assumed representative of the average flow conditions for the year and thus used for comparison and adjustment to the calculated TAZ data average daily wastewater flows. Some data collected during the May monitoring period is suspect or invalid; particularly Cherry St East and Vista Dr. As a result, January monitoring data was used to estimate May flows for the invalid locations.

The flow monitoring data over the collection period were averaged to obtain an average daily flow for comparison to the calculated average daily flows. The most conservative flow values were used as the average daily flow in the model. At three of the locations, Bass & 2nd, Cherry St West and Imhof Rd, the calculated average daily flows were higher than the observed flows during the monitoring period and the calculated values were used in the model. At PS #2, Vista Dr and Cherry St East, the observed average daily flow was higher than the calculated flow and the observed flows were used in the model. The higher observed flows at PS #2 and Cherry St East are not unexpected because of the difficulty in approximating sewer flows from commercial and industrial land uses, which are predominant in this area of the City.

Table 2 summarizes the observed values compared to the calculated values and the final daily average flow loading for the existing model scenario (as originally performed in 2011) at those locations where flow monitoring occurred. It is important to note that the average daily flows were applied to the model only as base flows used for model node loading; they are not peak hourly flows used for the analysis as discussed below. It should be noted that Table 2 is a summary of the original model calibration performed for the Sewer Comprehensive Plan in 2011. It does not account for any new flow additions or flow redistributions that have occurred since the original analysis, which are minor and considered insignificant for the purposes of this analysis.

Table 2. May 2010 Flow Monitoring, TAZ Calculated Ave Daily Flow Loading and Existing Modeling (2011 SCP) Scenario Base Loading

Location	May 2010 Flow Monitoring - Daily Average Flow (gpm)	Calculated (TAZ data) Daily Average Flow = Model Base Loading (gpm)	Model Base Loading Adjustment	Final Adjusted Model base Loading (gpm)
PS#2 influent	251	173	multiply service area model loads by 1.45	251
Vista Dr 2nd-3rd	294 [1]	234	multiply service area model loads by 1.26	295
Bass & 2nd	96	111	use calculated	111
Cherry St West	537	636	use calculated	636
Cherry St East	268 [2]	187	multiply local service area model loads by 1.21	268
Imhof Rd	234	270	use calculated	270
WWTP Total (MGD) =	1.50	1.57	--	1.69

Notes: 1. Vista Dr May flow estimated as a percentage of Cherry St West flow based on January monitoring data.
2. Cherry St East flow is estimated by adding local loading between PS#2 and Cherry St East to PS#2 flow.

Average Daily Flow – Future YR-2034

Model flows for the future scenario also included Ferndale UGAs and areas currently un-sewered within City limits as additional service areas. Topography was used to approximate where the additional areas would add sewer loads to the existing City sewer system; no future or proposed sewer mains were modeled (i.e. future UGA piping). Figure 1 shows the locations where UGAs were applied to the model for the future scenario analysis. Table 3 summarizes the Future (2034) model scenario daily average flow loading at the flow monitoring locations as discussed previously. The flows in Table 3 are final adjusted model base loading values, thus they had the same calibration adjustments made to the TAZ data calculated daily average flows as for the existing calculations at each location.

Table 3 reflects the original model calibration performed for the Sewer Comprehensive Plan in 2011 with some updates. It includes the following additional flows for this Plan update, based on input from City Planning regarding significant potential additions to the 2034 TAZ data (all East of the Nooksack River):

- Lummi Tribe 300-room hotel located in the southwest quadrant of Slater Rd and Interstate 5 intersection; base flow = 44 gpm (peak hourly flow = 175 gpm),
- Whatcom County Jail ¼ mile west of Labounty Dr and ½ mile south of W Smith Rd; base flow = 50 gpm (peak hourly flow = 200 gpm),
- 150-room hotel located along Barrett Ave, near Pump Station #3; base flow = 23 gpm (peak hourly flow = 90 gpm),
- 50% hotel expansion along Riverside Dr; base flow = 5.5 gpm (peak hourly flow = 22 gpm).

Table 3 also reflects the following significant flow re-routing changes which are anticipated within the next 6 years:

- Decommission of PS#10 Aquarius/Apollo Dr; routes flows by gravity to Parkland Way and ultimately east to Malloy (and down Thornton Extension, see next item) instead of south down Shannon to Main St,
- Thornton Rd Sewer Extension; routes flows from Malloy north of Thornton east to I-5 and south to the Portal Way Roundabout,
- Decommission of PS#15 Smith Rd/Bellaire Estates; no change in flow path.

Table 3. Future YR-2034 Model Scenario Base Loading (Daily Average Flow)

Location	Final Adjusted Model base Loading (gpm)
PS#2 influent	762
Vista Dr 2nd-3rd	305
Bass & 2nd	628
Cherry St West	1,275
Cherry St East	824
Imhof Rd	557
WWTP Total (MGD) =	3.82

Peak Hourly Flows

The InfoSewer program uses a peaking factor equation for steady-state simulations; however, it is only globally applied and it is not possible to assign different peaking factors to different areas of the model with this equation. As a result, the peaking factor was set to equal 1 in the model so that peak hourly flows were not calculated by the model using the built-in equation. Alternatively, sewer zones were delineated and a peaking factor was applied to each sewer zone. The loads at each node were multiplied by the peaking factor for that respective sewer zone to calculate the peak hourly flow, which was assigned to the node as a direct load. The delineated sewer zones and their general flow path are shown in Exhibit D of the Sewer Comprehensive Plan.

Peaking factors for each sewer zone were calculated using the Criteria for Sewage Works Design equation:

$$\frac{Q_{peak\ hourly}}{Q_{design\ average}} = \frac{18 + P^{0.5}}{4 + P^{0.5}}$$

Where: Q peak hourly = Maximum rate of wastewater flow (peak hourly flow)
Q design average = Design average daily wastewater flow
P = Population in thousands

Population for each sewer zone, which was used in the above equation, was tabulated from TAZ data. Table 4 summarizes the sewer zone population and resulting peak hourly peaking factor for each sewer zone. Note that the following Table 4 is shows Peaking Factors calculated for the original model in 2011. The current analysis does not modify these initial assumptions and calculations.

Table 4. Sewer Zone Population and Resulting Peaking Factor

	Existing Scenario (2008 TAZ data)		Future Scenario (2034 TAZ data)	
Sewer Zone	Household Population *	Peaking Factor (Peak Hourly) ***	Household Population **	Peaking Factor (Peak Hourly) ***
E1	183	4.16	224	4.13
E2	1,107	3.77	2,137	3.56
E3	203	4.15	403	4.02
E4	65	4.29	362	4.04
E5	648	3.91	1,117	3.77
E6	0	4.50	15	4.40
W1	2,822	3.46	4,712	3.27
W2	2,503	3.51	3,871	3.35
W3	1,021	3.79	2,941	3.45
W4	296	4.08	349	4.05
W5	469	3.99	2,265	3.54
W6	536	3.96	684	3.90
W7	103	4.24	129	4.21
W8	53	4.31	128	4.21
W9	175	4.17	2,115	3.57
W10	1	4.47	79	4.27
W11	2,996	3.44	5,592	3.20
W12	142	4.20	380	4.03
Total =	13,323	--	27,503	--

Notes: * Population for Ferndale City jurisdiction only, plus Sewer Zone E5 and E6, which are under County jurisdiction

** Population for Ferndale City and Ferndale UGA jurisdiction, plus Sewer Zone E5 and E6, which are under County jurisdiction

*** Peak Hourly Peaking Factor equation from Criteria for Sewage Works:

$$\frac{Q\ peak\ hourly}{Q\ design\ average} = \frac{18 + P^{0.5}}{4 + P^{0.5}}$$

where: P = population in thousands

Based on January 2011 sewer flow monitoring as described previously, the Vista Dr between 2nd and 3rd service area peaking factor was increased to 4.5 as it better matched the observed data. This service area consists of a portion of Sewer Zone W1.

4. CAPACITY ANALYSIS

The capacity analysis was conducted using steady-state conditions during the wet weather peak hourly flow situation. The main analysis criterion used in the hydraulic model capacity analysis was the observed peak flow (q) to full flow (Q) ratio. Model simulated pipes with a q/Q greater than 0.85 were identified as potential capacity issues. The modeled gravity trunk mains rated capacities for the existing and future scenarios are summarized in Table 5. Note Future Peak Hourly Flows (2034) assumes the additional flows and changes/upgrades to the system as described in Section 3 “Average Daily Flow – Future Yr-2034”.

Table 5. Trunk Main Characteristics, Flow Capacities, and Peak Hourly Flow

Trunk Main ID	Pipe Diameter (Min - Max)	Pipe Length	Average Pipe Slope	Flow Capacity	Existing Peak Hourly Flow	Future Peak Hourly Flow (2034)
	inches	feet	%	GPM	GPM	GPM
GM1W	42* – 48	2,683	0.22	23,500	3,534	8,201
GM2W	24* – 30	694	0.76	10,000	1,079	3,146
GM3W	36 – 36	851	0.75	25,959	2,455	5,054
GM4W	24 – 24	628	0.26	5,139	1,711	3,963
GM5W	17 – 17	3,492	0.51	2,898	411	2,655
GM6W	21 – 21	6,206	0.53	5,159	306	1,291
GM7W	17 – 17	345	0.73	3,468	1,300	1,308
GM8W	8* – 15	2,689	0.59	**552**	880	614
GM9W	8 – 10	1,686	1.16	475	412	619
GM10W	15 – 15	3,021	0.72	2,454	712	971
GM11W	10 – 10	1,555	3.13	1,741	310	378
GM12W	18* – 27	6,064	0.83	4,720	1,060	1,853
GM13W	8 – 8	1,505	3.04	580	156	198
GM14W	12 – 12	1,486	2.65	1,560	865	1,144
GM15W	12 – 12	4,210	2.92	2,400	691	826
GM1E	21 – 21	2,820	0.16	2,844	1,018	2,947
GM2E	21 – 21	384	0.08	1,989	616	1,424
GM3E	10* – 20	4,732	0.27	530	321	662
GM4E	10* – 20	6,391	0.78	635	295	762
GM5E	15 – 15	1,962	0.36	1,500	238	1,214
GM6E	12 – 12	2,931	0.22	758	219	1,162
GM7E	10 – 10	708	0.36	531	89	380
GM8E	8* – 10	2,027	0.58	560	63	301

* Indicates controlling pipe diameter.

Bold red type indicates that hydraulic capacity is inadequate at peak flow.

The modeled pump station rated capacities (per pump station wet well level logger monitoring) and incoming wet weather peak hourly flows for the existing and future scenarios are summarized in Table 6. Note that the peak inflows are presented without short-term pumping peak effects and reflect the peak hourly flows throughout the system.

Table 6. Pump Station Capacities and Model Peak Hourly Inflows

			EXISTING	FUTURE (2034)
Pump Station	Capacity (model [1]) (gpm)	TDH (model) (ft)	Peak Hourly Inflow [2] (gpm)	Peak Hourly Inflow [2] (gpm)
PS # 2 - Main St N Side Pioneer Bridge	1,438	22	1,019	**2,947**
PS # 3 - Barrett Rd South of Main St	1,488	16	617	1,424
PS # 4 - Smith Rd / North of Ready Mix	756	48	237	**1,209**
PS # 5 - Northwest Rd / County Planning	259	34	55	62
PS # 6 - Correll Park / Flair	187	55	90	102
PS # 7 - Main St / 7-11 / Post Office	75	17	44	**131**
PS # 9 - Portal Way North	209	24	42	61
PS # 10 - Aquarius / Apollo Dr	132	50	**149**	**315**
PS # 11 - Oxford / Unrein Dr	84	70	80	80
PS # 15 - Smith Rd / Bellaire Estates	764	40	57	160
PS #16 - Portal Way South near I-5	404	35	305	**1,290**
PS # 17 - Slater Rd / Silver Ck Ind Park	415	69	89	**674**
PS # 18 - Nicholas Dr / Ryan's Glen	128	47	24	28
PS # 19 - Malloy Village	113	68	30	**140**
PS # 20 - Church Rd / South Church LLC	133	31	10	75
PS #22 - Whiskey Creek	205	51	17	104

Notes: All capacities are with 1 pump running.

1. Calibrated model pumping capacities based on level logger monitoring at each pump station wet well Jan-Feb 2011.
2. Values shown do not reflect short-term spikes created by upstream Pump Stations. They are a sum of peak hourly flows upstream from the Model.

Based on the above Table 6 the following pump station *capacity* upgrades are recommended (not including upgrades currently in progress, i.e. PS #2, #3, and #4):

- Pump stations requiring capacity upgrades **within 6-years**:
  - PS #10 Aquarius/Apollo Dr (Decommissioning of station anticipated)
  - PS #16 Portal Way South (Phase 1 to capacity of force main)

- Pump stations requiring capacity upgrades **after 6-years**:
    - PS #7 Main St/7-11/Post Office
    - PS#16 Portal Way South (Phase 2 if growth occurs as forecasted, requires upgrading the force main)
    - PS #17 Slater Rd/Silver Crk Ind Park
    - PS #19 Malloy Village

The model peak hourly wastewater flows at the flow monitoring locations as described above for the existing and future (2034) scenarios are summarized in Table 7.

Table 7. Model Peak Hourly Wastewater Flows at Flow Monitoring Locations

	Model Peak Hourly Flows (gpm)	
Location	Existing	Future (2034)
PS#2 influent	1,018	2,947
Vista Dr 2nd-3rd	1,300	1,308
Bass & 2nd	411	2,655
Cherry St West	2,455	5,054
Cherry St East	1,079	3,146
Imhof Rd	1,060	1,855
Resulting WWTP influent (MGD) [1] =	6.62	14.48

Notes: 1. WWTP Flow = Cherry St West + Cherry St East + Imhof Rd

It should be noted that pump station upgrades as required to convey incoming peak hourly flows were assumed for the future scenario modeled pump stations.
The City is consideringdecommissioning pump stations #10 and #15 as described previously, and decommissioning of these stations was assumed for the future modeling scenario. Decommissioning of PS#11 and #19 are also options in the future if a gravity main to the east is installed to serve the UGA to the north. PS#10, #11, and #19 are discussed further below.

Existing Scenario (Peak Hourly Flow) – Capacity Analysis Results

Figure 2 shows the pipes that the model predicts may have inadequate capacity during wet weather peak hourly flows based on the observed flow to flow capacity ratio q/Q > 0.85 (near capacity) and q/Q >1 (over capacity). Also identified are pipe segments that have adverse (negative) slopes according to the manhole database. The main areas of

concern from the capacity analysis are summarized as follows (the letters correspond to the area identified on Figure 2):

A) Related CIPs: 80G02b, 80G13, 90023. Malloy Ave from Jensen St to 300-ft south of Golden Eagle Dr (Note: sewer line from Kiwi St to Eagle Dr is east of Malloy Ave approximately 600-ft) – the majority of this segment of 8-in RCP sewer line is undersized for the service area . Additionally, City staff has indicated it is in very poor condition with many bellied (sagging) sections and separated pipe joints. Construction of the Thornton Extension to Portal Way (CIP 90023) will relieve the vast majority of capacity issues on this section of pipe. From Jensen St to Thornton St (CIP 80G13) is still required. Rehabbing with cure-in-place pipe will eliminate infiltration concerns (CIP 80G02b). **RECOMMENDED FOR IMPROVEMENTS (REPLACE/UPGRADE PORTION, CIPP SLIPLINE PORTION, AND BYPASS WITH NEW MAIN EXTENSION)**.

B) Related CIP: 80G01. Labounty Dr from Interstate-5 to 500-ft west of Nordic Way – the section of 21-inch RCP from I-5 to Nordic Way has zero slope according to the City database and as a result does not have the required flow carrying capacity. Additionally, city staff has identified sections of this pipe to have significant bellied sections and potentially major joint separation or the presence of major holes. **RECOMMENDED FOR REPLACMENT**.

Future YR-2034 Scenario (Peak Hourly Flow) – Capacity Analysis Results

Figure 3 shows the pipes that the model predicts may have inadequate capacity during wet weather peak hourly flows (near capacity and over capacity identified as described for existing and shown on figure). The main areas of concern from the analysis, in addition to those identified above for the Existing Scenario, include (the letter corresponds to the area as shown on Figure 3):

C) Second Ave between Vista Dr and Main St – 310-ft section of 24-in PVC identified as over capacity with projected flows from future growth. General area also includes 220-ft of 15-in RCP on Main St just west of Third Ave at near capacity, and 160-ft of 15-in RCP on Third Ave just south of Main St at capacity, which previously during Main Street roadway improvements the decision was made not to incorporate improving the identified section of pipe on Main St because the potential effects from the level of capacity issues expected were insignificant.

D) Main St from MH 3564 (west of Nordic Way) to PS#2 – approximately 2,000-ft of mainly 21-in RCP (110-ft of 24-in RCP) identified as near or over capacity with projected flows from future growth. This section also includes two pipe segments (465-ft) that have negative slope.

E) Related CIP: 80G15. Main St from 150-ft west of Barrett Rd to east of Barrett Rd 650-ft – 10-in RCP identified as over capacity with projected flows from future growth.

F) Second Ave between Portal Way roundabout and Somerset St – approximately 760-ft of 17-in PVC identified as near capacity with project flows from future growth. Note this is limited to flows of 875 gpm through the PS#16 force main (capacity at velocity=10 ft/s) from the Phase 1 upgrades to PS#16. Phase 2 upgrades to PS#16 (including force main upsizing) would increase flows to approximately 1,300 gpm if growth occurs as forecasted (yr-2034). These flows would increase the length of over or near capacity pipe to approximately 2,000-ft of 17-in PVC from the roundabout to Willard St.

   NOTE: the City pipe and manhole database identifies the pipe segment as 17-in diameter PVC. This should be verified. If it is actually 18-in diameter pipe it reduces the full yr-2034 projected flow effects to 910-ft of near capacity pipe.

G) South and West of Labounty Dr (PS#4 discharge gravity main, lower portion of Trunk Main GM5E) – approximately 770-ft of 15-in RCP identified as near capacity. Note that flows to this main include potential large additions to the TAZ projected yr-2034 from both the Whatcom County Jail and Lummi Hotel as described in Section 3.

H) Related CIP: 80G16. West of Labounty and South of W Smith Rd (Trunk Main GM6E)– approximately 3,000-ft of 12-in PVC identified as over capacity. Note that flows to this main include potential large additions to the TAZ projected yr-2034 from both the Whatcom County Jail and Lummi Hotel as described in Section 3.

The above areas identified in the future scenario modeling are recommended for continued monitoring as growth continues into the future.

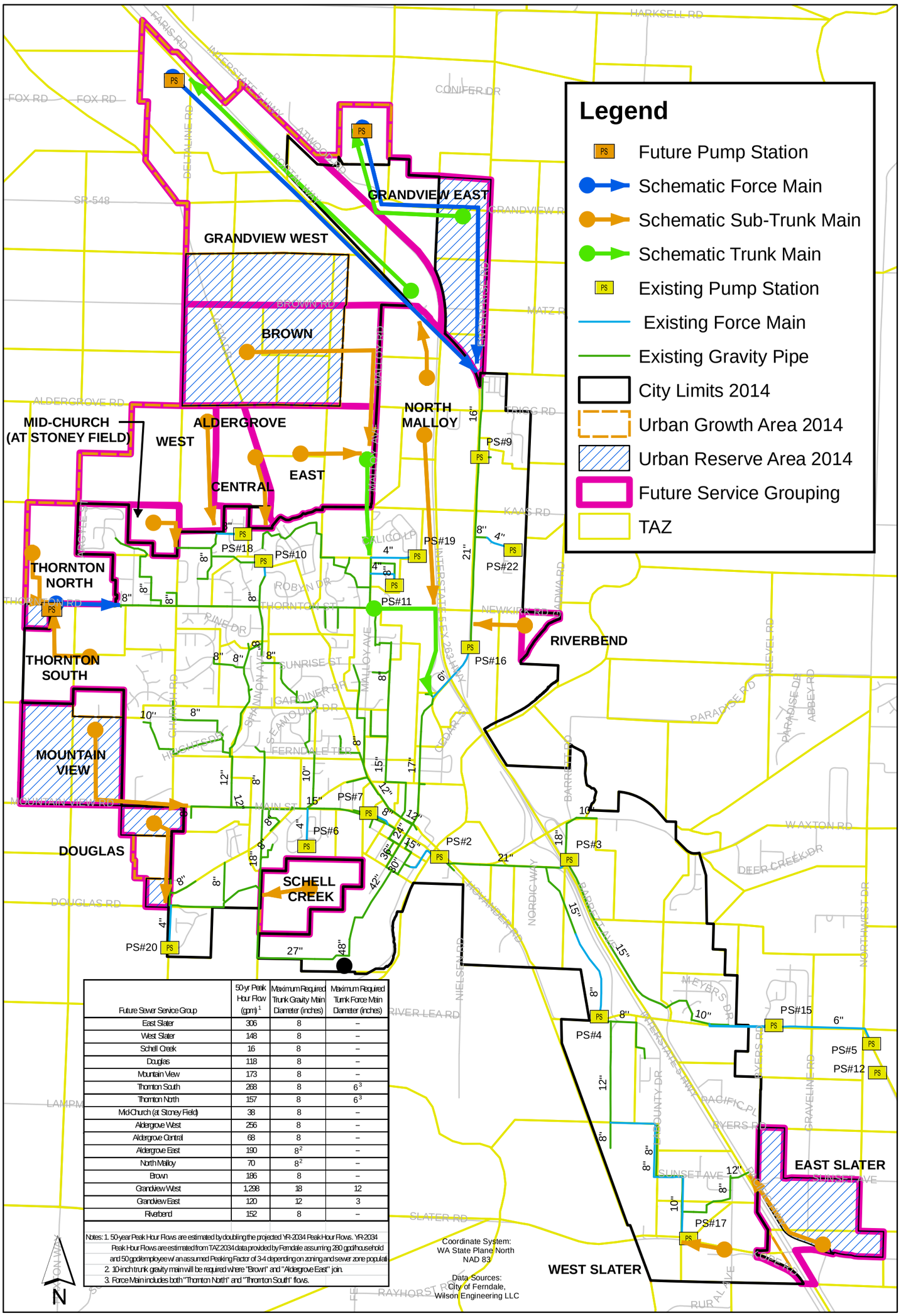
Future Alternative: Decommission PS#10

Figure 4 shows the model capacity analysis results with PS#10 Aquarius/Apollo Dr decommissioned and influent flows being redirected and flowing by gravity to Parkland Way. By relocating flows, many capacity issues are created along the 8-in PVC between Parkland Way and Malloy Ave. Figure 4 identifies required pipeline improvement phases and their associated CIP projects. **Decommission not recommended until Malloy Ave improvements are made (CIP 80G13), the Thornton Extension is constructed (CIP 90023), and Parkland Way to Malloy Ave Phase 1 improvements are made (CIP 80PS10, and 90010).**

Future Alternative: Decommission PS#11 & #19

Figure 5 shows the model capacity analysis results with PS#11 Oxford/Unrein Dr and PS#19 Malloy Village decommissioned and influent flows being redirected and flowing by gravity to the Portal Way roundabout, in part via the Thornton Extension (CIP 90023). The gravity along the railroad to Portal Way is one potential future alternative for serving the UGAs to the north. The flows from PS#11 and #19 are already assumed to be routed down the future Thornton Extension and thus do not cause any additional capacity issues along Second Ave (South of Portal Way roundabout) that are not already anticipated due to project growth or other flow re-routing (PS#10 decommission). Decommissioning of these stations does not eliminate the requirement for upgrading Malloy between Jensen and Thornton (CIP 80G13). **Decommissioning of both pumps recommended if future piping installed to east along railroad.**

FIGURES:



Future Sewer Service Group	50-yr Peak Hour Flow (gpm)[1]	Maximum Required Trunk Gravity Main Diameter (inches)	Maximum Required Trunk Force Main Diameter (inches)
East Slater	306	8	–
West Slater	148	8	–
Schell Creek	16	8	–
Douglas	118	8	–
Mountain View	173	8	–
Thornton South	268	8	6[3]
Thornton North	157	8	6[3]
Mid-Church (at Stoney Field)	38	8	–
Aldergrove West	256	8	–
Aldergrove Central	68	8	–
Aldergrove East	190	8[2]	–
North Malloy	70	8[2]	–
Brown	186	8	–
Grandview West	1,298	18	12
Grandview East	120	12	3
Riverbend	152	8	–

Notes: 1. 50-year Peak Hour Flows are estimated by doubling the projected YR-2034 Peak Hour Flows. YR-2034 Peak Hour Flows are estimated from TAZ 2034 data provided by Ferndale assuming 2.80 gpd/household and 50 gpd/employee w/ an assumed Peaking Factor of 3-4 depending on zoning and sewer zone population.
2. 10-inch trunk gravity main will be required where "Brown" and "Aldergrove East" join.
3. Force Main includes both "Thornton North" and "Thornton South" flows.

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

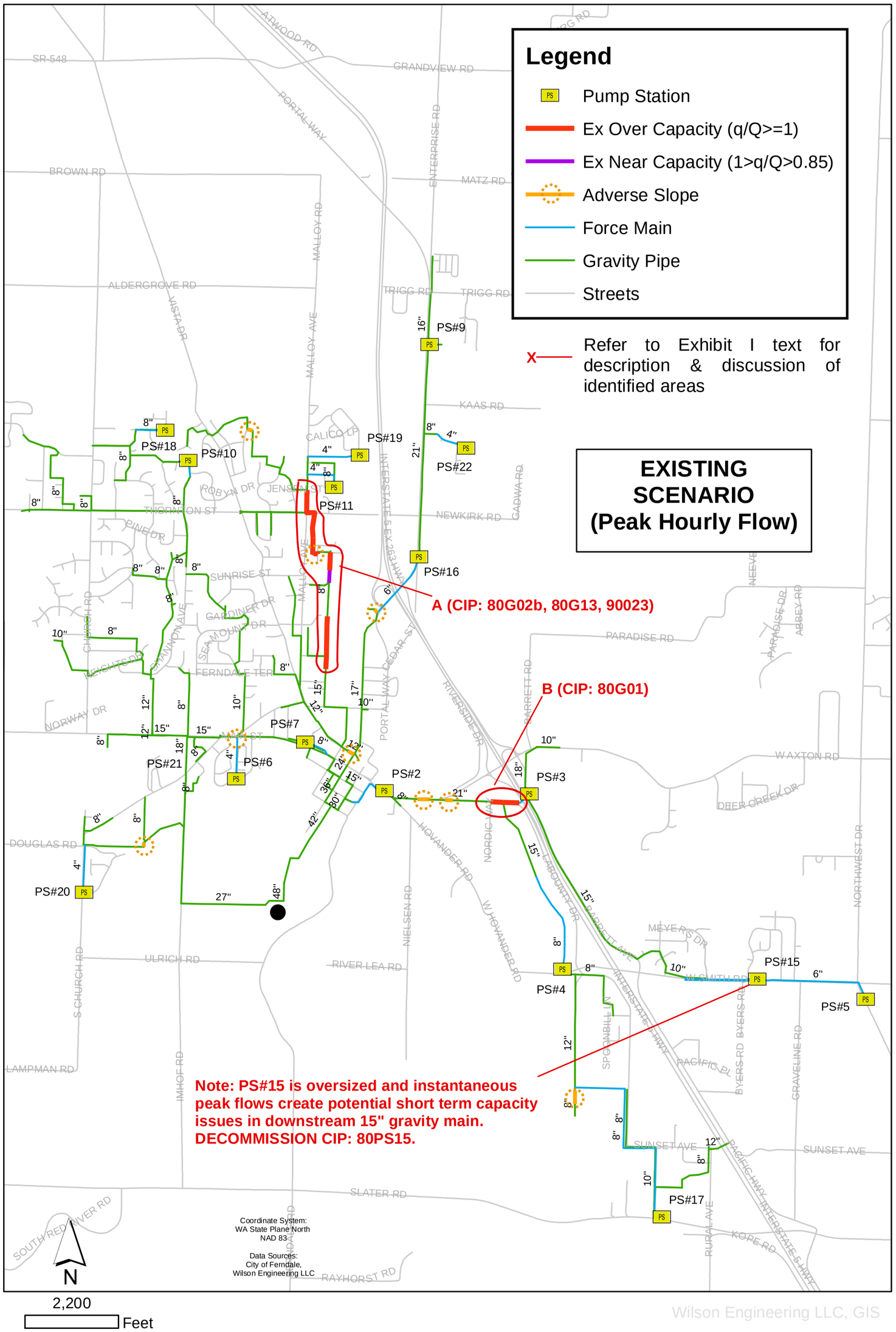
CITY OF FERNDALE, WA

WHATCOM COUNTY — WASHINGTON

FIGURE 1

Ferndale Sewer – Model Flow Loading for Future Sewer Service

DATE	SHEET
FEB 2015	1
SCALE 1:30,000	OF 1
JOB NUMBER 2014-036	



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

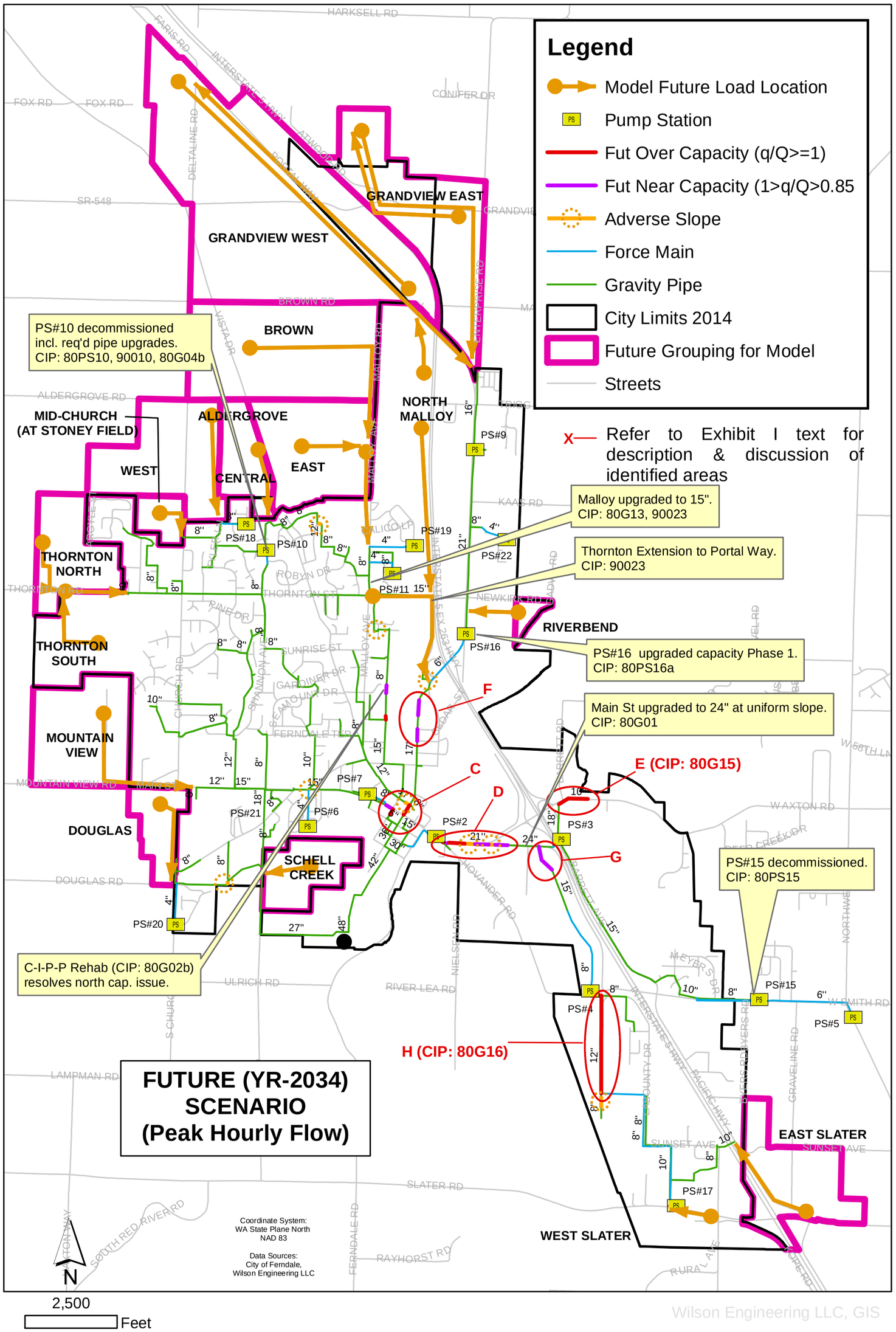
CITY OF FERNDALE, WA

WHATCOM COUNTY WASHINGTON

FIGURE 2

Ferndale Sanitary Sewer Model Analysis - Existing

DATE	SHEET
FEB 2015	1
SCALE	OF
1:26,000	1
JOB NUMBER	
2014-036	



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

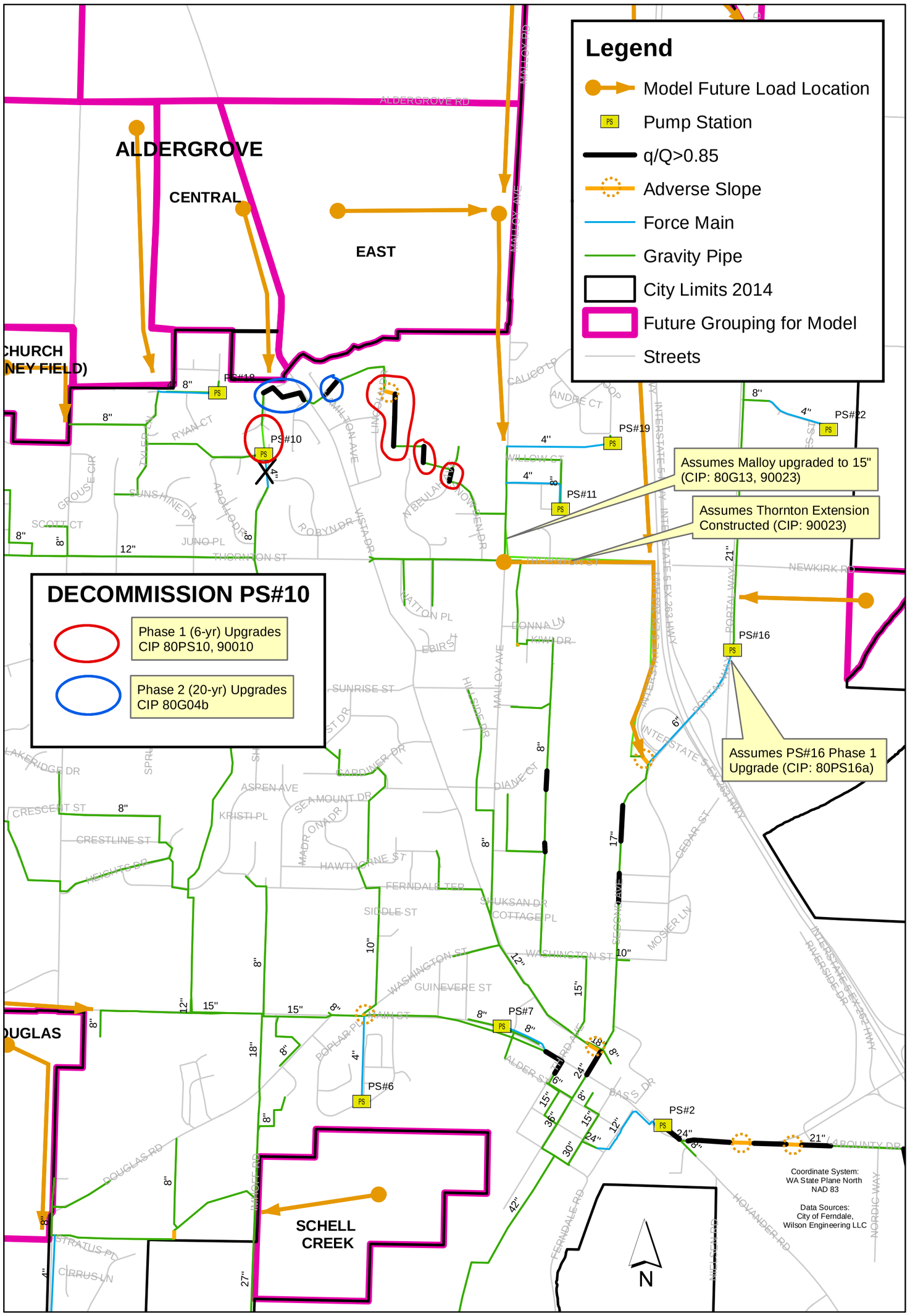
WHATCOM COUNTY WASHINGTON

FIGURE 3

Ferndale Sanitary Sewer

Model Analysis - Future (YR-2034)

DATE	SHEET
FEB 2015	1
SCALE	OF
1:30,000	1
JOB NUMBER	
2014-036	



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

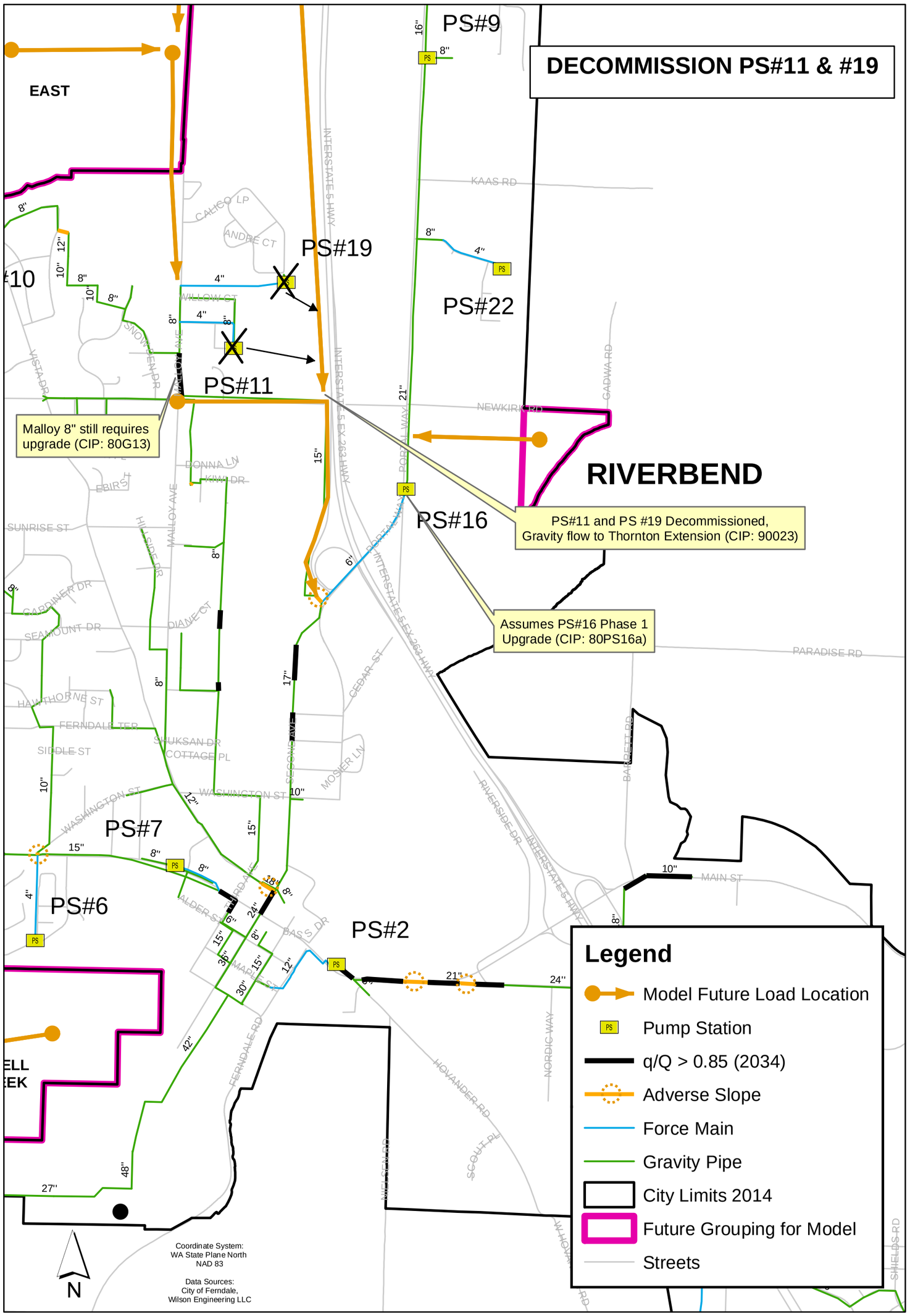
WHATCOM COUNTY WASHINGTON

FIGURE 4

Ferndale Sanitary Sewer

Future Alternative: Decommission PS#10

DATE	SHEET
FEB 2015	1
SCALE	OF
1:13,000	1
JOB NUMBER	
2014-036	



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

FIGURE 5

Ferndale Sanitary Sewer

Future Alt: Decommission PS#11 & #19

DATE	SHEET
FEB 2015	1
SCALE	OF
1:13,000	1
JOB NUMBER	
2014-036	

EXHIBIT J

Pump Station Data

City of Ferndale
Pump Station Information

updated: 3/21/2016

Pump Station	Year Installed	Pumps Replaced (Year)	Pump Type	Pump Mfgr	Model Number	Rated Power (HP)	Phase/ Voltage	Serial Numbers	Impeller	Operating Capacity (gpm)	Operating Head (TDH, ft)	Mix Flush Valve	Discharge Pipe Diam /Matl (at PS)	Discharge Pipe Depth (to top) (in)	Alarm	Telemetry	Generator & Fuel Type	Generator Ready	Portable Generator	Plug Style
PS # 2 - Main St N Side Pioneer Bridge	1972	2006	centrifugal	Allis-Chalmers	ITT 200	15.0	3 / 480	01086076086 010860760 ?	14 in	1438	22.0		12-in DI	112.0 (bottom)	Red Light	Yes	Own Natural Gas			
PS # 3 - Barrett Rd South of Main St	1973		centrifugal	Allis-Chalmers	250 F7B2	15.0	3 / 480	731-09251-5-1	12.75 in	1488	16.0		12-in DI	66.0	Red Light	Yes	Own Natural Gas			
PS # 4 - Smith Rd / North of Ready Mix	2015		submersible	Flygt	NP3202.095-460	60.0	3 / 480	1560002 1560003	294 mm	1250	98.0	yes	8-in DI	147.3	Red Light	Yes	Own Diesel			
PS # 5 - Northwest Rd / County Planning / Norbell	1985	2010	submersible	Flygt	3100 (CP-3101X)	5.0	3 / 220		172 mm	259	34.0		4-in DI	31.5	Red Light	Yes	Own Propane			
PS # 6 - Correll Park / Flair	1998		submersible	Flygt	3127.090 HT	7.4	1 / 220	9860230	200 mm	187	55.0	yes	4-in DI	46.5	Red Light	Yes		Yes	Yellow	Gray Metal
PS # 7 - Main St / 7-11 / Post Office	1970's	1995	submersible	Flygt	3102.090-6039 3102.090-5239	5.0	3 / 480	9720058		75	17.0		4-in DI	typical (3-4 ft)	Red Light	Yes		Yes	Yellow / Green Onan	Red
PS # 9 - Portal Way North	2006		submersible	Flygt	3085.092-0292	3.0	3 / 480		151 mm	209	24.0		4-in DI	101.5	Red Light	Yes		Yes	Green Onan	N/A
PS # 10 - Aquarius / Apollo Dr / Alexander Est	1978	2008	submersible	Flygt	3127.090-2435	7.5	1 / 220	820067 820068	188 mm	132	50.0	yes (one)	4-in DI	58.0	Red Light	Yes		Yes	Yellow	Gray Metal
PS # 11 - Oxford / Unrein Dr / Cascade Peaks	1991	Yes - year unknown	submersible	Flygt	3102.09	6.5 ?	1 / 220		125 mm	84	70.0	no	4-in DI	33.0	Red Light	Yes		Yes (2015 In Progress)	Yellow	Gray Metal
PS # 12 - Northwest Ave/Day Academy	1983		grinder	Flygt		2.0	1 / 208						1.5-in PVC	95.0	Red Light	Yes		No		
PS # 15 - Smith Rd / Bellaire Estates	1994		submersible	Flygt	CP3140.090-5012	15.0	3 / 480	9360017 9360018	#481	764	40.0	no	4-in DI	89.0	Red Light	Yes		Yes	Yellow	Red
PS #16 - Portal Way South near I-5 (ULID #7)	1994		submersible	Flygt	CP-3127.090-5565	7.5	3 / 480	9450095 9450096	206 mm	404	35.0		6-in DI	75.0	Red Light	Yes		Yes	Green Onan	N/A
PS # 17 - Slater Rd / Silver Ck Ind Park (ULID #8)	1994		submersible	Flygt	3140.090-6024 CP-3140.091	15.0	3 / 480	9420004 9420003	#481	415	69.0	no	4-in DI	62.0	Red Light	Yes		Yes	Green Onan	N/A
PS # 18 - Nicholas Dr / Ryan's Glen	1995		submersible	Flygt	3102.090-6043	5.0	3 / 208		#435	128	47.0	yes (one)	4-in DI	44.5	Red Light	Yes		Yes	Yellow	Blue
PS # 19 - Malloy Village	2005		submersible	Flygt	3127.090-0520081	10.0	3 / 480	0520081 0520082	217 mm	113	68.0	yes (one)	4-in DI	40.5	Red Light	Yes		Yes	Green Onan	N/A
PS # 20 - Church Rd / South Church LLC	2007		submersible	Flygt	NP3102.090-465	3.9	1 / 220	0660164 0660165	152 mm	133	31.0	no	4-in DI		Red Light / Horn	Yes		Yes	Yellow	Gray Metal
PS #22 - Whiskey Creek	2007		submersible	Flygt	NP3127X-489HT	7.5	3 / 480	0650139 0650140	195 mm	205	51.0		4-in DI	44.5	Red Light	Yes		Yes	Green Onan	N/A

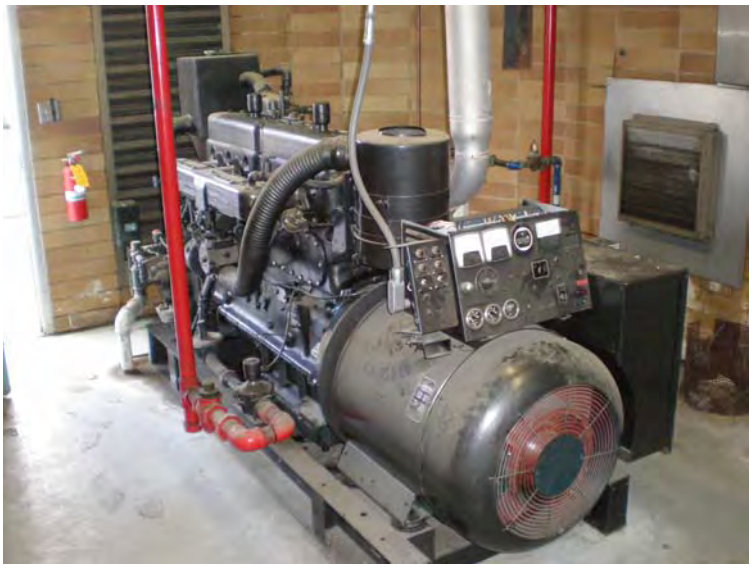
Note: All depths are measured down from the pump station hatch rim unless otherwise noted.
Flow Capacities shown are per level logger monitoring at each pump station, TDH shown are per model at corresponding flows

City of Ferndale
Pump Station Wet Well Information

Pump Station	Wet Well Diameter (ft)	Bottom Type	Rim Elevation (ft)	Wet Well Depth (ft)	Inlet 1 Direction	Inlet 1 Diameter & Material	Inlet 1 Depth to Invert (in)	Inlet 2 Direction	Inlet 2 Diameter & Material	Inlet 2 Depth to Invert (in)	Inlet 3 Direction	Inlet 3 Diameter & Material	Inlet 3 Depth to Invert (in)	Pump Cycle Range/Depth
PS # 2 - Main St N Side Pioneer Bridge	22 (half wet)	sloped	28.0	21.2 (bottom)	E	27-in DI	152.0							+/- 4-ft
PS # 3 - Barrett Rd South of Main St	22 (half wet)	sloped	32.0	22.6 (bottom)	W	21-in DI	132.0							+/- 3.5-ft
PS # 4 - Smith Rd / North of Ready Mix	8	Sloped	24.5	26.5	NE	15-in	207.0							+/- 5-ft lag on +6"
PS # 5 - Northwest Rd / County Planning / Norbell	6		92.0	14.8	SE	10-in PVC	107.5	W	8-in PVC	85.0	S	6-in PVC	58.0	+/- 3-ft on: 117", off:150", lag on +18"
PS # 6 - Correll Park / Flair	6	sloped	26.5	14.9	S	10-in PVC	131.0							+/- 4-ft
PS # 7 - Main St / 7-11 / Post Office	6	partial slope	18.0	12.5	N	8-in PVC	108.0	S	8-in RCP	100.0				
PS # 9 - Portal Way North	6	sloped	61.7	29.3	E	10-in PVC	264.0							
PS # 10 - Aquarius / Apollo Dr / Alexander Est	6	flat	227.2	16.6	W	8-in PVC	80.5	S	6-in PVC	77.0				+/- 4-ft
PS # 11 - Oxford / Unrein Dr / Cascade Peaks	6	flat	89.1	18.3	SW	8-in PVC	150.0	W	8-in PVC	70.0	N	8-in PVC	70.0	+/- 5-ft
PS # 12 - Northwest Ave/Day Academy	4			9.9 (top of pump)	S	4-in PVC	9.1	N	4-in PVC	9.1				+/- 1.5 ft on: 108", off: 123", high alarm 95"
PS # 15 - Smith Rd / Bellaire Estates	6	sloped	93.4	16.0 (top of slope)	W	8-in PVC	177.0							+/- 1.5-ft lag on +1-ft
PS #16 - Portal Way South near I-5 (ULID #7)	8	sloped	36.6	25.3 (bottom)	S	8-in PVC	174.0	N	21-in PVC	186.0				+/- 4-ft lag on +0.25-ft
PS # 17 - Slater Rd / Silver Ck Ind Park (ULID #8)	6	sloped	25.2	15.8 (slope low pt)	S	12-in PVC	88.0							on: 5.75-ft, off: 3-ft lag on: 9.08-ft, hi alarm: 10.58-ft, lo alarm: 1.5-ft
PS # 18 - Nicholas Dr / Ryan's Glen	8		220.4	16.5 (edge)	W	8-in PVC	102.0	N	8-in PVC	111.0				small
PS # 19 - Malloy Village	8	flat	79.1	13.0	N	8-in PVC	128.0							+/- 1.25-ft
PS # 20 - Church Rd / South Church LLC	12	sloped	19.8	15.7 (+/-bottom)	S	8-in PVC w/ Tee	130.0							+/- 4-ft
PS #22 - Whiskey Creek	10		35.9	24.4	NW	8-in PVC	168.0							on: 8-ft, off: 2-ft lag on: 10-ft, lag off: 3-ft

Note: All depths are measured down from the pump station hatch or discharge valve vault rim unless otherwise noted.

Pump Station #2
Main St N Side Pioneer Bridge



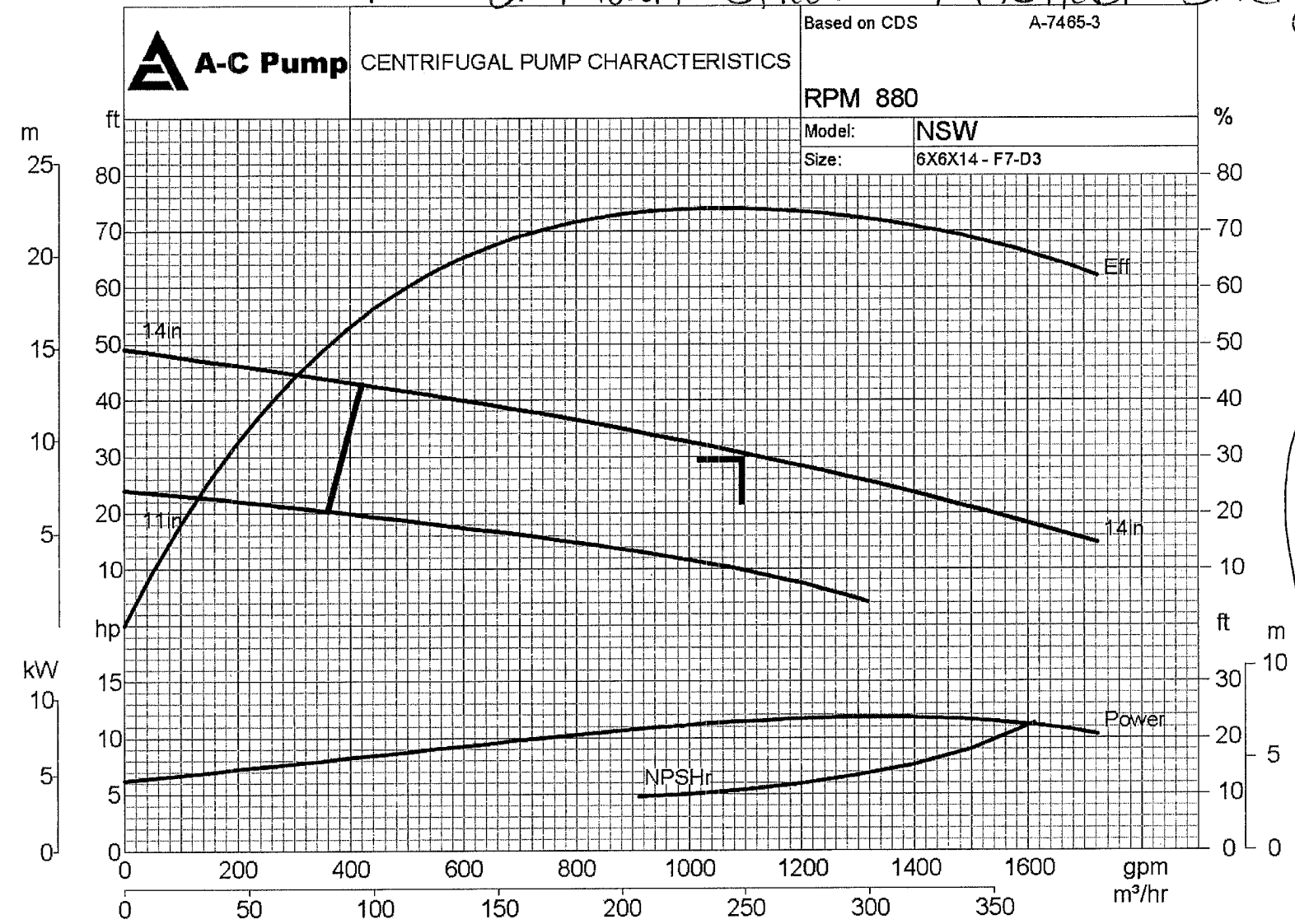
PS #2 Generator

PS #2 Wetwell Influent Pipe

PS#2 Wetwell Floats

PS#2 Dry Well Pumps

PS #2 Main Street N / Pioneer Bridge



Item No: ITEM 001
Service:
Rated Flow: 1,100.0 gpm
Rated TDH: 30.0 ft
Imp. Diam.: 14.0000 in

ITT

PS #2

FROM WHITNEY EQUIP. 12-15-10

City of Ferndale
Pump Station Reconnaissance

PS Id: #2 nearest by River

Date: 12/9/2010
Time: 2:30
Personnel: cas, Bob

Photo numbers: 81-99

Pump Information:

type: A.C. centrifugal
# of pumps: 2
pump mfr and model no.: ITT200
age: ≈1 yr of PS #3-1973
discharge piping diam. & mat.: 12" D.I.
discharge depth from rim: 112" to top of pipe bot
rated power: 15hp
phase/voltage: 3/480
downstream flow meter present: Y (N)
curves or other info available: Y N explain: _____

Notes on general condition of pumps/valves/vault, etc. (corrosion, noises, rattling/shaking, etc.):
- pumps replaced in 2006, both

slab bottom, 13" above grade

Wetwell Information: sketch as necessary on back of sheet

diameter: 22' Ø sloped bottom
overall depth: 254" to inside floor
inlet direction: E
inlet diam. & material: 27" D.I. in wall (measured 25")
inlet depth from rim: top to inside floor = 127"
cycle range depth/elevations: on: ≈ 4' cycle range hi alarm:
off: lo alarm:

Notes on general condition of wetwell and all appurtenances:
- good no leaks/cracks/infil apparent

Other miscellaneous notes (needs/wants for upgrades or replacements - site issues incl. GW infil, water inundation, STW backup, etc. - general pumphouse conditions incl HVAC, etc.)
- elec controls also run PS #8 gen (STW pumps)
- control panel original, only runs manually, replacement in works

Pump Station #3
Barrett Rd South of Main St

PS#3 Wetwell Influent Pipe

PS#3 Wetwell Access

PS#3 Dry Well Pumps

PS#3 Discharge Line

233.710

119.210

#3 Pump Station 2

NO EXCEPTION TAKEN ☐ MAKE CORRECTIONS NOTED ☒

REJECTED ☐ REVISE AND RESUBMIT ☐

SUBMIT SPECIFIED ITEM ☐

CHECKING IS ONLY FOR GENERAL CONFORMANCE WITH THE DESIGN CONCEPT OF THE PROJECT AND GENERAL COMPLIANCE WITH THE INFORMATION GIVEN IN THE CONTRACT DOCUMENTS. ANY ACTION SHOWN IS SUBJECT TO THE REQUIRMENTS OF THE PLANS AND SPECIFICATIONS. CONTRACTOR IS RESPONSIBLE FOR DIMENSIONS WHICH SHALL BE CONFIRMED AND CORRELATED AT THE JOB SITE; FABRICATION PROCESSES AND TECHNIQUES OF CONSTRUCTION; COORDINATION OF HIS WORK WITH THAT OF ALL OTHER TRADES AND SATISFACTORY PERFORMANCE OF HIS WORK.

DATE 2/28/73 BY JS CHP

STEVENS THOMPSON & RUNYAN, INC.

#WV27 31 WATSON SPICER COUPLING & DRIVE SHAFT

SLIP JOINT

END OF PUMP SHAFT

¾" P. TAP FOR DRAIN

1" P. TAP

59.750

"B"

DISCHARGE

6.0 DISCHARGE STD. 125# FLANGES WITH SLOTTED HOLES

"B"

16.375

26.375

SUCTION

1.00

(2)-1" P. TAPS

2" PIPE TAP

10.752 ELEV.-FEET

+2"

HANDHOLE

9.920 ELEV.-FEET

2"

6.0 SUCTION STD 125# FLANGE WITH SLOTTED HOLES

¼" P. TAP

CALCULATED AND DRAWN BY COMPUTER

CASING STYLE #1 IS CONSIDERED STANDARD

8.0 17.00

HAND HOLE

12.188

4-1" DIA. BOLTS

13.75 13.75

30.0 SQ.

SECTION "B-B"

ALL DIMENSIONS IN INCHES UNLESS OTHERWISE NOTED.

CASING STYLE NO'S. VIEWED FROM COUP.

CCW ROTATION

CW ROTATION

REFERENCE		
SHAFT	DIA.	KEY SIZE
MOTOR	1.625	0.375 SQ
PUMP	2.375	0.625 SQ

PUMP STATION 2

ALLIS-CHALMERS CERTIFIED DIMENSION SHEET

CERTIFIED FOR NELSON CONSTRUCTION

CUST ORD NO 12127 MFG ORD NO 09251-03

SIZE 6X6X17 TYPE NSWV G.P.M. 1100 HD 23.0

MTR FR 286TP12 HP 15.0 Ø60 ~3 V 230-460 R.P.M. 900

CERTIFIED BY _____ DATE _____

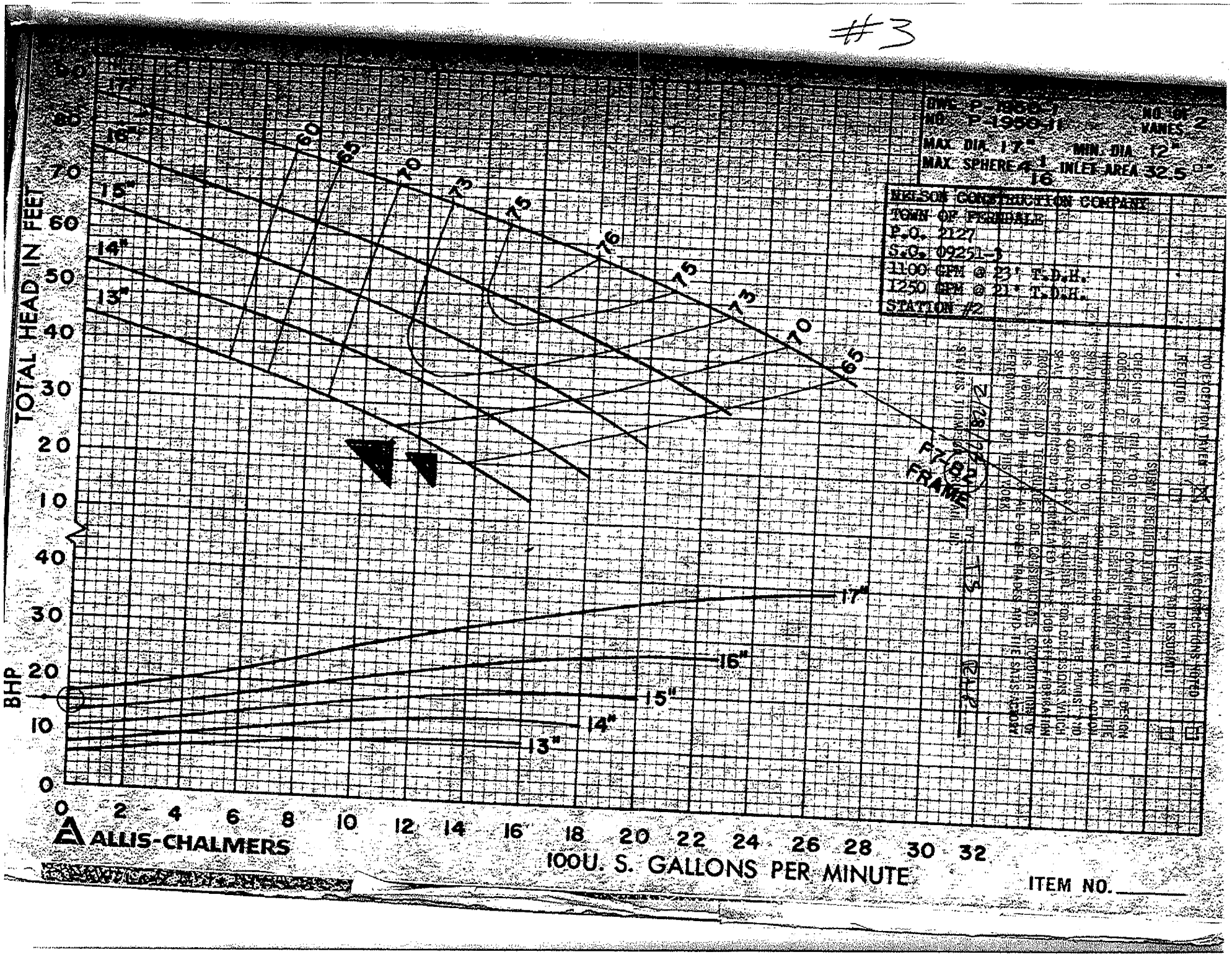
01 2-14-73 HC

#WV27

DIMENSION SHEET FOR 6X6X17 NSWV PUMP MODEL 250 USING 2 SECTIONS OF WV27 INTERMEDIATE SHAFTING

B-52-000-925-103

#3


TOTAL HEAD IN FEET
BHP
100 U. S. GALLONS PER MINUTE
ALLIS-CHALMERS
DWG. P-1950-J
NO. OF VANES 2
MAX. DIA. 17"
MIN. DIA 12"
MAX. SPHERE 4 1/16"
INLET AREA 32.5 □"
NELSON CONSTRUCTION COMPANY
TOWN OF FIRDALE
P.O. 2127
S.O. 09251-3
1100 GPM @ 23' T.D.H.
1250 GPM @ 21' T.D.H.
STATION #2
FRAME
17"
16"
15"
14"
13"
60
65
70
73
75
76

ITEM NO. ____

City of Ferndale
Pump Station Reconnaissance

PS Id: PS #3 Barrett Sof Main

Date: 12/9/2010
Time: 14.20
Personnel: CDS, Bob

Photo numbers: 61 - 80

Pump Information:

mod # 250 F782
Imp Ø = 12.75
RPM = 875
size 6x6x17
1100 type 23 TDH
type: NSWV

type: non-submn
# of pumps: 2
pump mfr and model no.: Allis Chalmers - Centrifugal
age: 1973
discharge piping diam. & mat.: 12" DS
discharge depth from rim: 66" to top of pipe
rated power: 15hp
phase/voltage: 3/480
downstream flow meter present: Y (N)
curves or other info available: Y N explain: _____

Notes on general condition of pumps/valves/vault, etc. (corrosion, noises, rattling/shaking, etc.):
- ok, some corrosion / pretty old
- original pumps

slab elev. 12" from ground lev.

Wetwell Information: sketch as necessary on back of sheet

diameter: 22' - bigger - wet storage half of wetwell
overall depth: 127" to inside floor at bottom, bottom = ground level
inlet direction: W
inlet diam. & material: 21" D.I. in well anyway
inlet depth from rim: top to inside top 153" = ground level
cycle range depth/elevations: on: +/- 3.5' cycle range hi alarm:
off: lo alarm:

Notes on general condition of wetwell and all appurtenances:
- ok no leaks or seepage apparent

Other miscellaneous notes (needs/wants for upgrades or replacements - site issues incl. GW infil, water inundation, STW backup, etc. - general pumphouse conditions incl HVAC, etc.)
- bigger gen, control box needing to be updated, PS #2 gen bad going to be done soon
- not too many issues

Pump Station #4
Smith Rd / North of Ready Mix

PS #4 Wetwell

PS#4 Discharge Valve Vault

xylem
Let's Solve Water

NP 3202 HT 3~ 460

FLYGT

Performance curve

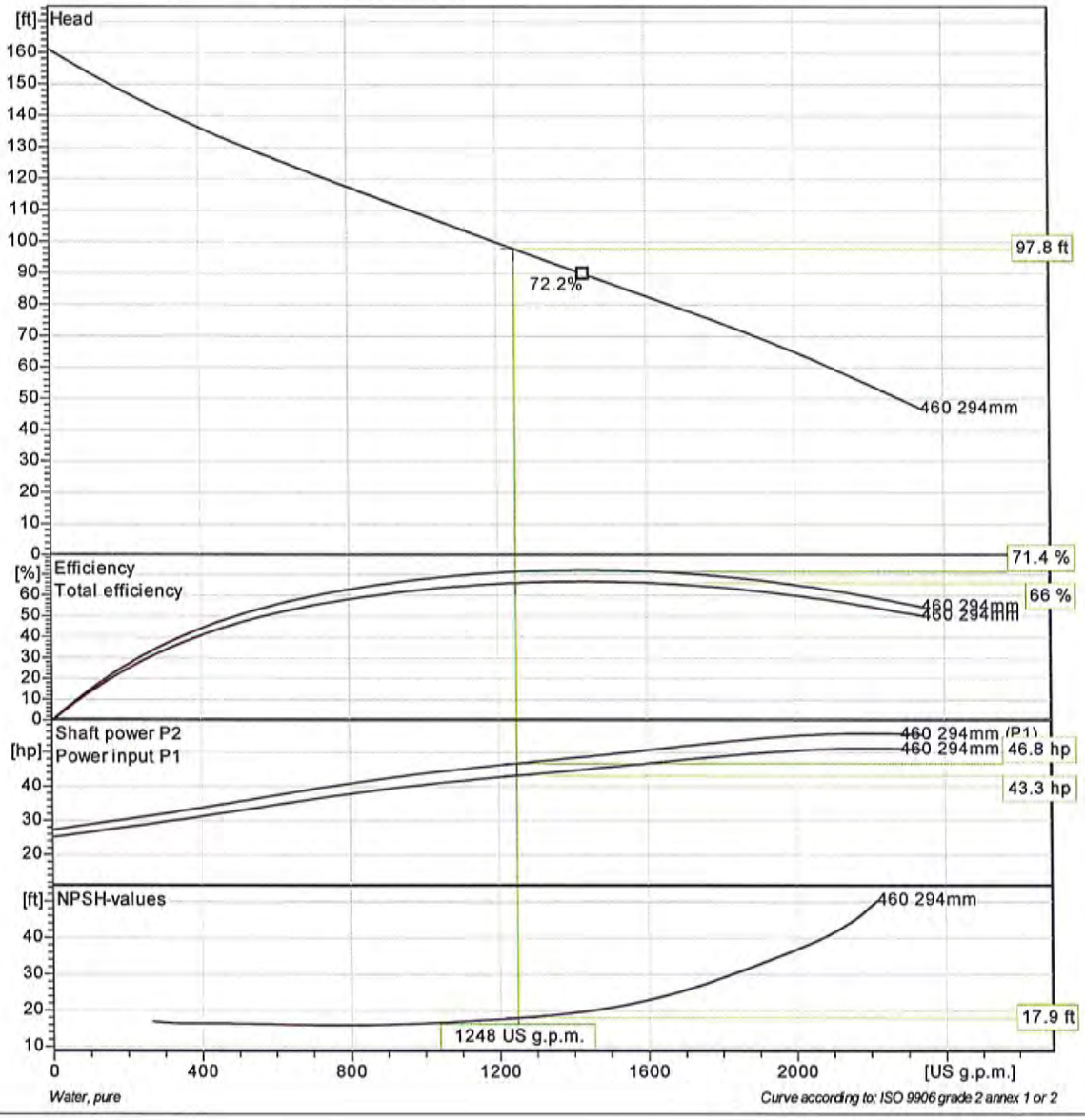
Pump

Discharge Flange Diameter	5 7/8 inch
Suction Flange Diameter	150 mm
Impeller diameter	11 9/16"
Number of blades	2

Motor

Motor #	N3202.095 30-24-4AA-W 60hp
Stator variant	1
Frequency	60 Hz
Rated voltage	460 V
Number of poles	4
Phases	3~
Rated power	60 hp
Rated current	68 A
Starting current	425 A
Rated speed	1770 rpm

Power factor	
1/1 Load	0.91
3/4 Load	0.88
1/2 Load	0.82
Efficiency	
1/1 Load	91.5 %
3/4 Load	92.0 %
1/2 Load	92.5 %



Project	Project ID	Created by	Created on	Last update
			2015-04-22	

WHITNEY EQUIPMENT COMPANY, INC.
21222 30th Drive SE, Suite 110 Bothell, Wash. 98021
Phone: (425) 486-9499 Fax: (425) 485-7409

Specification Data Sheet For: *FLYGT SUBMERSIBLE PUMP NP-3202.095*

DATE:	6/12/15	CONTRACTOR:	Tiger Construction, Ltd
SECTION NUMBERS:	11100	ENGINEER:	Wilson Engineering
		JOB NAME:	Ferndale Sewer Upgrade
WECO SALES ORDER		LOCATION:	Pump Station #4

REVISION	BY	DATE	DESCRIPTION	NOTES
0	BC	6/12/15	Original Submittal	Submersible Pumps

A	GENERAL SPECIFICATIONS		C	BASIC EQUIPMENT FEATURES	
1	QUANTITY	2	20	CABLE SEAL	GROMMET TYPE
2	TAG NUMBERS		21	CABLE SIZE	4G25 + S POWER - 50'
3	MODEL NUMBER	NP-3202.095 - 460	22	SEAL- INNER	TUNGSTEN-CARBIDE
4	RATED CAPACITY	1250 GPM @ 98 FT	23	SEAL- OUTER	TUNGSTEN-CARBIDE
5	SHUTOFF	160'	24	WEIGHT	1260 LBS
6	DISCHARGE SIZE	6"	25	LIFTING CHAINS	25' STAINLESS STEEL
7	IMPELLER TYPE	"N" NON-CLOG	26	UPPER RAIL BRACKETS	3" STAINLESS STEEL
8	HORSEPOWER	60 HP	27	INTERM RAIL BRACKETSS	3" X 6" STAINLESS STEEL
9	MOTOR SPEED	1770 RPM	28	GUIDE RAILS	3" STAINLESS STEEL
10	MOTOR ELECTRICALS	460V, 3 PH, 60 HZ	29	LIFTING DEVICE	FLYGT GRIP EYE
11	INSULATION	CLASS H	30	PAINT SYSTEM	INDUSTRIAL EPOXY
12	SERVICE FACTOR	1.15	31	FLUSH VALVE	4901 MIX FLUSH
13	PUMP BODY	CAST IRON 35B	32		
14	MOTOR RATING	INVERTER DUTY	33		
15	PUMP SHAFT	431 STAINLESS STEEL	34		
16	SYSTEM RATING	FM RATED EX PROOF	35		

B	Spare Parts Included	D	Options Included
17		36	FLS MOISTURE SENSORS
18		37	MINI-CAS 120 RELAY UNITS
19		38	FACTORY PUMP PERFORMANCE TESTS

Drawing Number	Showing	Notes
4-3202	PUMP DIMENSIONS	MANUFACTURERS STARTUP AND TRAINING SERVICES
6-3202	PUMP ELECTRICAL SPECS	
8/4 460	PUMP CURVE	

Pump Station #5
Northwest Rd / County Planning / Norbell

PS#5 Wetwell

PS#5 Discharge Valve Vault

Norbell PS#5 New Pumps (2011)

PERFORMANCE CURVE

PRODUCT	TYPE
NP3102.980	MT

DATE	PROJECT	CURVE NO	ISSUE
2006-11-20		63-463-00-3703	5

	1/1-LOAD	3/4-LOAD	1/2-LOAD
POWER FACTOR	0.81	0.75	0.64
EFFICIENCY	85.0 %	85.5 %	83.5 %
MOTOR DATA	---	---	---

RATED POWER	5	hp
STARTING CURRENT	41	A
RATED CURRENT	6.8	A
RATED SPEED	1745	rpm
TOT.MOM.OF INERTIA	0.027	kgm2
NO. OF BLADES	2	

IMPELLER DIAMETER: 172 mm

MOTOR #	STATOR	REV
18-11-4AL	04D	11

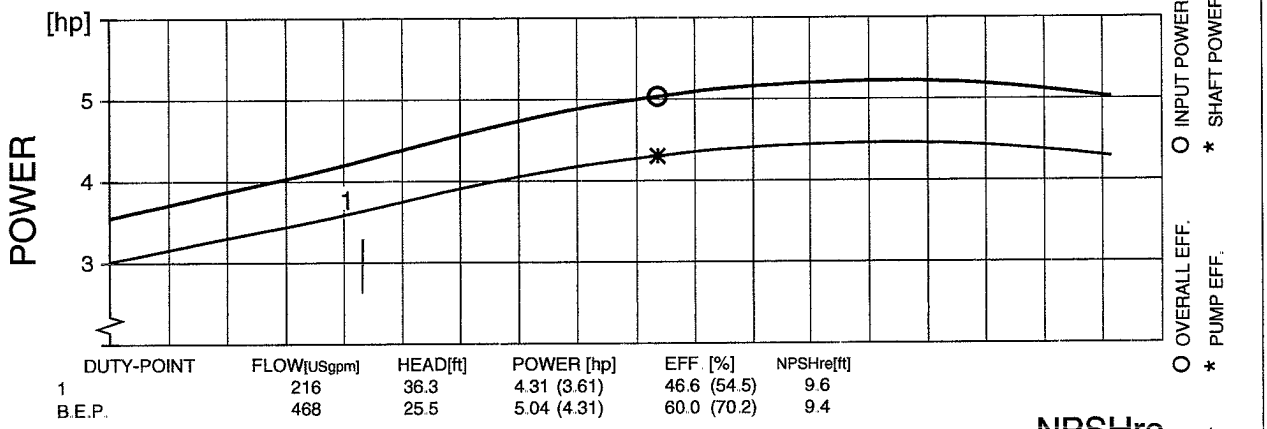
FREQ.	PHASES	VOLTAGE	POLES
60 Hz	3	460 V	4

GEARTYPE	RATIO
---	---

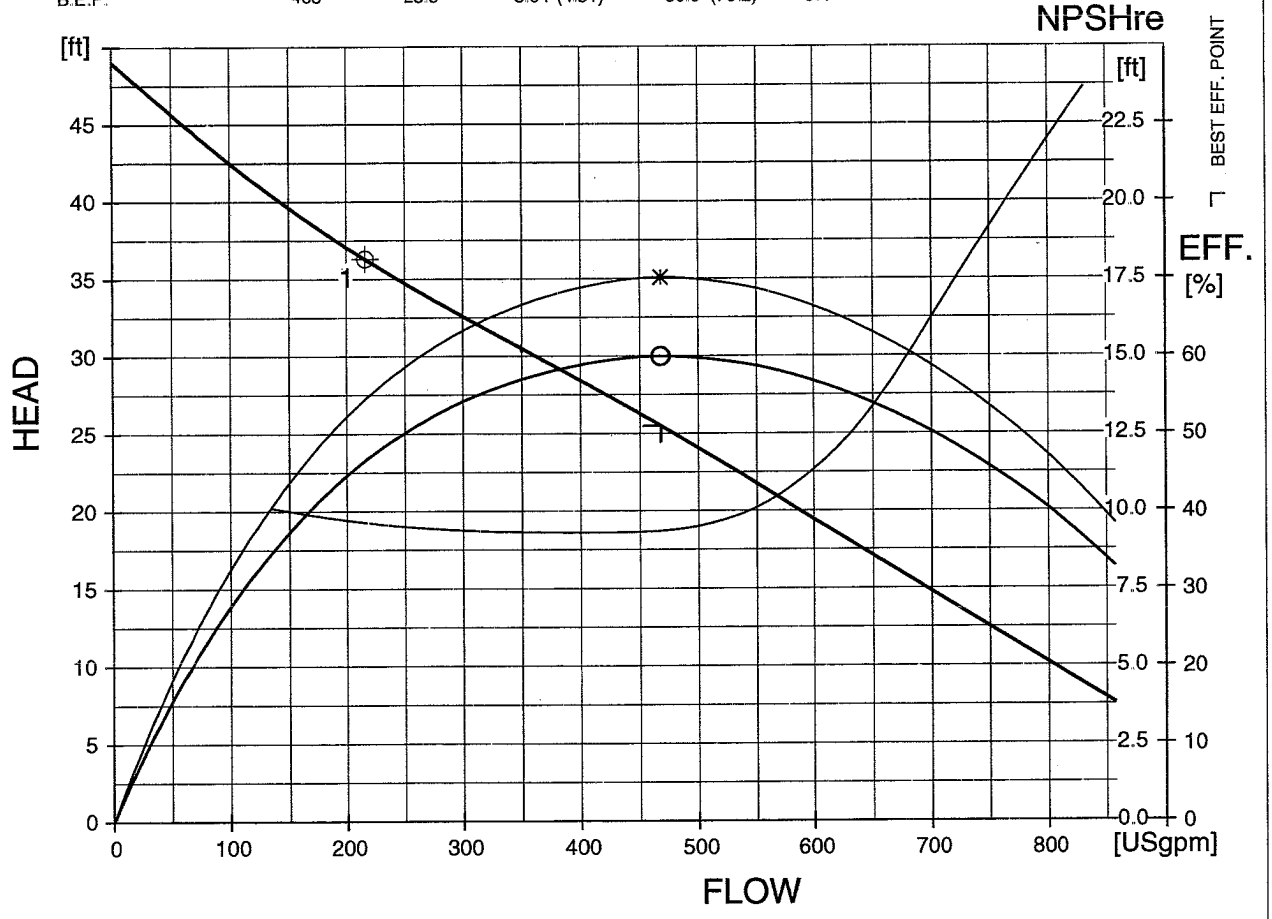
COMMENTS

INLET/OUTLET: -/ 4 inch

IMP. THROUGHLET: ---



DUTY-POINT	FLOW[USgpm]	HEAD[ft]	POWER [hp]	EFF. [%]	NPSHre[ft]
1	216	36.3	4.31 (3.61)	46.6 (54.5)	9.6
B.E.P.	468	25.5	5.04 (4.31)	60.0 (70.2)	9.4



NPSHre = NPSH3% + min. operational margin

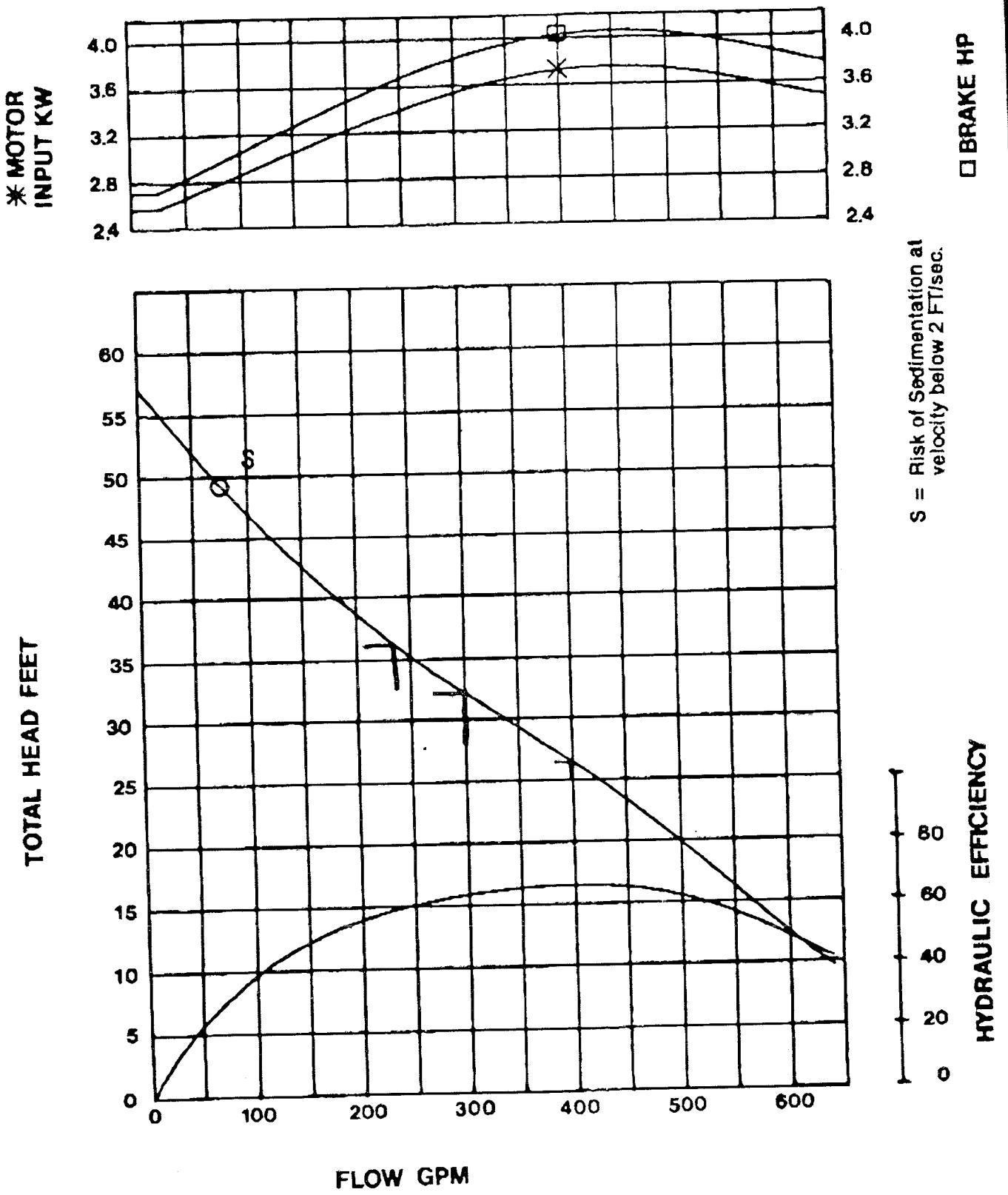
Performance with clear water and ambient temp 40 °C

FLYPS3.1.5.7 (20060531)

HI B Curve

Norbell PS #5 Old Pumps

5.0 HP - 1750 RPM 3φ: 200, 230/460, 575V	Standard Performance C-3101	SECTION 3101	PAGE 8A
	Wastewater Impeller 432	SUPERSEDES 3/79	ISSUED 6/81



CR/CT 3101	SECTION 3101	PAGE 7A

City of Ferndale
Pump Station Reconnaissance

PS Id: #5 NW/county planning

Date: 12/9/2010
Time: 12:30
Personnel: COS, BOG

Photo numbers: 20 ~~22~~ - 22 GPS at sta 23-26 GPS at C.P. gen

Pump Information:

type: Subm.
# of pumps: 2
pump mfr and model no.: Flygt 3100
age: old - no tags left on pumps - 1985
discharge piping diam. & mat.: 4" DI.
discharge depth from rim: 40" to top of pipe to flange below pipe
rated power: 5hp
phase/voltage: 3/220
downstream flow meter present: Y (N)
curves or other info available: Y N explain: _____

Notes on general condition of pumps/valves/vault, etc. (corrosion, noises, rattling/shaking, etc.):

- orginal pumps
- very old, in process of buying new ones, one this yr 2 ~~next~~ next yr

Wetwell Information: sketch as necessary on back of sheet

diameter: 6'
overall depth: 178"
inlet direction: SE, W, ? → 6" PVC stub from South, 58"
inlet diam. & material: SE - 10" PVC W - ~~8" PVC~~
inlet depth from rim: SE - 107.5" W - 85"
cycle range depth/elevations: on: ± 3' cycle 117" - lag on ± 18" hi alarm:
off: 150" lo alarm:

Notes on general condition of wetwell and all appurtenances:

- seepage at joint, ok apparently
- lid ok
- check valves need to be replaced or rebuilt

Other miscellaneous notes (needs/wants for upgrades or replacements - site issues incl. GW infil, water inundation, STW backup, etc. - general pumphouse conditions incl HVAC, etc.)

- ~~both~~ constant steady stream of clear water coming in all from below Annex bldg apparently
- own gen, e.c. panel behind annex

Pump Station #6
Correll Park / Flair

PS#6 Wetwell

PS#6 Discharge Valve Vault

PS #6 CANDIDATE

PERFORMANCE CURVE

PRODUCT	TYPE
CP3127.980	HT

DATE	PROJECT	CURVE NO	ISSUE
2010-12-13		63-485-00-2202	1

	1/1-LOAD	3/4-LOAD	1/2-LOAD
POWER FACTOR	0.88	0.85	0.77
EFFICIENCY	83.5 %	84.5 %	83.5 %
MOTOR DATA	---	---	---

RATED POWER	7.5	hp
STARTING CURRENT ...	52	A
RATED CURRENT ...	9.6	A
RATED SPEED	1740	rpm
TOT.MOM.OF INERTIA ..	0.095	kgm2
NO. OF BLADES	1	

IMPELLER DIAMETER: 200 mm

MOTOR #	STATOR	REV
21-10-4AL	12YSER	11

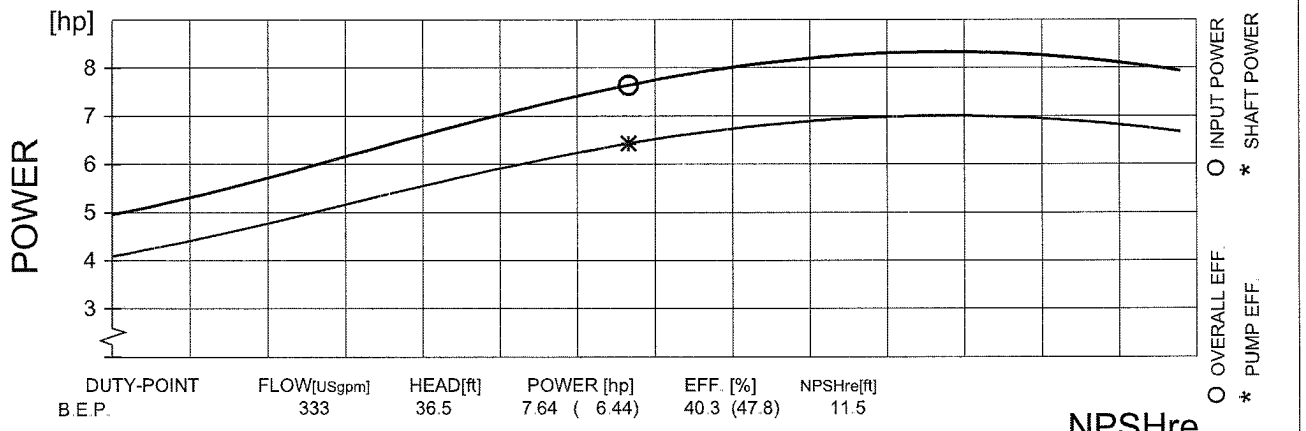
FREQ.	PHASES	VOLTAGE	POLES
60 Hz	3	460 V	4

GEARTYPE	RATIO
---	---

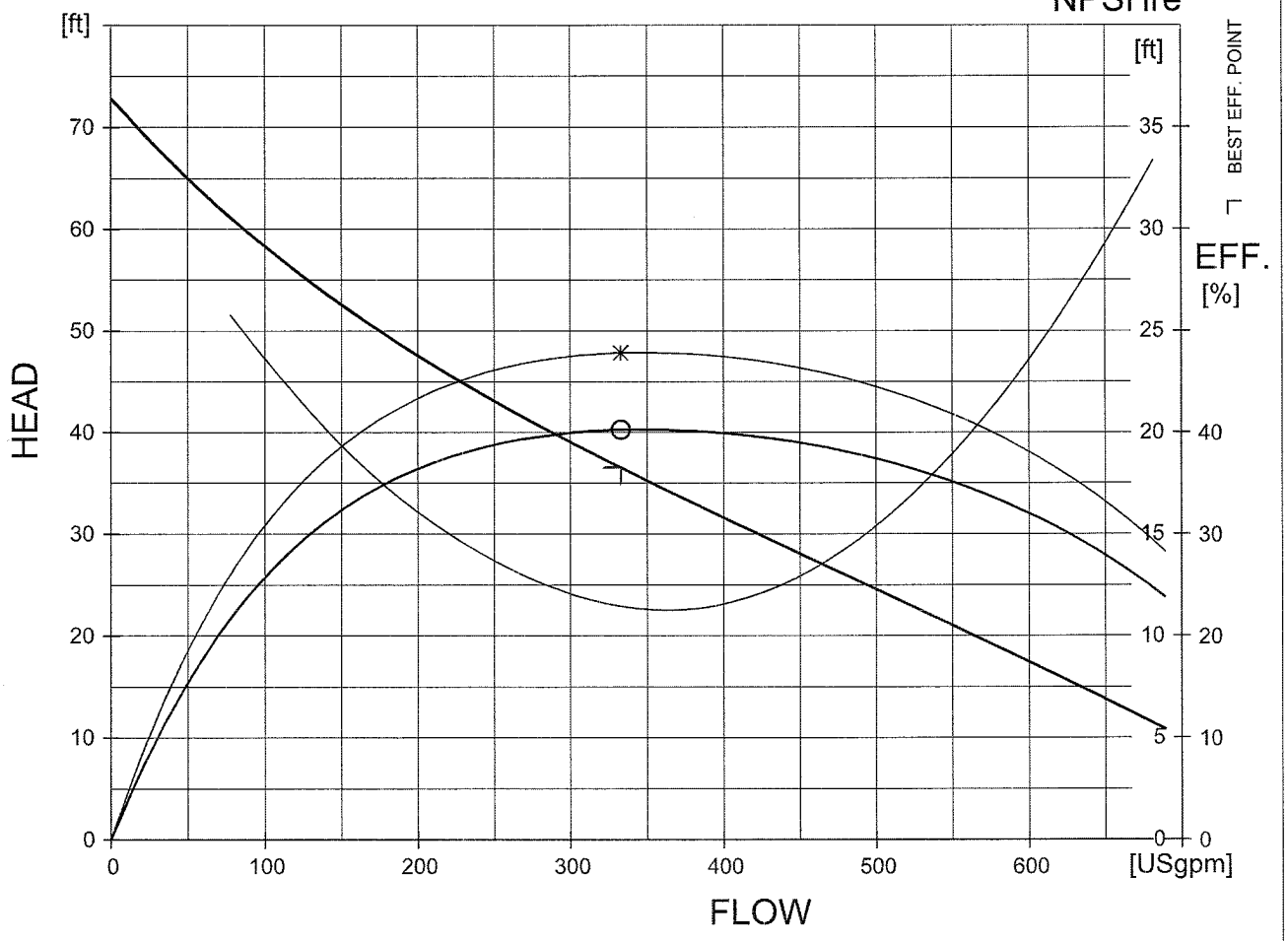
COMMENTS: NEVACLOG

INLET/OUTLET: -/ 4 inch

IMP. THROUGHLET: 3.0 inch



DUTY-POINT	FLOW[USgpm]	HEAD[ft]	POWER [hp]	EFF. [%]	NPSHre[ft]
B.E.P.	333	36.5	7.64 (6.44)	40.3 (47.8)	11.5



FLYPS3.1.0.0 (20050224)

NPSHre = NPSH3% + min. operational margin

Performance with clear water and ambient temp 40 °C

HI B Curve

City of Ferndale
Pump Station Reconnaissance

PS Id: #6 Correll/Flair

Date: 12/9/2010
Time: 9:30
Personnel: COS, Bob

Photo numbers: 19 - 24

Pump Information:

type: Subm.
# of pumps: 2
pump mfr and model no.: Flygt 3127.090 HT
age: 1998
discharge piping diam. & mat.: 4"
discharge depth from rim: 46.5" to top of pipe
rated power: 7.4 hp
phase/voltage: 1/220
downstream flow meter present: Y N
curves or other info available: (Y) N explain: manuals onsite

Notes on general condition of pumps/valves/vault, etc. (corrosion, noises, rattling/shaking, etc.):

- mixed flush valve

Wetwell Information: sketch as necessary on back of sheet

diameter: 6' - sloped bottom
overall depth: 178.5"
inlet direction: S
inlet diam. & material: 10" PVC
inlet depth from rim: 139" ±
cycle range depth/elevations: on: ± 4' hi alarm:
off: lo alarm:

Notes on general condition of wetwell and all appurtenances:

- no major seepage, but some at joints
- no GW infil

Other miscellaneous notes (needs/wants for upgrades or replacements - site issues incl. GW infil, water inundation, STW backup, etc. - general pumphouse conditions incl HVAC, etc.)

- System lots of infil, roof drain, CWA, steady flow clear
West - Flair, Coral East

Pump Station #7
Main St / 7-11 / Post Office

PS#7 Wetwell

City of Ferndale
Pump Station Reconnaissance

PS Id: #7 PO/711/Main St

Date: 12/9/2010
Time: 10:30
Personnel: COS, Bob

Photo numbers: ~~1-8~~ 1-8 mobh GPS
4

Pump Information:

type: Subm.
# of pumps: 2
pump mfr and model no.: Flygt 3102.090
age: old - pre 70's
discharge piping diam. & mat.: 4" DI
discharge depth from rim: std to top of pipe
rated power: 5hp
phase/voltage: 3/480
downstream flow meter present: Y (N)
curves or other info available: Y N explain: _____

Notes on general condition of pumps/valves/vault, etc. (corrosion, noises, rattling/shaking, etc.):
-old old old
#pl ad 15 yrs apt.

Wetwell Information: sketch as necessary on back of sheet

diameter: 6' - mostly flat - 1.7% slope overall
overall depth: 150"
inlet direction: N, S
inlet diam. & material: N-8" PVC S - 8"? conc
inlet depth from rim: N-9', S-9'-Ø(8")
cycle range depth/elevations: on: hi alarm:
off: lo alarm:

Notes on general condition of wetwell and all appurtenances:
-no major infil, plenty of cuelage

Other miscellaneous notes (needs/wants for upgrades or replacements - site issues incl. GW infil, water inundation, STW backup, etc. - general pumphouse conditions incl HVAC, etc.)
-new lid hatch w/road project

Pump Station #9
Portal Way North

PS#9 Wetwell

PS#9 Control Panel

PS#9

FLYGT

PERFORMANCE CURVE

PRODUCT	TYPE
NP3085.092	MT

DATE	PROJECT	CURVE NO	ISSUE
2010-12-16		63-462-00-5306	5

	1/1-LOAD	3/4-LOAD	1/2-LOAD
POWER FACTOR	0.81	0.74	0.62
EFFICIENCY	77.5 %	78.0 %	76.0 %
MOTOR DATA	---	---	---

RATED POWER	3	hp
STARTING CURRENT	25	A
RATED CURRENT	4.5	A
RATED SPEED	1705	rpm
TOT.MOM.OF INERTIA	0.018	kgm2
NO. OF BLADES	2	

IMPELLER DIAMETER: 151 mm

MOTOR #	STATOR	REV
15-10-4AL	61D	10

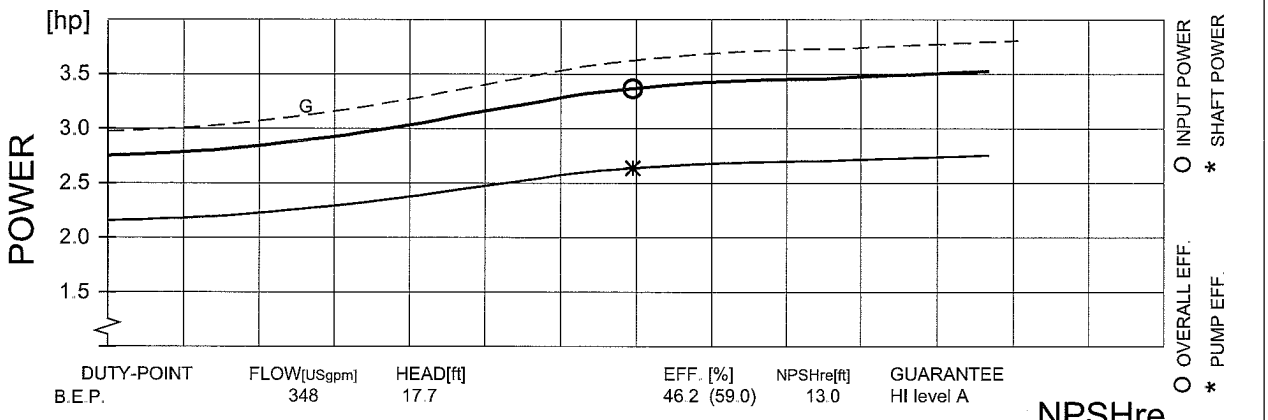
FREQ.	PHASES	VOLTAGE	POLES
60 Hz	3	460 V	4

GEARTYPE: --- RATIO: ---

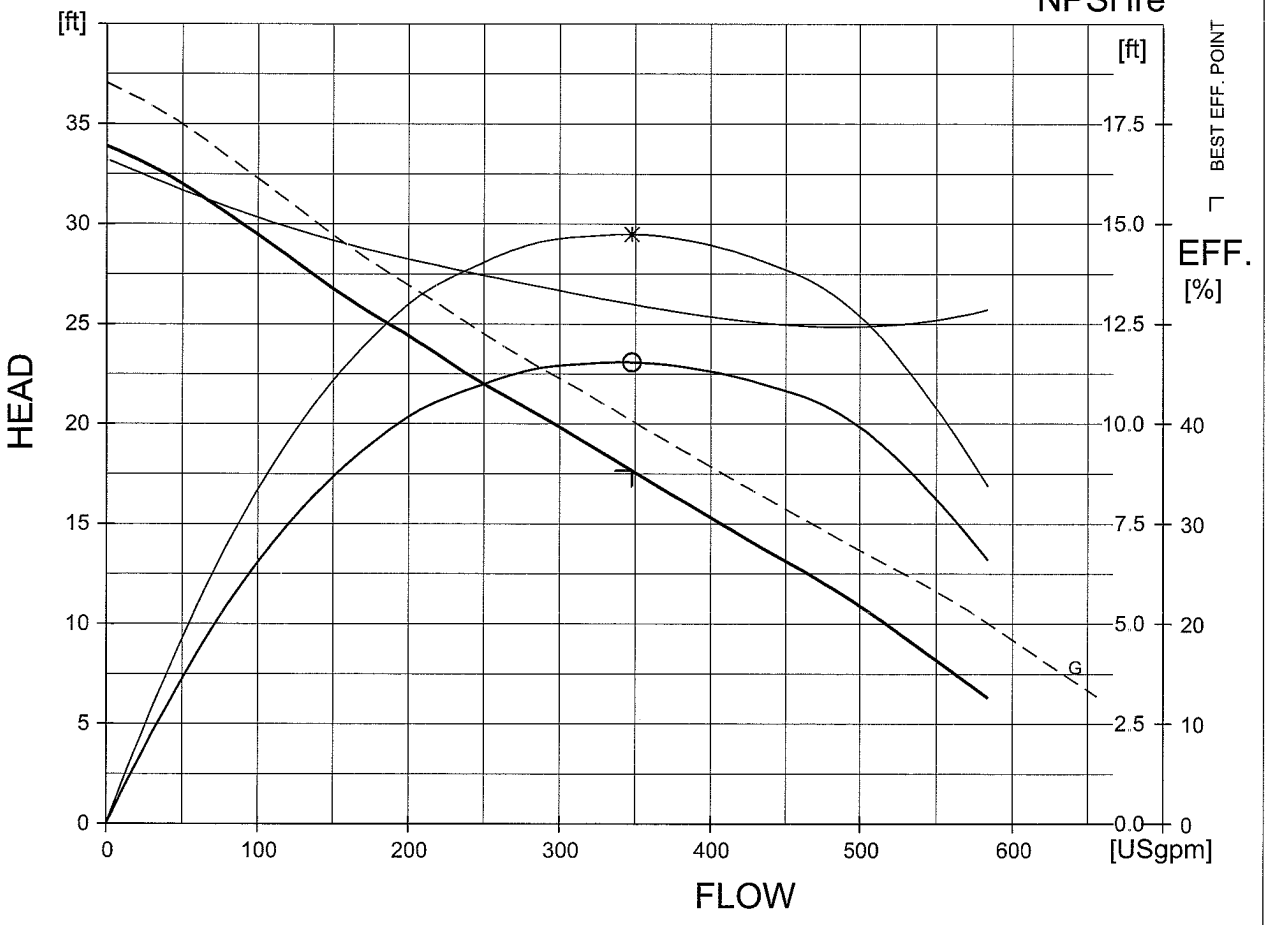
COMMENTS

INLET/OUTLET: - / 3.0 inch

IMP. THROUGHLET: ---



DUTY-POINT	FLOW[USgpm]	HEAD[ft]	EFF. [%]	NPSHre[ft]	GUARANTEE
B.E.P.	348	17.7	46.2 (59.0)	13.0	HI level A



NPSHre = NPSH3% + min. operational margin

Performance with clear water and ambient temp 40 °C

GUARANTEE BETWEEN LIMITS (G) ACC. TO: HI level A

FLYPS3.1.6.3 (20060531)

City of Ferndale
Pump Station Reconnaissance

PS Id: #9 Portal North

Date: 12/9/2010
Time: 13:30
Personnel: CB, Bob

Photo numbers: 51 - ~~55~~ 56

Pump Information:

type: submg
# of pumps: 2
pump mfr and model no.: Flygt 3085.092-0092
age:
discharge piping diam. & mat.: 4" DI
discharge depth from rim: 101.5" to top of pipe
rated power: 3hp
phase/voltage: 3/480
downstream flow meter present: Y (N)
curves or other info available: (Y) N explain: manuals on site

Notes on general condition of pumps/valves/vault, etc. (corrosion, noises, rattling/shaking, etc.):

OK

Wetwell Information: sketch as necessary on back of sheet

diameter: 6' - sloped bottom
overall depth: 303" + 3.5-4'
inlet direction: E
inlet diam. & material: 10" PVC
inlet depth from rim: 254" to top of pipe
cycle range depth/elevations: on: hi alarm:
off: lo alarm:

Notes on general condition of wetwell and all appurtenances:

- okay, no apparent infil / leakage, joints sealed in most places
- one spring / calcium restrictor ± 6' down

Other miscellaneous notes (needs/wants for upgrades or replacements - site issues incl. GW infil, water inundation, STW backup, etc. - general pumphouse conditions incl HVAC, etc.)

Pump Station #10
Aquarius / Apollo Dr / Alexander Estates

PS#10 Wetwell

PS#10 Discharge Valve Vault

PS #10

PERFORMANCE CURVE

PRODUCT	TYPE
NP3127.090	MT

DATE	PROJECT	CURVE NO	ISSUE
2010-12-17		61-439-00-3004	1

	1/1-LOAD	3/4-LOAD	1/2-LOAD
POWER FACTOR	0.96	0.99	1.00
EFFICIENCY	83.0 %	84.5 %	83.0 %
MOTOR DATA	---	---	---

RATED POWER	7.5	hp
STARTING CURRENT	66	A
RATED CURRENT	30	A
RATED SPEED	1745	rpm
TOT.MOM.OF INERTIA	0.047	kgm2
NO. OF BLADES	2	

IMPELLER DIAMETER: 188 mm

MOTOR #	STATOR	REV
21-12-4AL	12-	13

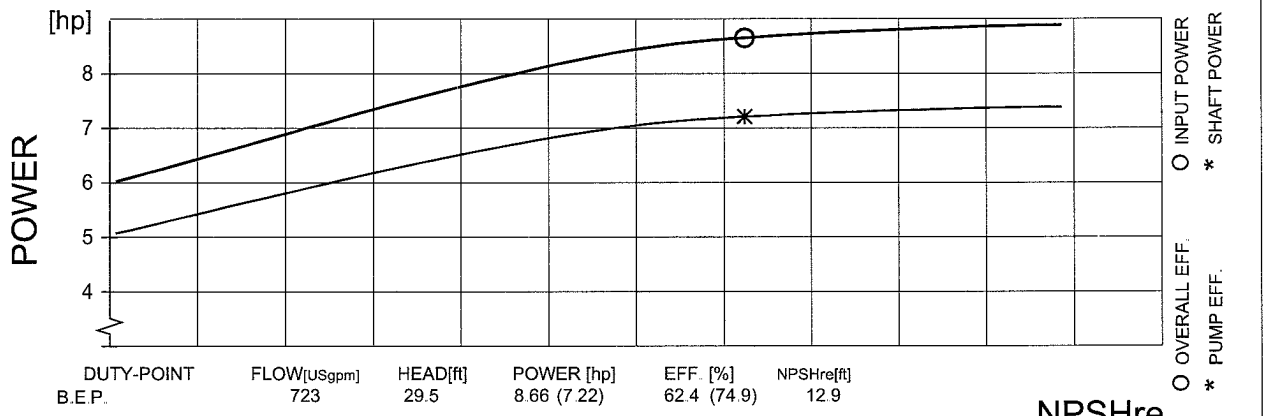
FREQ.	PHASES	VOLTAGE	POLES
60 Hz	1	230 V	4

GEARTYPE: --- RATIO: ---

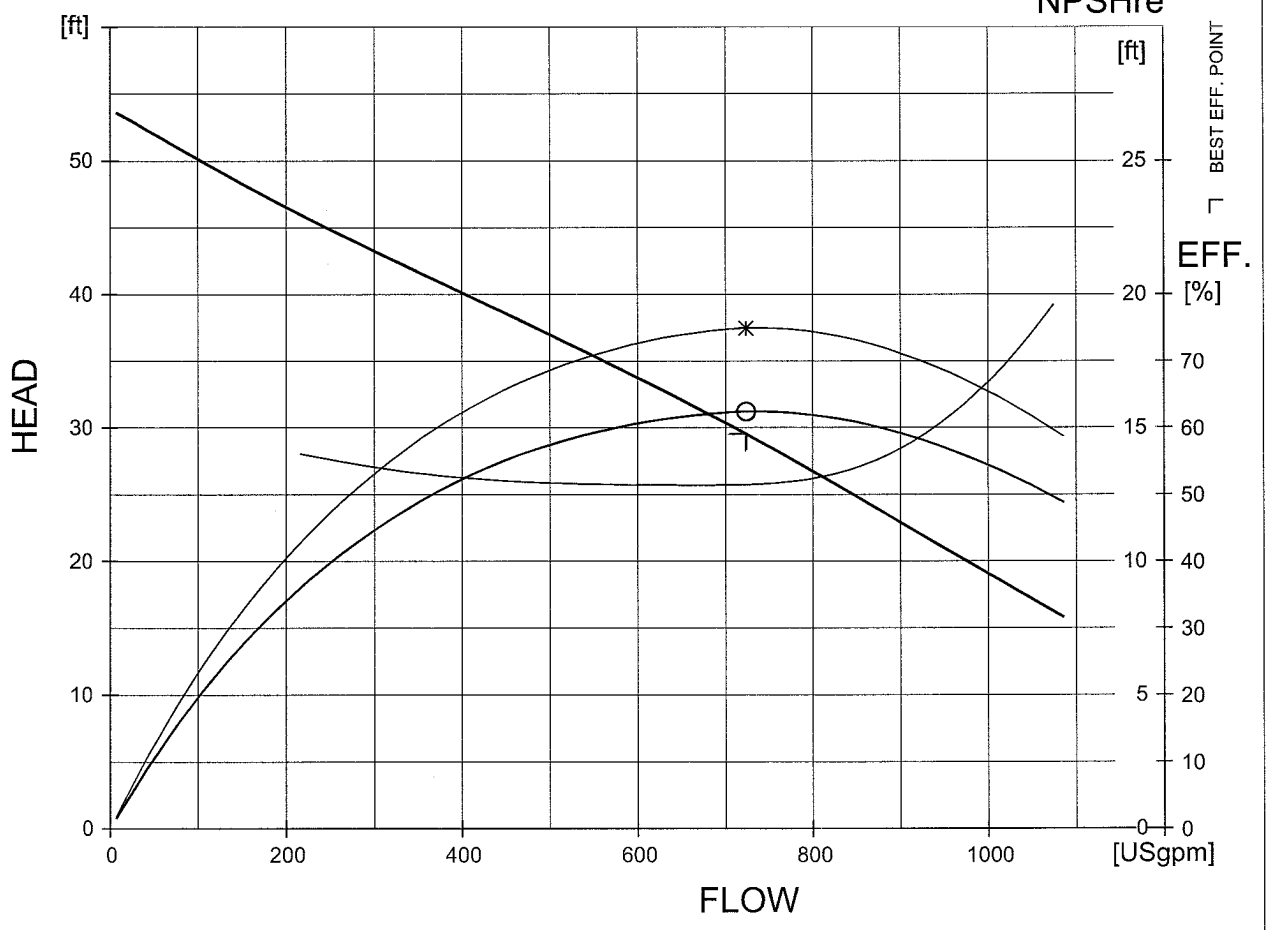
COMMENTS

INLET/OUTLET: -/ 4 inch

IMP. THROUGHLET: ---



DUTY-POINT	FLOW[USgpm]	HEAD[ft]	POWER [hp]	EFF. [%]	NPSHre[ft]
B.E.P.	723	29.5	8.66 (7.22)	62.4 (74.9)	12.9



NPSHre = NPSH3% + min. operational margin

Performance with clear water and ambient temp 40 °C

HI B Curve

FLYPS3.1.5.7 (20060531)

City of Ferndale
Pump Station Reconnaissance

PS Id: #10 Aquarius (Alexander Estates)

Date: 10/9/2010
Time: 8:15
Personnel: COS, Bob

Photo numbers: 5-9

Pump Information:

from a retrofit designed for new on 3rd set of pumps removed in 2yrs ago Apr. 08

type: ~~Ex~~ Submers.
# of pumps: 2
pump mfr and model no.: Flygt 3127.090-2435
age: 70's → 1978
discharge piping diam. & mat.: 4" d.i.
discharge depth from rim: 58" to top of pipe
rated power: 7.5hp, rewated 5
phase/voltage: 1/230
downstream flow meter present: Y (N) on none
curves or other info available: Y N explain: _____

Notes on general condition of pumps/valves/vault, etc. (corrosion, noises, rattling/shaking, etc.):

-n

Wetwell Information: sketch as necessary on back of sheet

diameter: 6'
overall depth: 16'7" - Flat bottom
inlet direction: W S
inlet diam. & material: W - 8" PVC w/ C.I ext. S - 6" PVC
inlet depth from rim: W - 40"+38.5" S - 77"
cycle range depth/elevations: on: ~~unkown~~ hi alarm:
off: +/- 4-5 inches obs. lo alarm:

Notes on general condition of wetwell and all appurtenances:

-noise infil, some bleed past ring joint
-new discharge elbows w/ new pumps 2yrs ago
-mixing/flush valve on one pump

Other miscellaneous notes (needs/wants for upgrades or replacements - site issues incl. GW infil, water inundation, STW backup, etc. - general pumphouse conditions incl HVAC, etc.)

-was one of constant monitoring, new pumps okay
for many 10 years

Pump Station #11
Oxford / Unrein Dr / Cascade Peaks

PS#11 Wetwell

PS#11 Control Panel

#11 Candidate

FLYGT

PERFORMANCE CURVE

PRODUCT	TYPE
NP3102.181	SH

DATE	PROJECT	CURVE NO	ISSUE
2010-12-13		63-257-00-5206	4

	1/1-LOAD	3/4-LOAD	1/2-LOAD
POWER FACTOR	0.93	0.91	0.87
EFFICIENCY	80.5 %	80.5 %	78.0 %
MOTOR DATA	---	---	---

RATED POWER	6.5	hp
STARTING CURRENT ...	69	A
RATED CURRENT ...	8.1	A
RATED SPEED	3475	rpm
TOT.MOM.OF INERTIA ...	0.011	kgm2
NO. OF BLADES	2	

IMPELLER DIAMETER: 125 mm

MOTOR #	STATOR	REV
18-10-2AL	38D	12

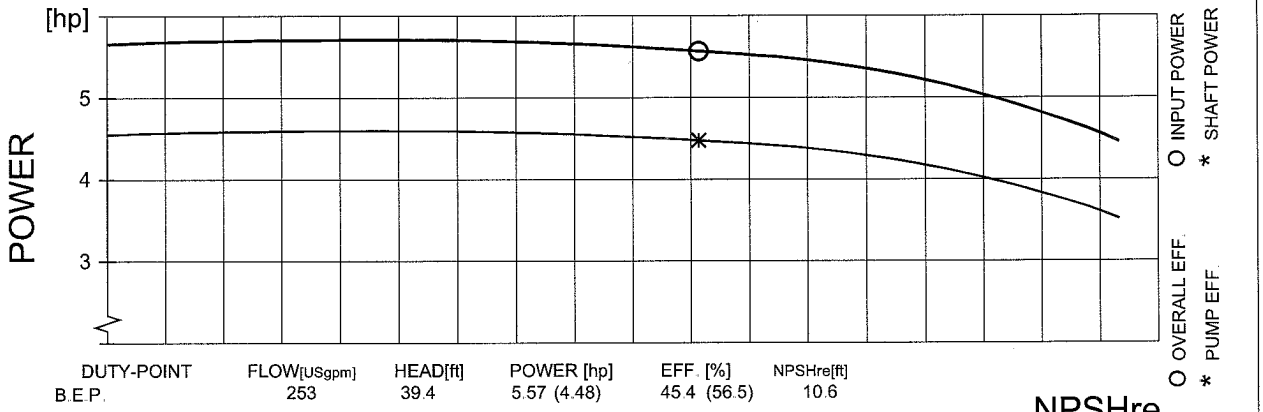
FREQ	PHASES	VOLTAGE	POLES
60 Hz	3	460 V	2

GEARTYPE: --- RATIO: ---

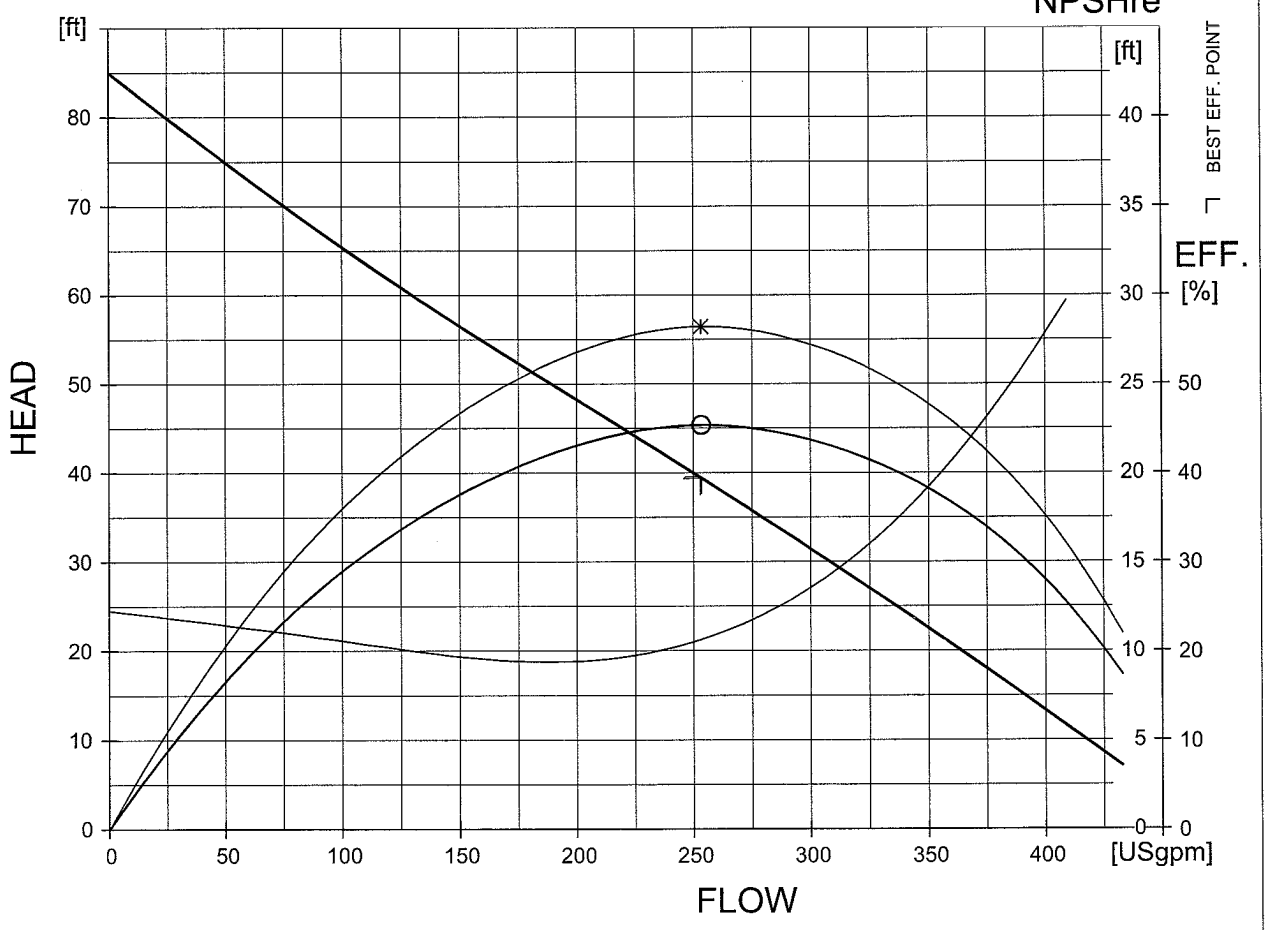
COMMENTS

INLET/OUTLET: - / 3.0 inch

IMP. THROUGHLET: ---



DUTY-POINT	FLOW[USgpm]	HEAD[ft]	POWER [hp]	EFF. [%]	NPSHre[ft]
B.E.P.	253	39.4	5.57 (4.48)	45.4 (56.5)	10.6



NPSHre = NPSH3% + min. operational margin

Performance with clear water and ambient temp 40 °C

FLYGT HI B Curve

FLYPS3.1.5.7 (20060531)

City of Ferndale
Pump Station Reconnaissance

PS Id: #11 Cascade Peaks

Date: 12/9/2010
Time: 8:40 am
Personnel: COS, Bob

Photo numbers: 10 - 14

Pump Information:

type: Submn
# of pumps: 2
pump mfr and model no.: 3102.090 Flygt
age: >11 yrs ± 20+ yrs circa 1991
discharge piping diam. & mat.: 4"
discharge depth from rim: 33" to top of pipe
rated power: ?
phase/voltage: 1/220
downstream flow meter present: Y (N)
curves or other info available: Y N explain:

Notes on general condition of pumps/valves/vault, etc. (corrosion, noises, rattling/shaking, etc.):

-undersized from 40 yrs, before #19 piped to it
-1 time upgrade, rebuilt once, 2nd replacement
-under head, bottom 3 yrs power
-no mixed flush valves

Wetwell Information: sketch as necessary on back of sheet

diameter: 6' - Flat bottom
overall depth: 18'-4"
inlet direction: SW, W, N
inlet diam. & material: 8" PVC all
inlet depth from rim: SW - 150" W - 70" N - 70" ±
cycle range depth/elevations: on: ± 5' storage hi alarm:
off: lo alarm:
± 2-3 hrs holding - peak time of day

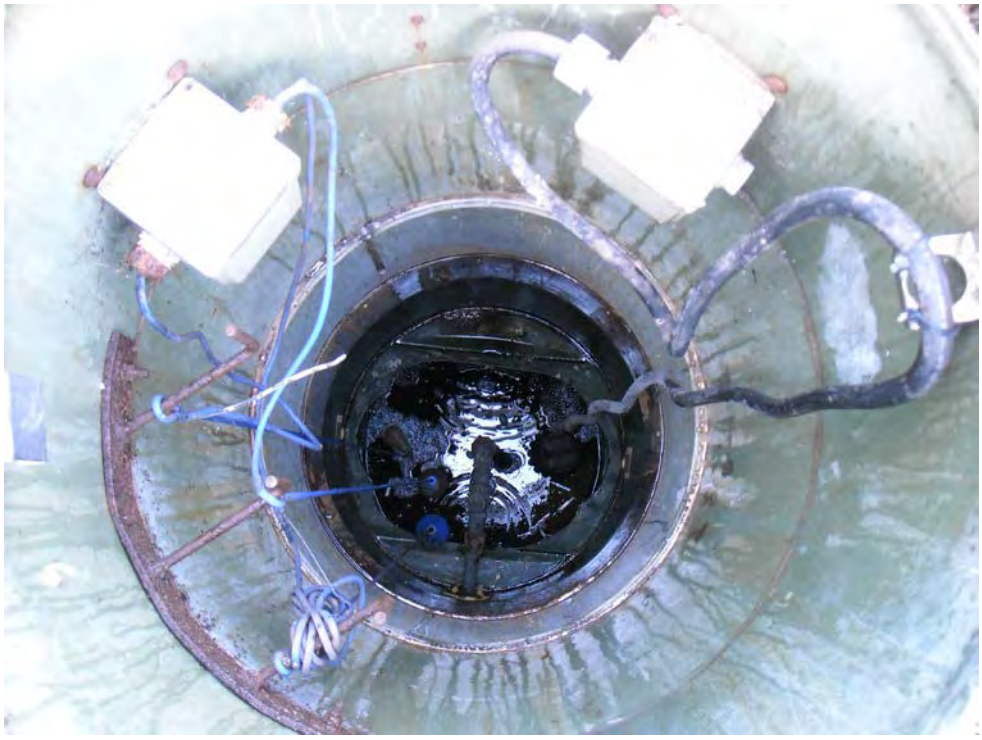
Notes on general condition of wetwell and all appurtenances:

-shelby ct connection inlet low, reduced > 1/2 holding time/storage
-seepage at joints/rings

Other miscellaneous notes (needs/wants for upgrades or replacements - site issues incl. GW infil, water inundation, STW backup, etc. - general pumphouse conditions incl HVAC, etc.)

-tele - tells plant if pump fail maybe pour outage

Pump Station #12
Northwest Ave / Day Academy



PS #12 Wet well and Pumps

PS#12 Control Panel

PS#12 Site

City of Ferndale
Pump Station Reconnaissance

PS Id: PS#12 - NoAthwest Ave / Dal Academy

Date: 4-27-2012
Time: 8:30
Personnel: C. Schoenfelder
Ferndale: Mike Hailey
Jeremy

Photo numbers: _____

Pump Information:

type: Grinder - Flygt
# of pumps: 1
pump mfr and model no.: Flygt No.? (Whitney Equip supplied)
age: 1983
discharge piping diam. & mat.: 1½" PVC
discharge depth from rim: 95" to top of pipe → wetwell to ground + 2 ft
rated power: 2 HP 119" to top of pump to typical
phase/voltage: 1/208
downstream flow meter present: Y (N)
curves or other info available: Y (N) explain: Whitney may have

Notes on general condition of pumps/valves/vault, etc. (corrosion, noises, rattling/shaking, etc.):

Wetwell Information: sketch as necessary on back of sheet

diameter: 2' riser, sump - 4' ø
overall depth: 119" ~~top of~~ pump to top rim of wet well (2 ft above grade)
inlet direction: N & S
inlet diam. & material: conglee ~~steel~~ - ± 4"
inlet depth from rim: 109" ±, both same
cycle range depth/elevations: on: top ww - 9' hi alarm: 95"
off: top ww - 123" lo alarm:

Notes on general condition of wetwell and all appurtenances:

Other miscellaneous notes (needs/wants for upgrades or replacements - site issues incl. GW infil, water inundation, STW backup, etc. - general pumphouse conditions incl HVAC, etc.)

Pump Station #15
Smith Rd / Bellaire Estates

PS#15 Wetwell

PS#15 Control Panel

Bellair Estates #15

PS #15

MAINTENANCE SUMMARY FORM

PROJECT: Bellaire Estates Subdivision CONTRACT NO. _____

1. EQUIPMENT ITEM Flygt CP3140.090
2. MANUFACTURE Flygt
3. EQUIPMENT SERIAL NUMBER(S) 9360017, 9360018
4. WEIGHT OF INDIVIDUAL COMPONENTS (OVER 100 POUNDS) 710#
5. NAMEPLATE DATA (HP, VOLTAGE, SPEED, ETC.) 15.0HP, 460V, 3PH, 1755RPM
6. MANUFACTURE'S LOCAL REPRESENTATIVE
   a. Name: Whitney Equipment Co., Inc. Telephone No.: (206) 556-1750
   b. Address: 14636 NE 95th Street, Redmond, WA 98052
7. MAINTENANCE REQUIREMENTS

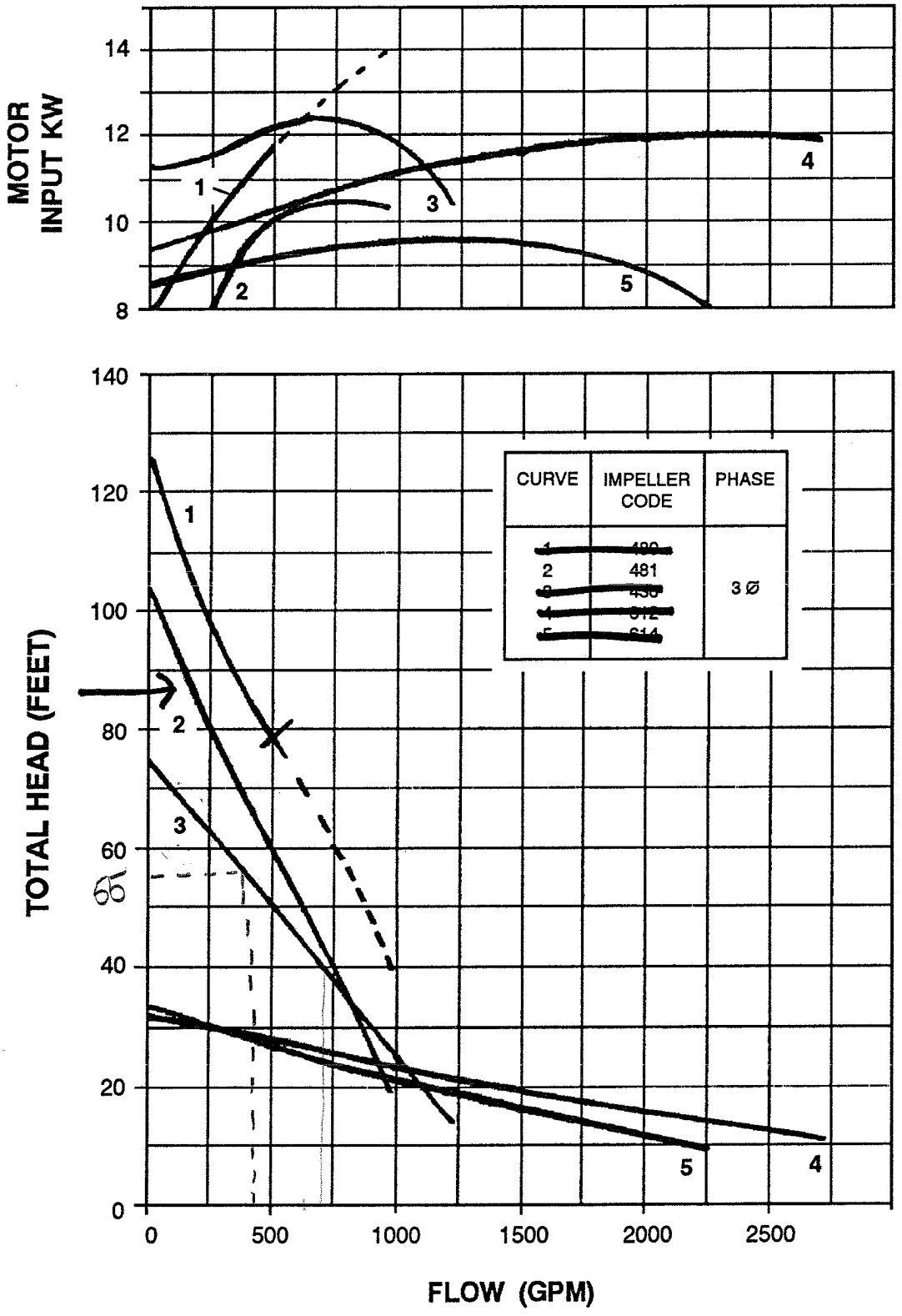
Maintenance Operation Comments (Maintenance Summary)	Frequency	(If Applicable) Lubricant Symbol
Inspect visible parts on pump, pump casing & impeller for wear	annually	n/a
Check oil level & condition, change as necessary	annually	SAE10W30
Check cables for wear and tightness	annually	n/a
Inspect pump voltage draw and meggar readings	monthly	n/a
Check function of level sensors, starter and monitoring equip.	annually	n/a
Check rotation direction of pump	when reconnecting	n/a
Check pipes, valves, peripheral equipment	annually	n/a

PS#15 Smith Road / Billaire Estates

C-3140

FAMILY OF PERFORMANCE CURVES

SECTION	MODEL
3	3140
SUPERSEDES	ISSUED
	12/91



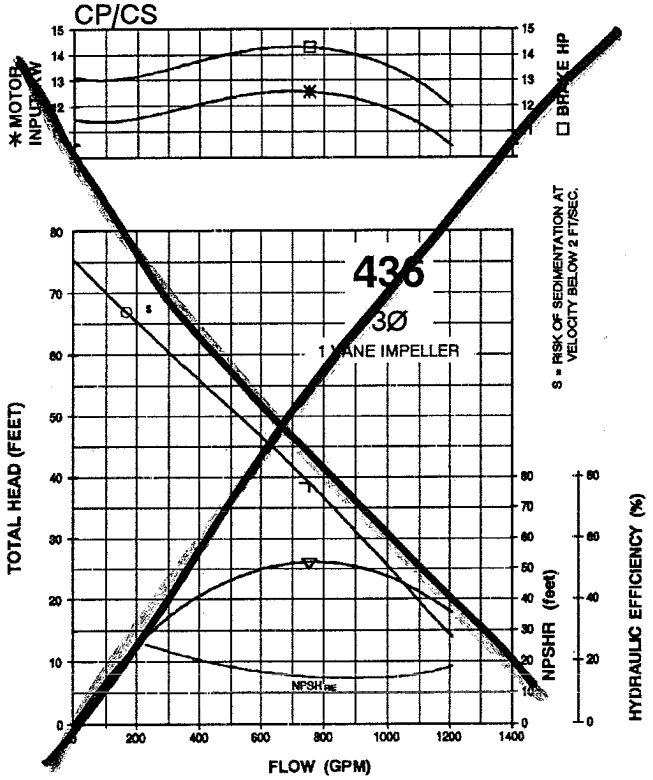
NOTE:
FAMILY OF PERFORMANCE CURVES ARE FOR PRE-SELECTION ONLY.
SEE INDIVIDUAL CURVES IN THIS SECTION FOR FINAL SELECTION.

FLYGT

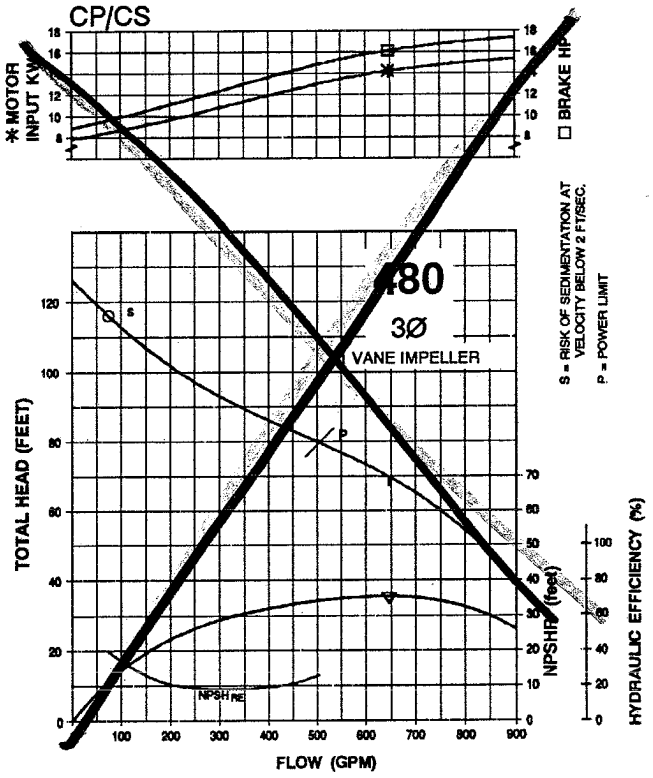
SECTION	PAGE	WASTEWATER	IMPELLER PERFORMANCE CURVES	C-3140
3	1			
SUPERSEDES	ISSUED 12/91			

PS15
P2

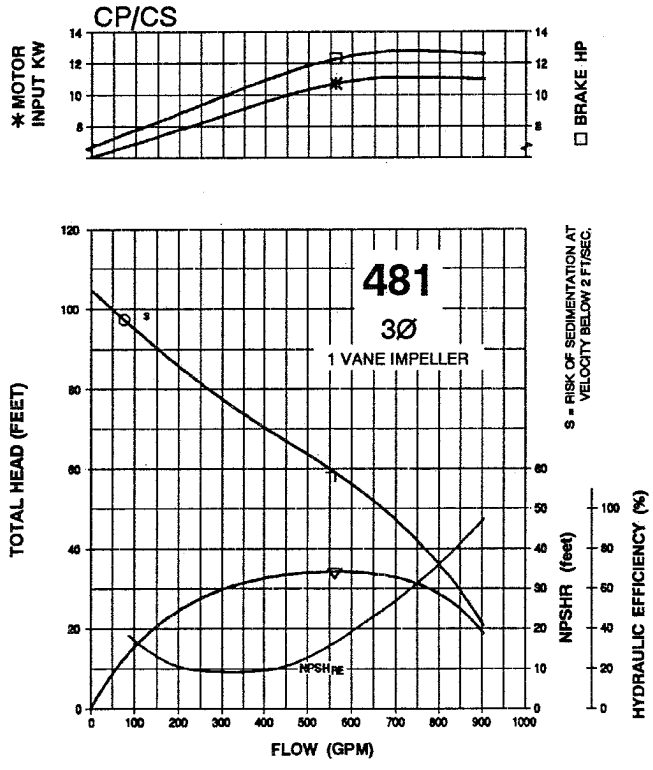
CP/CS



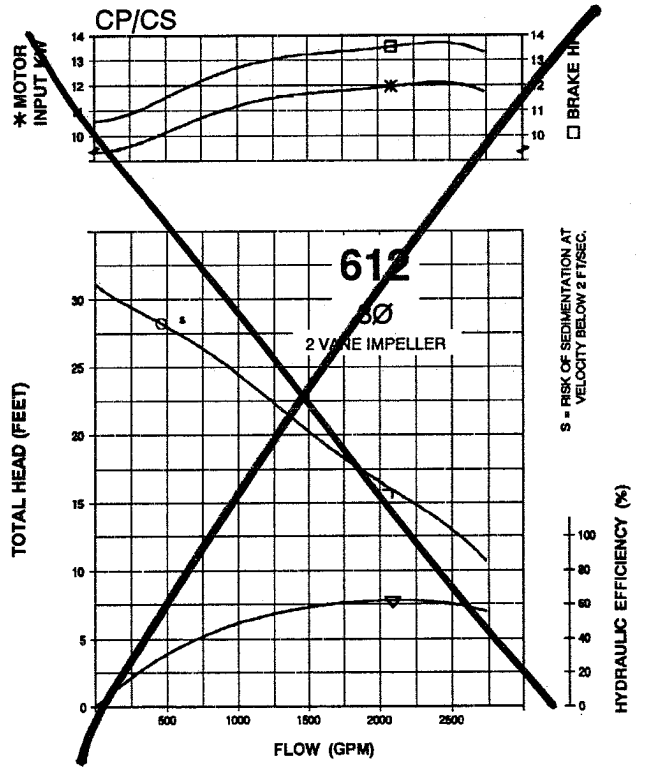
CP/CS



CP/CS



CP/CS



City of Ferndale
Pump Station Reconnaissance

PS Id: #15 Bellaire Estates

Date: 12/9/2010
Time: 12:50
Personnel: COS, Bob

Photo numbers: 28 on GPS, 42-43
7

Pump Information:

type: Subm.
# of pumps: 2
pump mfr and model no.: Flygt 3140.090-5012
age: 1994
discharge piping diam. & mat.: 4" D.I.
discharge depth from rim: 89" to top of pipe
rated power: 14.8 hp
phase/voltage: 3/480
downstream flow meter present: Y (N)
curves or other info available: Y N explain: _____

Notes on general condition of pumps/valves/vault, etc. (corrosion, noises, rattling/shaking, etc.):
- no mix flush valve
- original pumps, no problems

Wetwell Information: sketch as necessary on back of sheet

diameter: 6' - sloped bottom
overall depth: 16' to top of slope edge
inlet direction: W
inlet diam. & material: 8" PVC
inlet depth from rim: 177"
cycle range depth/elevations: on: +/- 18" cycle depth hi alarm: lagoon + 12" max
off: lo alarm:

Notes on general condition of wetwell and all appurtenances:
- low inlet & cycle depth, pump run time is minimal
- ok shape, lid good
- no seepage apparent

Other miscellaneous notes (needs/wants for upgrades or replacements - site issues incl. GW infil, water inundation, STW backup, etc. - general pumphouse conditions incl HVAC, etc.)

Pump Station #16
Portal Way South near I-5

PS#16 Wetwell

PS#16 Discharge Valve Vault

South Portal Manor ULID #7 PS#16

PERFORMANCE CURVE

PRODUCT	CP3127.090	TYPE	MT
DATE	2010-12-14	PROJECT	
CURVE NO	63-433-00-2203	ISSUE	3

	1/1-LOAD	3/4-LOAD	1/2-LOAD
POWER FACTOR	0.88	0.85	0.77
EFFICIENCY	83.5 %	84.5 %	83.5 %
MOTOR DATA	---	---	---

RATED POWER	7.5	hp
STARTING CURRENT	52	A
RATED CURRENT	9.6	A
RATED SPEED	1740	rpm
TOT.MOM.OF INERTIA	---	
NO. OF BLADES	1	

IMPELLER DIAMETER: 206 mm

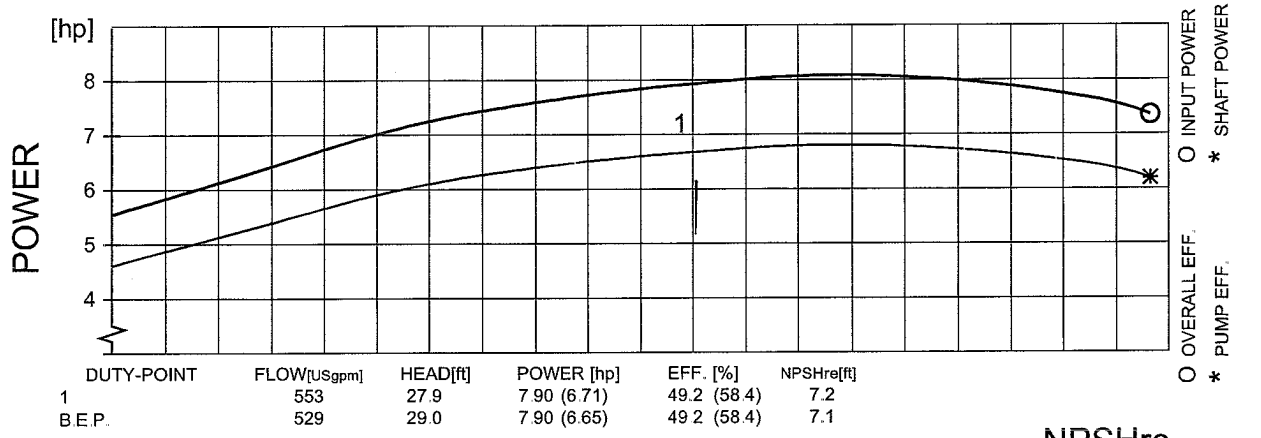
MOTOR #	STATOR	REV
21-10-4AL	12YSER	11

FREQ.	PHASES	VOLTAGE	POLES
60 Hz	3	460 V	4

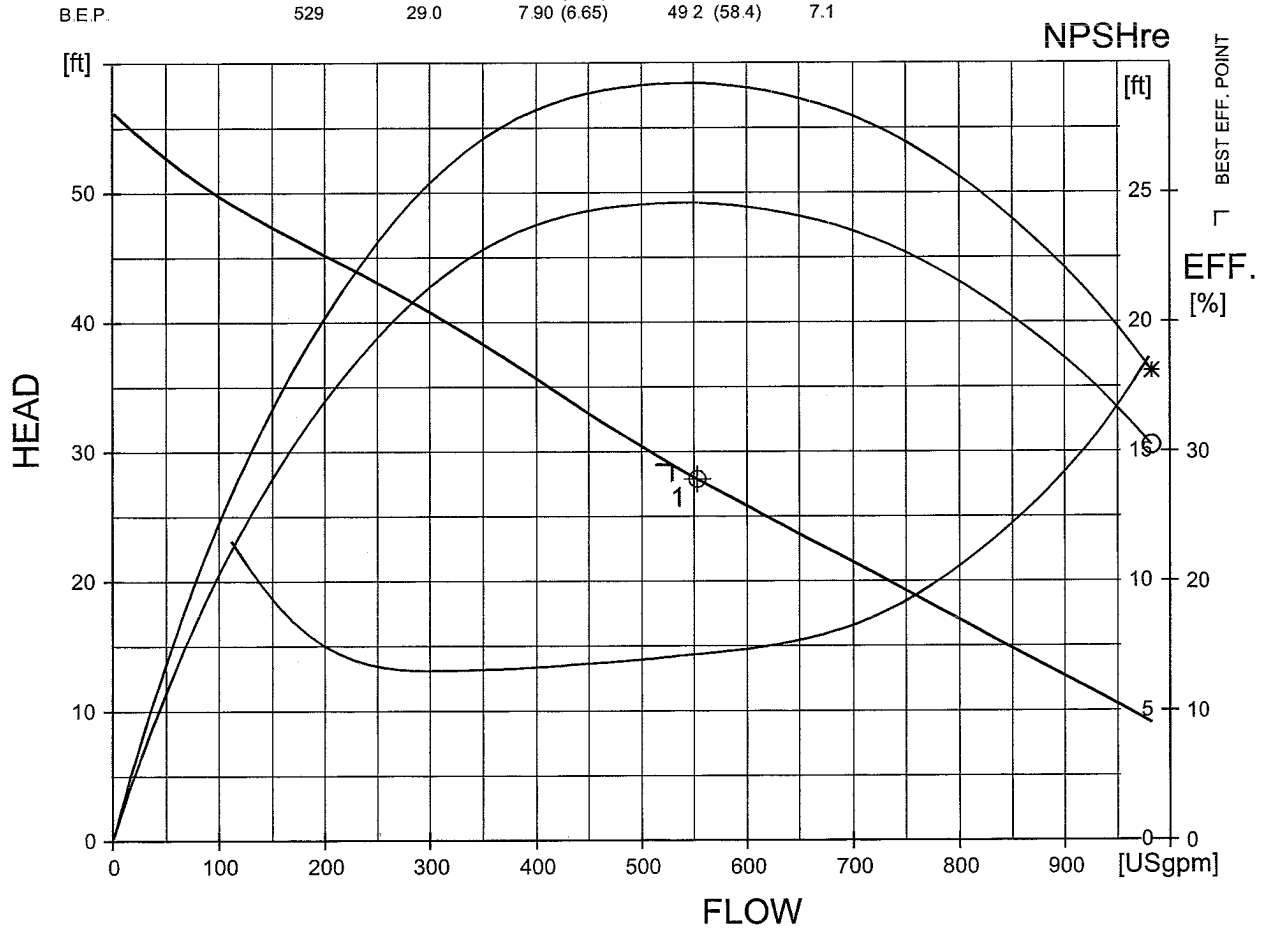
GEARTYPE	RATIO
---	---

COMMENTS

INLET/OUTLET	IMP. THROUGHLET
-/ 6 inch	3.2 inch



DUTY-POINT	FLOW[USgpm]	HEAD[ft]	POWER [hp]	EFF. [%]	NPSHre[ft]
1	553	27.9	7.90 (6.71)	49.2 (58.4)	7.2
B.E.P.	529	29.0	7.90 (6.65)	49.2 (58.4)	7.1



NPSHre = NPSH3% + min. operational margin

Performance with clear water and ambient temp 40 °C

FLYGT HI B Curve

FLYPS3.1.6.3 (20060531)

City of Ferndale
Pump Station Reconnaissance

PS Id: #16 - Portal Way South

Date: 12/9/2010
Time: 13:00
Personnel: CDS, Bob

Photo numbers: 44 - 50

Pump Information:

type: Subm.
# of pumps: 2
pump mfr and model no.: Flygt 3127.090-5505
age: 1993
discharge piping diam. & mat.: 6" DI
discharge depth from rim: 75" to top of pipe
rated power: 7.5hp
phase/voltage: 3/480
downstream flow meter present: Y (N)
curves or other info available: Y N explain: _____

Notes on general condition of pumps/valves/vault, etc. (corrosion, noises, rattling/shaking, etc.):
- pretty new OK

Wetwell Information: sketch as necessary on back of sheet

diameter: 8' - sloped, to very top of pumps
overall depth: 303" - to bottom bottom
inlet direction: S, N
inlet diam. & material: S - 8" PVC, N - 21" PVC
inlet depth from rim: N - 186", S - 174"
cycle range depth/elevations: on: ± 4' lag + 3'; hi alarm:
off: lo alarm:

Notes on general condition of wetwell and all appurtenances:
- new shape, lids good new
- infiltra leak towards bottom, 3rd joint down, otherwise no infil or seep
- newly spring

Other miscellaneous notes (needs/wants for upgrades or replacements - site issues incl. GW infil, water inundation, STW backup, etc. - general pumphouse conditions incl HVAC, etc.)

- ~~wall~~ ring joints were sealed w/ special sealant when installed were leaking bad, very deep shallow g/w

Pump Station #17
Slater Rd / Silver Creek Industrial Park

PS#17 Wetwell

PS#17 Discharge Valve Vault

Slater Road PS #8

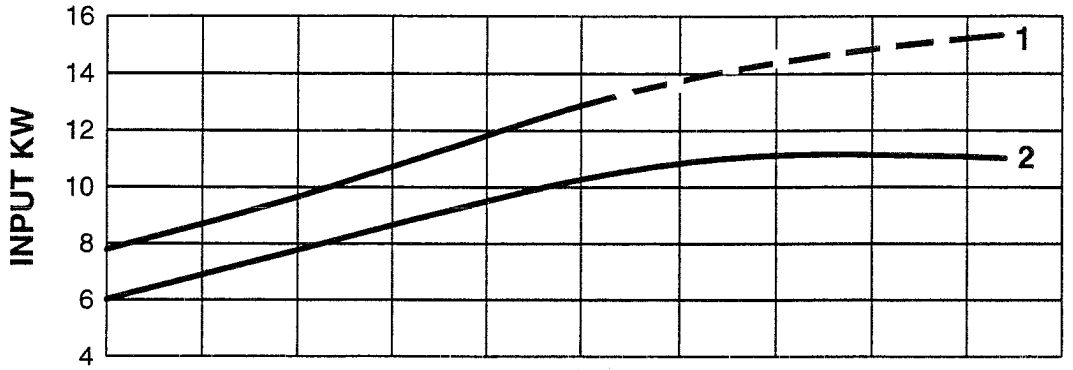
PS #17

C-3140

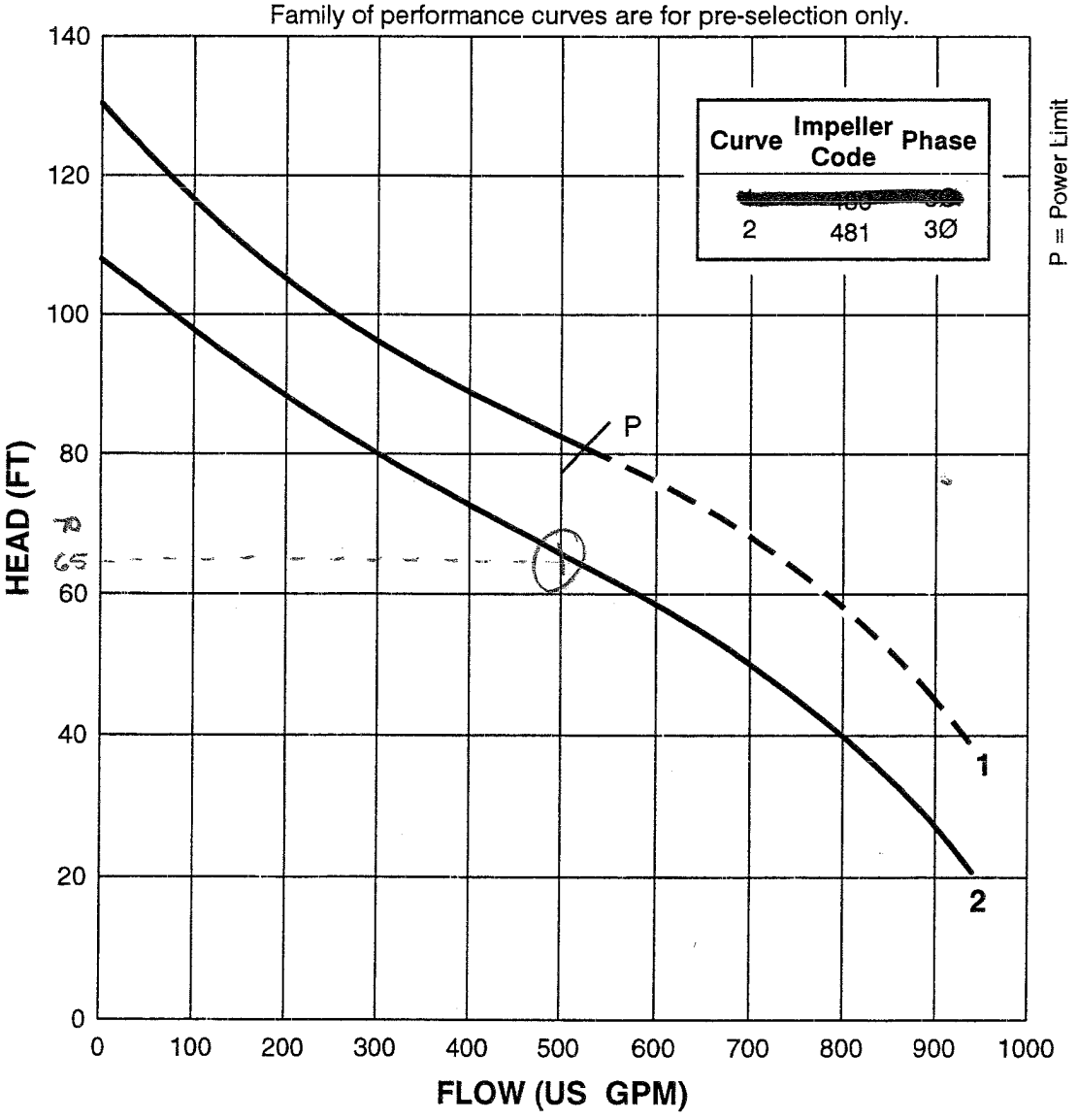
(HT Impellers)

ULID

(1) Duty point 65ft TDH
470 gpm



NOTE:
Family of performance curves are for pre-selection only.



City of Ferndale
Pump Station Reconnaissance

PS Id: #7 Slater/Silver Crk

Date: 12/9/2010
Time: 12:10
Personnel: CDS, Bob

Photo numbers: [illegible] GPS 14-19

Pump Information:

type: subm
# of pumps: 2
pump mfr and model no.: Flygt 3140.090-6024
age: 1994
discharge piping diam. & mat.: 4" D.I.
discharge depth from rim: 62" to top of pipe
rated power: 1 Shp
phase/voltage: 3/480
downstream flow meter present: Y (N)
curves or other info available: Y N explain: _____

Notes on general condition of pumps/valves/vault, etc. (corrosion, noises, rattling/shaking, etc.):

-no mix valve
-telemetry antenna, but not hooked up cnt compatible w/ staff now
-original pumps, are re-built last yr

Wetwell Information: sketch as necessary on back of sheet

diameter: 6' -sloped bottom
overall depth: 190" @ rear lap joint on sloped wall
inlet direction: S
inlet diam. & material: 12" PVC
inlet depth from rim: 88"
cycle range depth/elevations: on: ± 5'-9" lag: on + 3-4' hi alarm: lag on + 12-18"
off: ±3' lo alarm: off - 12-18"

Notes on general condition of wetwell and all appurtenances:

→ OK in shape, no infil or major seepage apparent

Other miscellaneous notes (needs/wants for upgrades or replacements - site issues incl. GW infil, water inundation, STW backup, etc. - general pumphouse conditions incl HVAC, etc.)

- reeds to be raised, in a hole, lots of STW inflow through top of vaults/MH, acts as a drain
- drain thru elec box
- standing water at times infront of panel

Pump Station #18
Nicholas Dr / Ryan's Glen

PS#18 Wetwell

PS#18 Discharge Valve Vault

P.S. #18 RYAN'S GLEN

WHITNEY EQUIPMENT COMPANY, INC.
14636 NE 95th Street Redmond, WA 98052
Phone: (206) 556-1750 Fax: (206) 556-1746

Specification Data Sheet For: *FLYGT SUBMERSIBLE PUMP CP-3102X*

DATE:	4/28/95	CONTRACTOR/CUSTOMER:	Ametron Consulting Group
SECTION NUMBERS:		OWNER:	City of Ferndale
		JOB NAME:	Ryan's Glen Lift Station
WECO SALES ORDER	4738	LOCATION	Ferndale, WA

REVISION	BY	DATE	DESCRIPTION	NOTES
0	DO	4/28/95	Original Submittal	

A GENERAL SPECIFICATIONS / C BASIC EQUIPMENT FEATURES

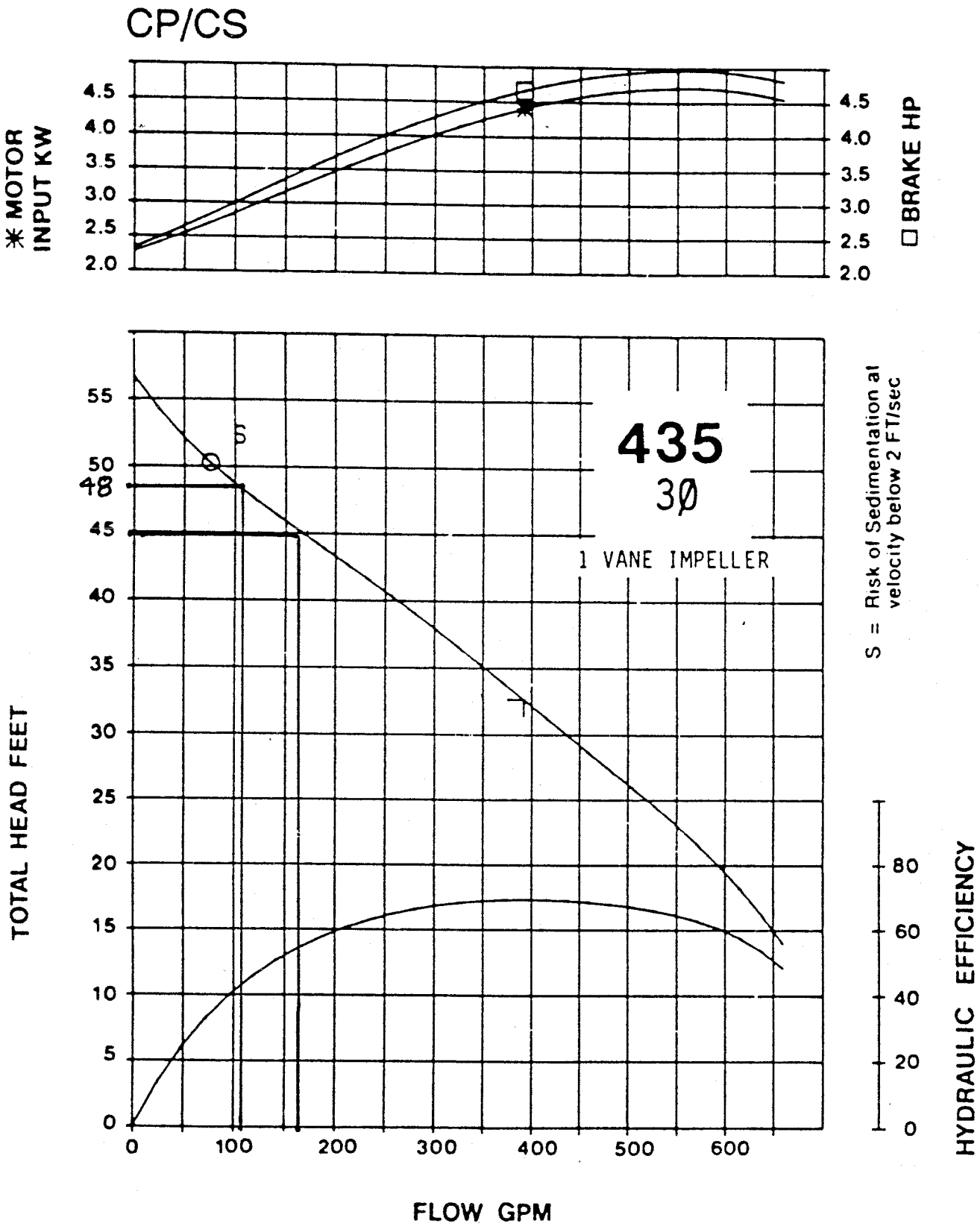
1	QUANTITY	2	20	CABLE SEAL	GROMMET TYPE
2	SITE	PUMP STATION	21	CABLE SIZE	20' #12 AWG/7 GC
3	MODEL NUMBER	CP-3102X-435	22	SEAL- INNER	TUNGSTEN-CARBIDE
4	TAG NUMBER		23	SEAL- OUTER	TUNGSTEN-CARBIDE
5	RATED CAPACITY	110GPM @ 48' TDH	24	WEIGHT	215 LBS
6	DISCHARGE SIZE	4"	25	CABLE HOLDER	STAINLESS STEEL
7	SOLID PASSING SIZE	3"	26	LIFTING CHAIN	20 FEET STAINLESS STEEL
8	HORSEPOWER	5.0	27	GUIDE BAR BRACKETS	STAINLESS STEEL
9	MOTOR SPEED	1700 RPM	28	HATCH COVER	SIR30X48 ALUMINUM
10	MOTOR ELECTRICALS	208V, 3 PH, 60 HZ	29		
11	INSULATION	CLASS F	30		
12	SERVICE FACTOR	1.15	31		
13	PUMP BODY	CAST IRON	32		
14	IMPELLER	435	33		
15	PUMP SHAFT	420 STAINLESS STEEL	34		
16	SYSTEM RATING	FM RATED EX PROOF	35		

B Spare Parts Included / D Options Included

17		36	FLS MOISTURE SENSORS
18		37	MINI-CAS RELAY UNITS
19		38	
20			

Drawing Number	Showing	Notes
4-3102	PUMP DIMENSIONS	
5-3102	LIFT STATION DIMENSIONS	
6-3102	PUMP ELECTRICAL SPECS	
435	PUMP CURVE	

P.S. #18 RYEN'S GLEN



City of Ferndale
Pump Station Reconnaissance

PS Id: #18 Ryans Glen

Date: 12/9/2010
Time: 8am
Personnel: CDS, Bob

Photo numbers: 1-4

Pump Information:

type: Submers.
# of pumps: 2
pump mfr and model no.: Flygt 3102.090-6093
age: unknown >11yrs one of newer → circa 1995
discharge piping diam. & mat.: 4"
discharge depth from rim: ± ~~3~~" to top of pipe 44.5"
rated power: 5hp
phase/voltage: 3/208
downstream flow meter present: Y (N)
curves or other info available: Y (N) explain:

Notes on general condition of pumps/valves/vault, etc. (corrosion, noises, rattling/shaking, etc.):
- leakage infil around ~~both~~ discharge pipes
→ ds cov good shape

Wetwell Information: sketch as necessary on back of sheet

diameter: 8'
overall depth: 16.5' at edge of MH
inlet direction: W- 8"PVC N- 8"PVC
inlet diam. & material: ↗
inlet depth from rim: ± 8.5'-W N- ± 9.25'
cycle range depth/elevations: on: unknown hi alarm:
off: shallow cycle depths lo alarm:

Notes on general condition of wetwell and all appurtenances:
- generally good other than infil around d. pipes
→ mixed flush valve on one pump

Other miscellaneous notes (needs/wants for upgrades or replacements - site issues incl. GW infil, water inundation, STW backup, etc. - general pumphouse conditions incl HVAC, etc.)

Pump Station #19
Malloy Village

PS#19 Wetwell

PS#19 Control Panel

PS #19 Malloy Village Duty pt 122gpm @ 62ft

PERFORMANCE CURVE

PRODUCT	TYPE
CP3127.090	HT

DATE	PROJECT	CURVE NO	ISSUE
2007-02-01		63-484-00-3702	1

	1/1-LOAD	3/4-LOAD	1/2-LOAD
POWER FACTOR	0.89	0.87	0.81
EFFICIENCY	83.5 %	85.0 %	84.5 %
MOTOR DATA	---	---	---

RATED POWER	10	hp
STARTING CURRENT ...	64	A
RATED CURRENT ...	13	A
RATED SPEED	1735	rpm
TOT.MOM.OF INERTIA ...	0.11	kgm2
NO. OF BLADES	1	

IMPELLER DIAMETER: 217 mm

MOTOR #	STATOR	REV
21-12-4AL	12YSER	11

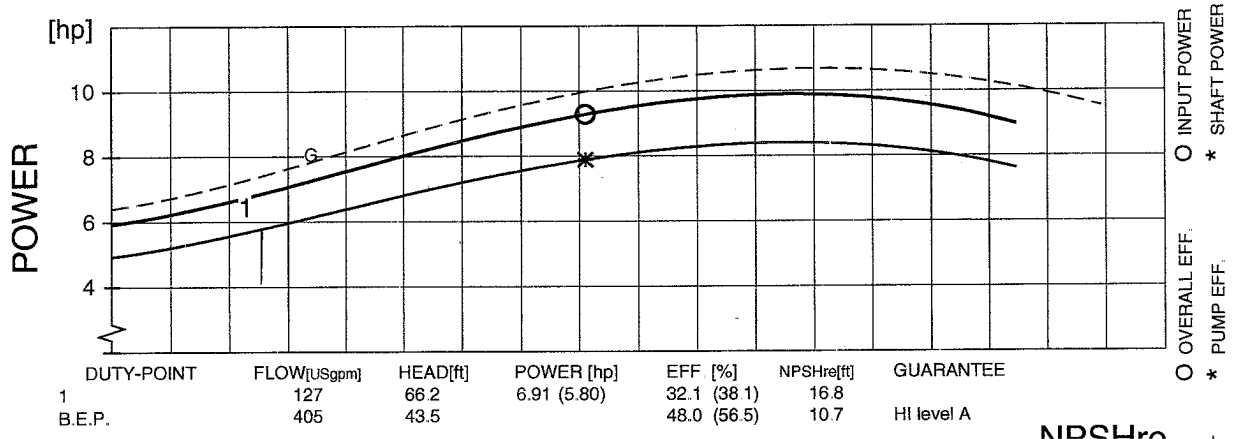
FREQ.	PHASES	VOLTAGE	POLES
60 Hz	3	460 V	4

GEARTYPE	RATIO
---	---

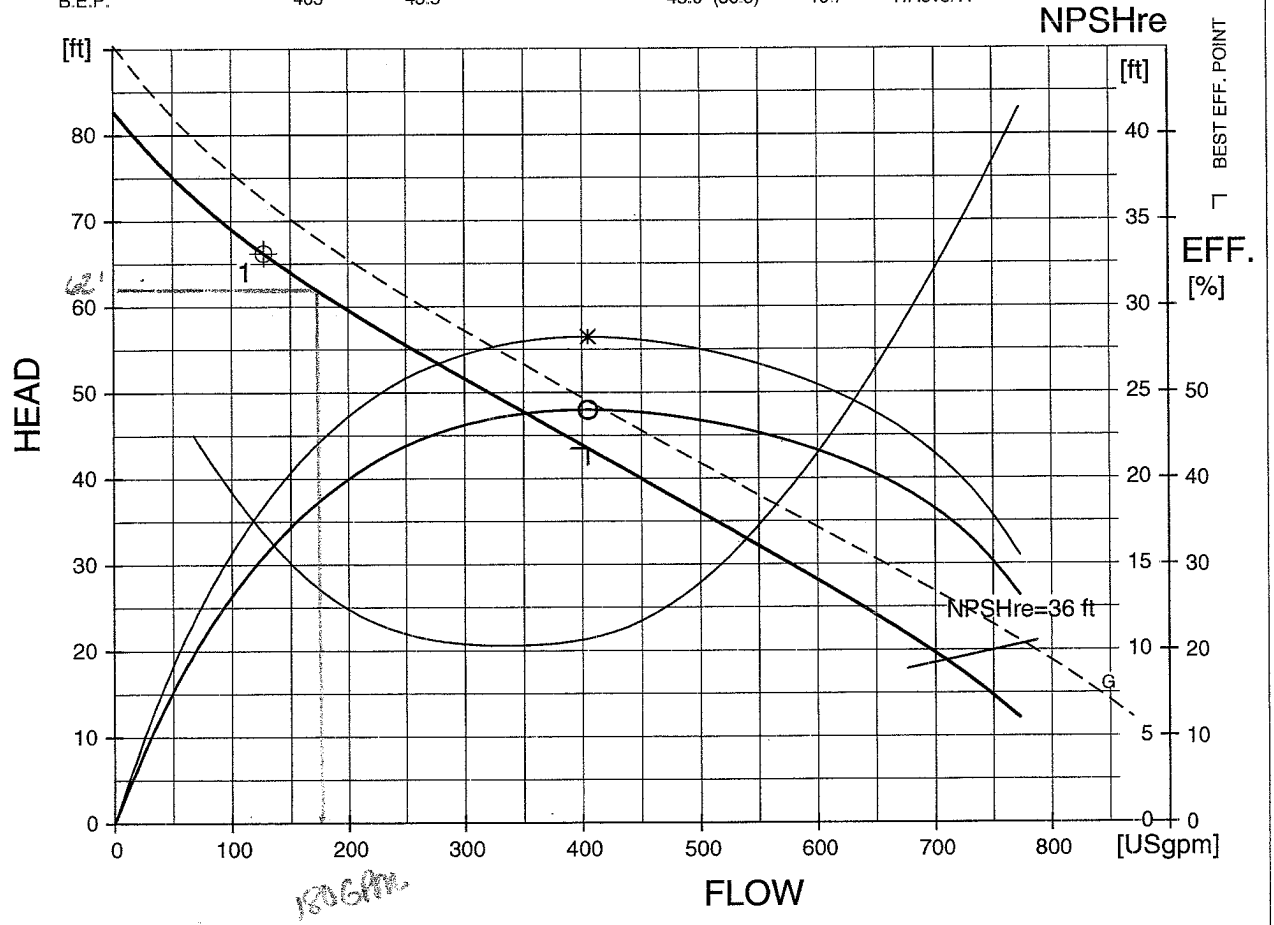
COMMENTS: NEVACLOG

INLET/OUTLET: -/ 4 inch

IMP. THROUGHLET: 3.0 inch



DUTY-POINT	FLOW[USgpm]	HEAD[ft]	POWER [hp]	EFF [%]	NPSHre[ft]	GUARANTEE
1	127	66.2	6.91 (5.80)	32.1 (38.1)	16.8	
B.E.P.	405	43.5		48.0 (56.5)	10.7	HI level A



FLYPS3.1.5.7 (20060531)

NPSHre = NPSH3% + min. operational margin

Performance with clear water and ambient temp 40 °C

GUARANTEE BETWEEN LIMITS (G) ACC. TO: HI level A

City of Ferndale
Pump Station Reconnaissance

PS Id: #19 Malloy Village

Date: 12/9/2010
Time: 8:50
Personnel: COS, BOB

Photo numbers: 15 - 18

Pump Information:

type: Subm.
# of pumps: 2
pump mfr and model no.: Flygt 3127.090-05 0081
age: ± 4yrs
discharge piping diam. & mat.: 4" DI.
discharge depth from rim: 40.5" to top of pipe (lowest top)
rated power: 10hp
phase/voltage: 3/480
downstream flow meter present: Y (N)
curves or other info available: Y N explain: _____

Notes on general condition of pumps/valves/vault, etc. (corrosion, noises, rattling/shaking, etc.):

newer - mixed flush valve on one

Wetwell Information: sketch as necessary on back of sheet

diameter: 8' - flat bottom
overall depth: 128" + 28" ±
inlet direction: N
inlet diam. & material: 8" PVC
inlet depth from rim: 128"
cycle range depth/elevations: on: 15" working range hi alarm:
off: lo alarm:

Notes on general condition of wetwell and all appurtenances:

newer

Other miscellaneous notes (needs/wants for upgrades or replacements - site issues incl. GW infil, water inundation, STW backup, etc. - general pumphouse conditions incl HVAC, etc.)

- upstream MH flat flow into Wetwell
- needs perm gen.

Pump Station #20
Church Rd / South Church LLC

PS#20 Wetwell

PS#20 Control Panel

MAINTENANCE SUMMARY FORM

PS#20

PROJECT : SOUTH CHURCH LONG PLAT

PS#20 N/A

1. EQUIPMENT ITEM NP3102.090-465

2. MANUFACTURE ITT FLYGT

3. SERIAL NUMBER(S) 0660164 & 0660165

4. WEIGHT OF INDIVIDUAL COMPONENTS (OVER 100 POUNDS) N/A

5. NAMEPLATE DATA (HP, VOLTAGE, SPEED, ETC.) 3.9 HP, 230 V, 1 PH

6. MANUFACTURE'S LOCAL REPRESENTATIVE

   a. Name: Whitney Equipment Co., Inc. Telephone No.: (425) 486-9499

   b. Address: 21222 30th Dr SE Suite 110 Bothell, WA 98021

7. MAINTENANCE REQUIREMENTS

Maintenance Operation Comments (Maintenance Summary)	Frequency	(If Applicable) Lubricant Symbol
Inspect visible parts on pump, pump casing & impeller for wear	annually	n/a
Check oil level & condition, change as necessary	annually	SAE10W30
Check cables & cable entry for wear and tightness	annually	n/a
Inspect pump voltage draw and meggar readings	monthly	n/a
Check function of level sensors, starter and monitoring equip.	annually	n/a
Check rotation direction of pump	when reconnecting	n/a
Check pipes, valves, peripheral equipment	annually	n/a
Check cooling system	annually	n/a

South Church PS #20

PERFORMANCE CURVE

PRODUCT	TYPE
NP3102.090	MT

DATE	PROJECT	CURVE NO	ISSUE
2010-12-14		61-465-00-3003	3

	1/1-LOAD	3/4-LOAD	1/2-LOAD
POWER FACTOR	0.94	0.95	0.95
EFFICIENCY	82.0 %	82.5 %	79.5 %
MOTOR DATA	---	---	---

COMMENTS

INLET/OUTLET	IMP. THROUGHLET
-/ 4 inch	---

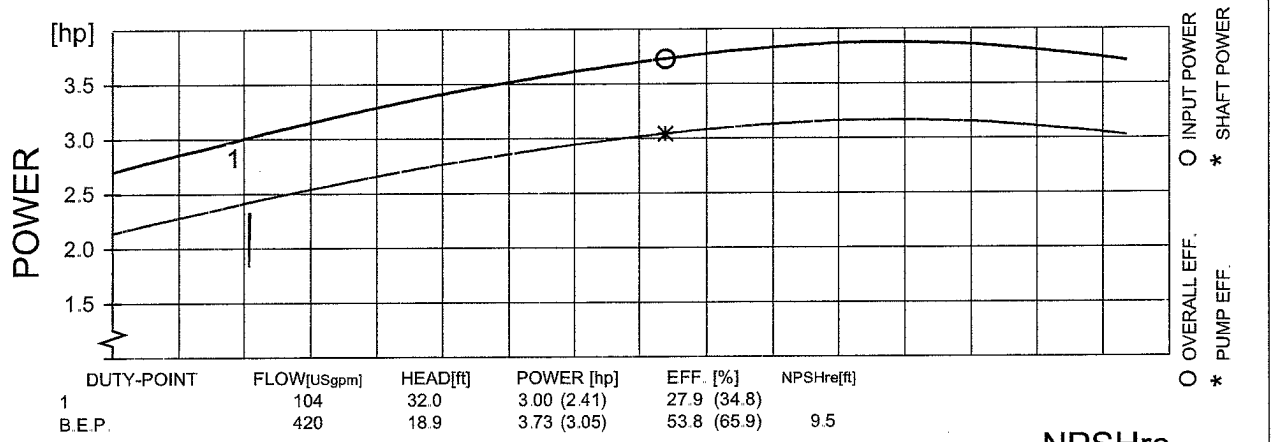
RATED POWER	3.9	hp
STARTING CURRENT	---	
RATED CURRENT	16	A
RATED SPEED	1755	rpm
TOT.MOM.OF INERTIA	0.026	kgm2
NO. OF BLADES	2	

IMPELLER DIAMETER: 152 mm

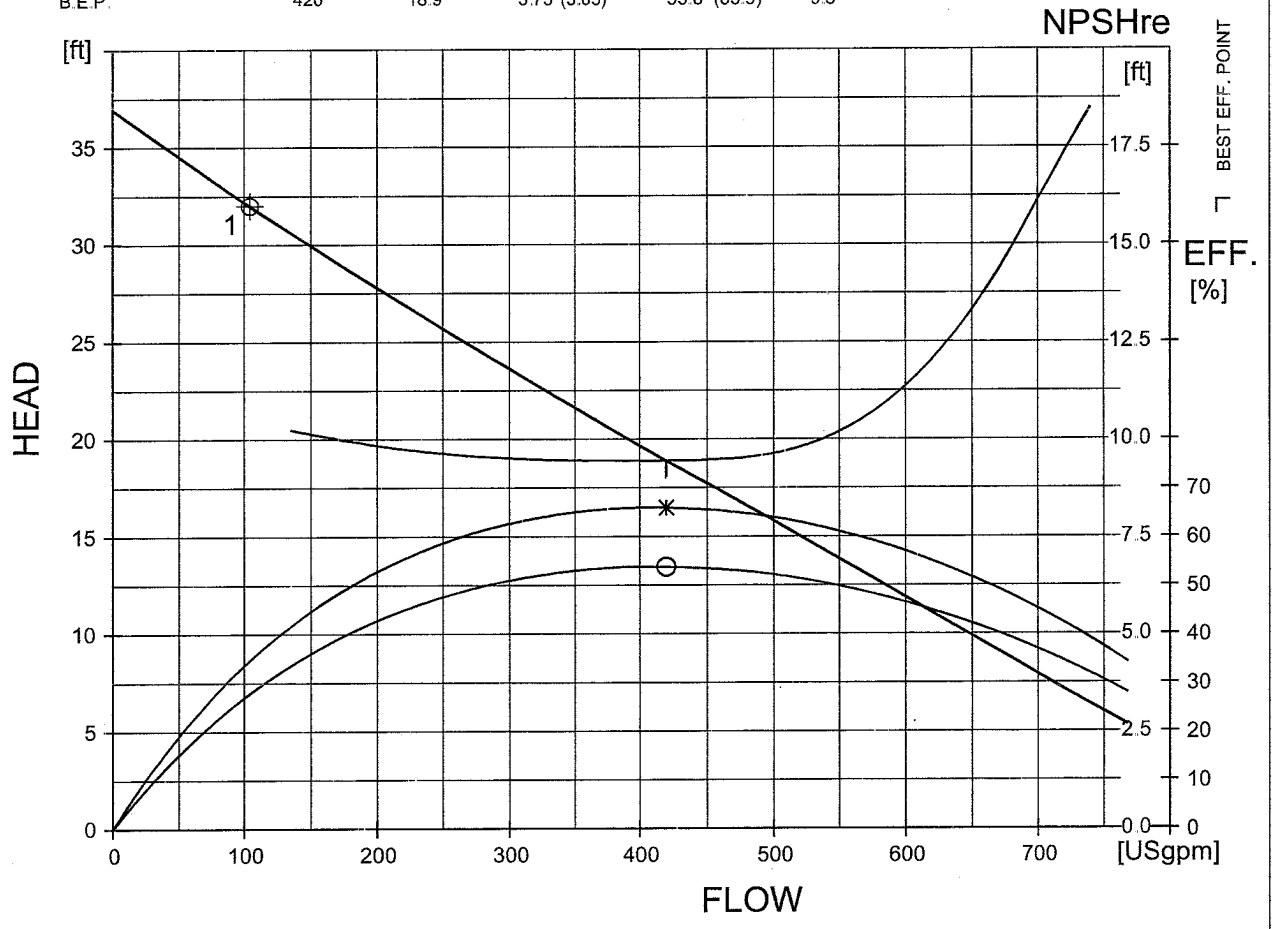
MOTOR #	STATOR	REV
18-11-4AL	01-	12

FREQ.	PHASES	VOLTAGE	POLES
60 Hz	1	230 V	4

GEARTYPE	RATIO
---	---



DUTY-POINT	FLOW[USgpm]	HEAD[ft]	POWER [hp]	EFF. [%]	NPSHre[ft]
1	104	32.0	3.00 (2.41)	27.9 (34.8)	
B.E.P.	420	18.9	3.73 (3.05)	53.8 (65.9)	9.5



NPSHre = NPSH3% + min. operational margin

Performance with clear water and ambient temp 40 °C

FLYGT HI B Curve

FLYPS3.1.6.3 (20060531)

City of Ferndale
Pump Station Reconnaissance

PS Id: #20 South Church

Date: 12/9/2010
Time: 10:10
Personnel: COS BB

Photo numbers: 35-41

Pump Information:

type: Subm.
# of pumps: 2
pump mfr and model no.: Flygt NP3102
age: 2007
discharge piping diam. & mat.: 4" D.I.
discharge depth from rim: _____ to top of pipe
rated power: 3.9 hp
phase/voltage: V 230
downstream flow meter present: Y (N)
curves or other info available: (Y) N explain: manuals onsite

Notes on general condition of pumps/valves/vault, etc. (corrosion, noises, rattling/shaking, etc.):

- no mixed flush valve
- undersized hopper

Wetwell Information: sketch as necessary on back of sheet

diameter: 12' - sloped bottom
overall depth: 150" at slope start, 188" towards center
inlet direction: S
inlet diam. & material: 8" PVC w/ Tee
inlet depth from rim: +/- 130"
cycle range depth/elevations: on: +/- 4 ft hi alarm:
off: lo alarm:

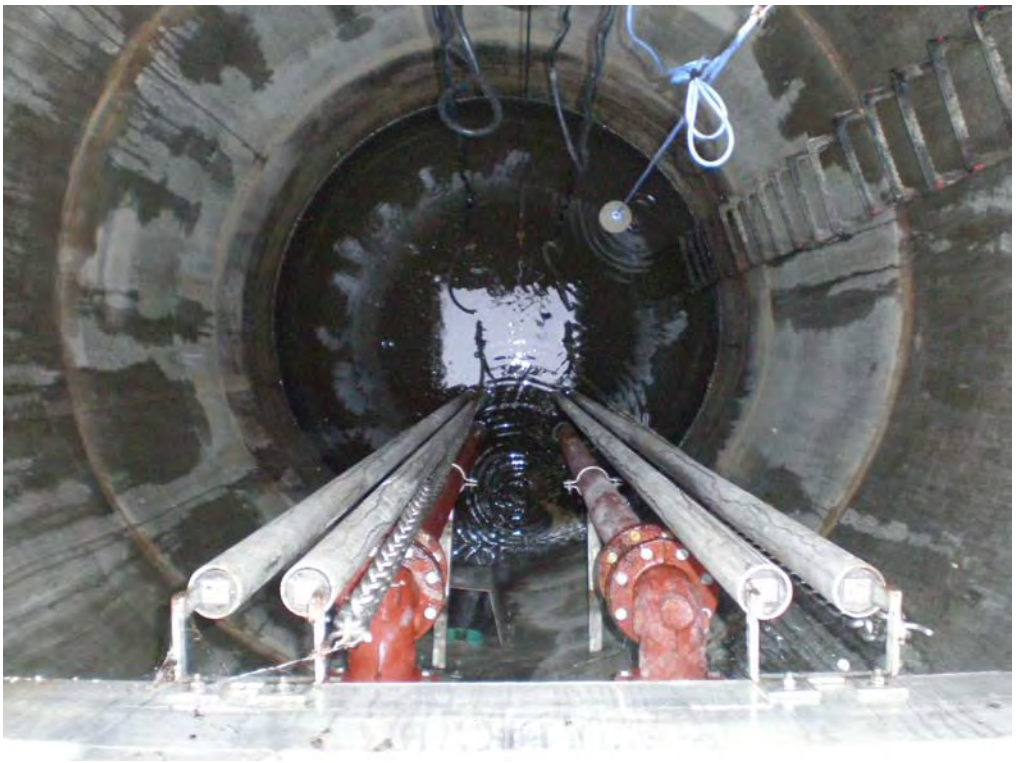
Notes on general condition of wetwell and all appurtenances:

good sewer
some seepage at joints

Other miscellaneous notes (needs/wants for upgrades or replacements - site issues incl. GW infil, water inundation, STW backup, etc. - general pumphouse conditions incl HVAC, etc.)

- no whitey feedback on pumps onsite
- 3/4/480 > bigger pumps shall be will for out soon
- 20-25 min run time on/off cycle, 30 min ok pumps

Pump Station #22
Whiskey Creek



PS#22 Wetwell

PS#22 Control Panel

Portal Way Whiskey Creek # 22

PS#22

WHITNEY EQUIPMENT COMPANY, INC.

21222 30th Drive S.E., Suite 110
Bothell, Washington 98021

Tel. (425) 486-9499
Fax. (425) 485-7409

Project name:	**Whiskey Creek Lift Station**
Consulting Engineer:	**Telegraph Engineering**
General Contractor:	**RAM Construction G. C. Inc.**
Utility:	**Ferndale Public Works**
Date:	**September 16, 2006**

Pumps

Manufacturer:	**ITT Flygt Corporation.**
Type:	**Submersible wet pit.**
Model number:	**NP-3127-489 with self cleaning impeller.**
Motor data:	**7.5-hp 460/480 volts, 3-phase, 60 hertz.**
Motor special:	**FM Explosion proof.**
Motor service factor:	**1.15**
Motor starts:	**15 evenly spaced starts per hour.**
Leak sensor:	**Float leak sensors (FLS) in leak chamber.**
Power cable:	**50-feet submersible, seven conductors.**
Impeller number:	**489**
Solids pass:	**All sewage solids**
Seals:	**Tandem mechanical seals.**
Bearings:	**Upper and lower bearings.**
Pumping rate:	**See attached curve.**
Material of construction:	**ASTM A-48, 35B cast iron and stainless.**
Discharge elbow:	**4-inch cast iron.**
Upper guide supports:	**Upper brackets, T-316 stainless steel.**
Guide rails:	**2-inch schedule 40 stainless pipe (80')**
Lifting system:	**Flygt Grip-eye system (see details)**
O & M / Training:	**Manuals and operator training included.**
Details:	**See pages attached listing: pump configuration, impeller number motor and other nominal sizes; pump performance curves, pump dimensional drawing.**

Portal Way Whiskey Crk #22

C/N-3127

Motor Data

RATED OUTPUT POWER HP	(kW)	Ø	VOLTS NOM.	FULL LOAD AMPS	LOCKED ROTOR AMPS	LOCKED ROTOR KVA	LOCKED ROTOR CODE LETTER KVA/HP	RATED INPUT POWER kW	POLES/RPM
6.4	(4.8)	3	200	21.0	138	48	G	5.7	4/1750
			230	18.0	120				
			460	9.0	60				
			575	7.2	48				
7.4	(5.5)	3	200	22.0	173	60	G	6.5	4/1750
			230	19.0	150				
			460	9.6	75				
			575	7.7	60				
7.5	(5.6)	1	230	31.0	58	13	A	6.6	4/1750
7.5	(5.6)	3	200	23.0	138	48	G	6.7	4/1740
			230	20.0	120				
			460	10.0	60				
			575	8.0	48				

PUMP MOTOR HP	EFFICIENCY			POWER FACTOR		
	100% LOAD	75% LOAD	50% LOAD	100% LOAD	75% LOAD	50% LOAD
6.4	84.0	83.0	80.0	0.82	0.77	0.66
7.4	85.0	84.0	81.0	0.84	0.77	0.71
7.5 1Ø	83.0	84.5	83.0	0.96	0.99	0.99
7.5	84.0	84.0	80.0	0.84	0.80	0.72

Cable Data

HP	VOLTS	MAX. LENGTH FT.	CABLE SIZE/ NOMINAL DIA.	CONDUCTORS (IN ONE CABLE)	PART NUMBER
6.4	200	150	10/3-2-1-GC 21.3mm (0.84")	(3) 10 AWG (PWR) (2) 12 AWG (CTRL) (1) 10 AWG (GND) (1) 12 AWG (GC)	94 21 06
	230	205			
	460	815			
	575	1275			
7.4 or 7.5 3Ø	200	135			
	230	170			
	460	710			
	575	1110			
7.5 1Ø	230	140	8/3-2-1-GC 28.2mm (1.11")	(3) 8 AWG (PWR) (2) 10 AWG (CTRL) (1) 8 AWG (GND) (1) 10 AWG (GC)	94 21 08

Pump station #22 Whisky Creek

FLYGT

PERFORMANCE CURVE

PRODUCT	TYPE
NP3127.090	HT

DATE	PROJECT	CURVE NO	ISSUE
2006-09-11		63-489-00-2202	1

	1/1-LOAD	3/4-LOAD	1/2-LOAD
POWER FACTOR	0.88	0.85	0.77
EFFICIENCY	83.5 %	84.5 %	83.5 %
MOTOR DATA	---	---	---

RATED POWER	7.5	hp
STARTING CURRENT	52	A
RATED CURRENT	9.6	A
RATED SPEED	1740	rpm
TOT.MOM.OF INERTIA ...	0.046	kgm2
NO. OF BLADES	2	

IMPELLER DIAMETER: 195 mm

MOTOR #	STATOR	REV
21-10-4AL	12YSER	11

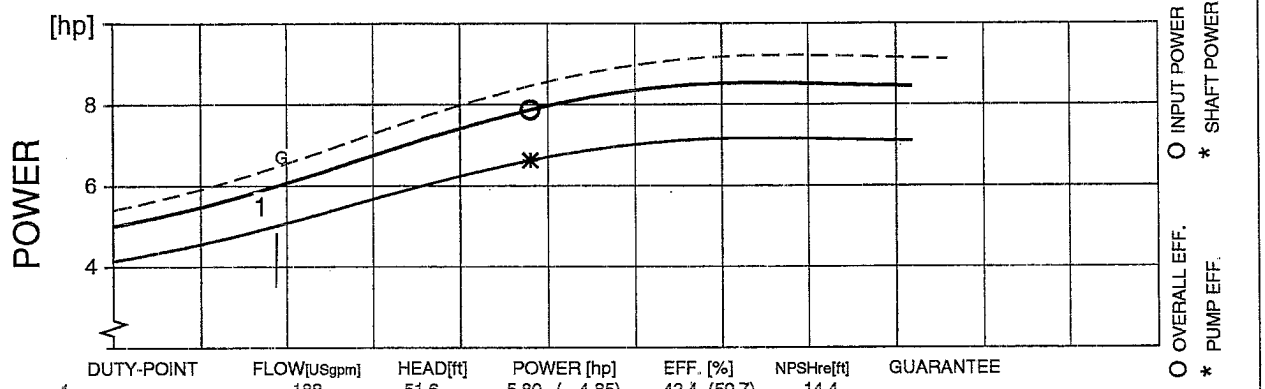
FREQ.	PHASES	VOLTAGE	POLES
60 Hz	3	460 V	4

GEARTYPE	RATIO
---	---

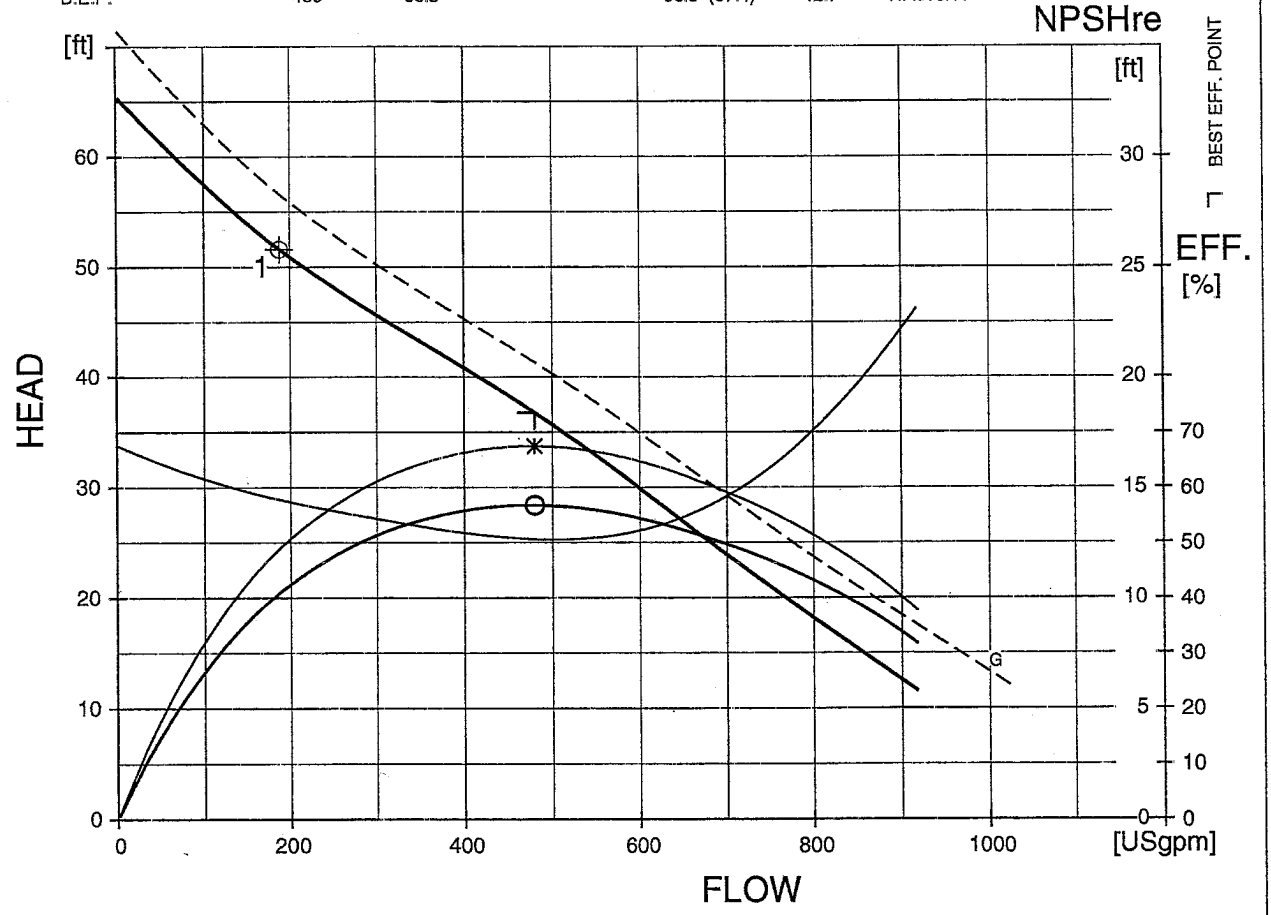
COMMENTS

INLET/OUTLET: -/ 4 inch

IMP. THROUGHLET: ---



DUTY-POINT	FLOW[USgpm]	HEAD[ft]	POWER [hp]	EFF. [%]	NPSHre[ft]	GUARANTEE
1	188	51.6	5.80 (4.85)	42.4 (50.7)	14.4	
B.E.P.	480	36.8		56.8 (67.4)	12.7	HI level A



FLYPS3.1.4.0 (20050224)

NPSHre = NPSH3% + min. operational margin

Performance with clear water and ambient temp 40 °C

GUARANTEE BETWEEN LIMITS (G) ACC. TO

HI level A

City of Ferndale
Pump Station Reconnaissance

PS Id: #22 Whiskey Creek

Date: 12/9/2010
Time: 13:30
Personnel: CDS, Bob

Photo numbers: 57 - 60

Pump Information:

type: Subm.
# of pumps: 2
pump mfr and model no.: Flygt NP 3127X-489HT
age: 2007
discharge piping diam. & mat.: 4" D.I.
discharge depth from rim: 44.5" to top of pipe
rated power: 7.5hp
phase/voltage: 3/480
downstream flow meter present: Y (N)
curves or other info available: Y N explain: _____

Notes on general condition of pumps/valves/vault, etc. (corrosion, noises, rattling/shaking, etc.):
-new OK

Wetwell Information: sketch as necessary on back of sheet

diameter: 10'
overall depth: 293"
inlet direction: NW
inlet diam. & material: 8" PVC
inlet depth from rim: 168"
cycle range depth/elevations: on: 8' lag 10' hi alarm:
off: 2' lag 3' lo alarm:

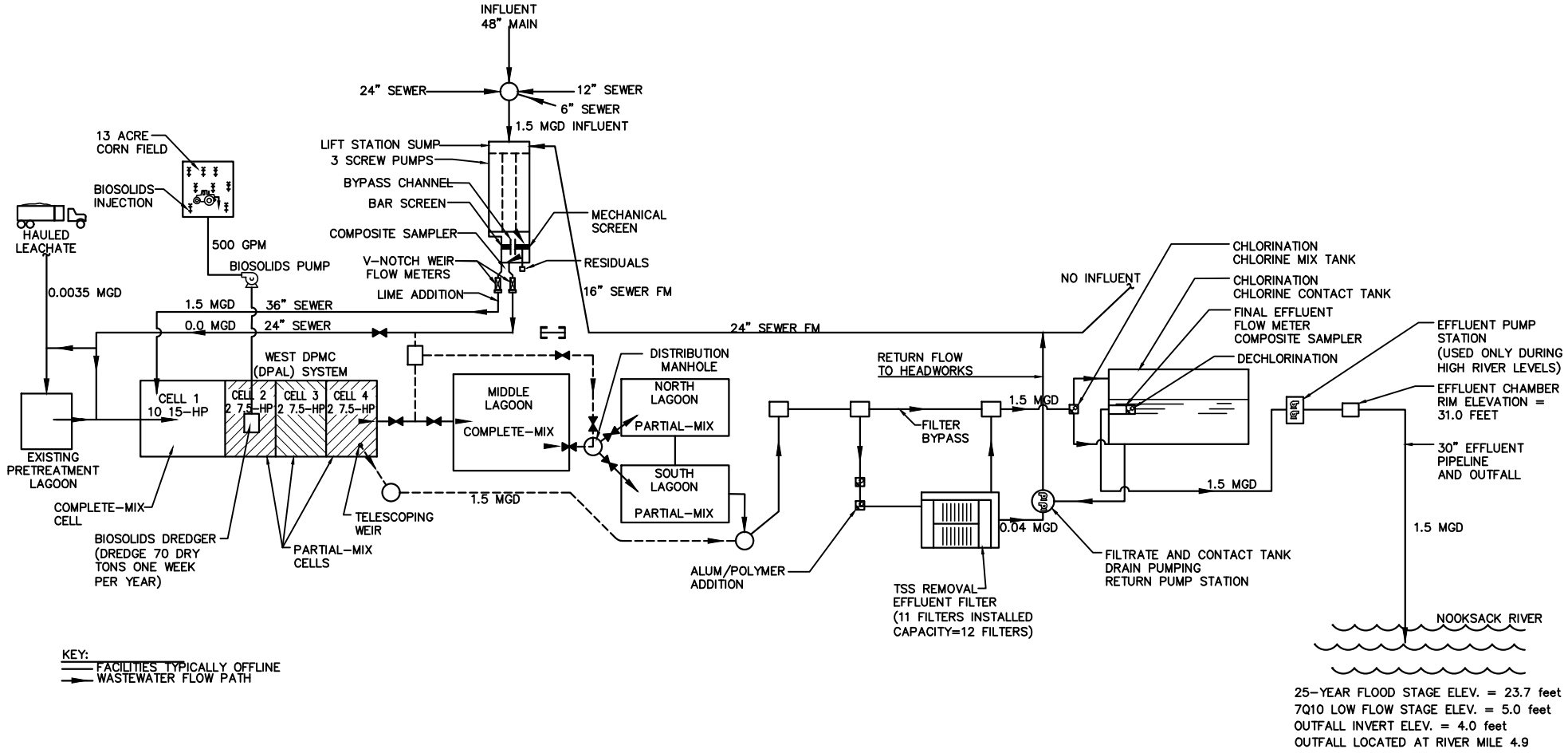
Notes on general condition of wetwell and all appurtenances:
-good, no apparent leaks, infil, or major cracks
joints sealed
-new

Other miscellaneous notes (needs/wants for upgrades or replacements - site issues incl. GW infil, water inundation, STW backup, etc. - general pumphouse conditions incl HVAC, etc.)

- can be set from WWTP, settings levels

EXHIBIT K

WWTP Existing Schematic Diagram



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
EXISTING WWTP FLOW SCHEMATIC

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

EXH K

EXHIBIT L

WWTP NPDES Permit

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 = $\frac{\text{Influent concentration (mg/L)} - \text{Effluent concentration (mg/L)}}{\text{Influent concentration (mg/L)}} \times 100$ 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.

EXHIBIT M

Slater Area Development Tech Memo

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

MEMORANDUM

TO: Greg Young, City Administrator

FROM: Melanie Mankamyer, PE and Curt Schoenfelder, PE

SUBJECT: Lummi Nation Proposed Development near I-5 at Slater Road, Sewer Loading effects

JOB NO.: 2014-036

DATE: August 4, 2015

This memo summarizes expected sewer loading effects from potential development changes near I-5 at Slater Road. Approximately 55 acres of currently City of Ferndale land zoned Commercial may potentially become Lummi Nation land and used for mixed use (retail/restaurant/office) potentially including a 300-room hotel. Exhibit 1 map shows the site location.

Original Projected Sewer Loading

Based on methods presented in the City of Ferndale Comprehensive Sewer Plan ([CSP] June 2011, revised May 2012), the year 2034 projected sewer loading for the subject property (Traffic Analysis Zone [TAZ] 792) is as follows:

- Average Daily Flow = 24,600 gpd = 17 gpm
- Peak Hourly Flow = 69 gpm

These flows represent similar development as what is expected under the Lummi Nation's plans for mixed use, excluding the hotel.

Additional Projected Sewer Loading from Hotel

The 300-room hotel is assumed to have a restaurant, laundry facilities, and swimming pool. The calculated sewer loading is as follows (see attached Exhibit 2 for calculations and assumptions):

- Average Daily Flow = 61,710 gpd = 43 gpm
- Peak Hourly Flow = 175 gpm

The estimated hotel loading is in addition to the other mixed use development anticipated for the site.

Downstream Effects on Sewer System

PS#17

The site would be served by City Pump Station #17 Slater Rd/Silver Creek Industrial Park. PS#17 currently has a capacity of 415 gpm. Per the 2011 Comprehensive Sewer Plan, existing and yr-2034 projected peak hourly flows to PS#17 (without the hotel) are approximately 90 gpm and 500 gpm, respectively. The yr-2034 projected flow includes the development of the City's Urban Growth Area adjacent to the west side of I-5 (6.6 acres) and the Urban Reserve area to

the east of I-5 (130 acres). The UGA is expected to be annexed in the 0-5 year time frame and has a projected peak hourly flow of 5 gpm. The UR area to the east of I-5 projected peak hourly flow is 173 gpm. The UR area is not expected to become UGA within the next 20 years, however, flow projections for yr-2034 assume that the UR is developed within this time frame. The potential hotel development would add approximately 175 gpm for an ultimate yr-2034 required capacity of 675 gpm at PS#17.

The acceleration of required improvements at PS#17 resulting from a hotel project are summarized as follows:

- Without Hotel: Assuming linear growth over 20 years from yr-2014 to yr-2034 without the hotel, upgrades to PS#17 would be required in yr-2029-2030 time frame (flow increase of 500 - 90 = 410 gpm over 20 years = 20.5 gpm per year. 415 gpm capacity – 90 gpm existing = 325 gpm remaining capacity / 20.5 gpm growth per year = 15-16 years).

- With Hotel: If the hotel is added, capacity upgrades would be expected in year 2021-2022 time frame (flow increase of 20.5 gpm per year from calcs above. 415 gpm capacity – 265 gpm existing w/ Hotel = 150 gpm remaining capacity / 20.5 gpm growth per year = 7-8 years).

The PS#17 discharge force main is an 8-inch diameter which has a capacity up to 1,250 gpm at a maximum velocity of 8 ft/s. Thus, the force main capacity would be sufficient with the addition of the hotel.

Gravity Trunk Main GM6E

PS#17 force main discharges to 12-inch diameter PVC gravity trunk main GM6E, which flows to PS#4. The following summarizes GM6E capacity and required capacity for different scenarios involving the potential subject hotel, as well as the potential Whatcom County Jail project (see Whatcom County Jail Planning – Sewer Capacity Analysis, September 6, 2013, from Wilson Engineering to the City):

- GM6E existing capacity = 758 gpm (per CSP Exhibit B Trunk Main Capacity table)

- Yr-2034 GM6E required capacity w/o Jail or Hotel projects = 603 gpm (per CSP Exhibit I Table 5, 834 gpm peak hourly flow into PS#4, less 47 gpm flow directly into PS#4, less 184 gpm flow into last two short pipe segments of GM6E, which have steeper slopes and sufficient capacity).

- Yr-2034 GM6E required capacity w/ Jail = 603 gpm + 200 gpm (thru yr-2050) = 803 gpm

- Yr-2034 GM6E required capacity w/ Hotel = 603 gpm + 175 gpm = 778 gpm

- Yr-2034 GM6E required capacity w/ Jail + Hotel = 603 gpm + 200 gpm + 175 gpm = 978 gpm.

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

- GM6E required capacity w/ Jail @ ultimate flows (yr-2050) + Hotel = 603+300+175 = 1,078 gpm

As shown in the above information upgrading gravity main GM6E would be required for the projected hotel OR the Whatcom County Jail project. Note that the jail flow projections have been fine-tuned since the Sept. 2013 Jail Memo and are in accordance with Whatcom County Planning flow projections. An upgraded 15-inch diameter PVC trunk main would have a capacity of 1,360 gpm and be sufficient to serve both potential hotel and jail developments based on the above projected development levels.

The existing 12-in GM6E has sufficient capacity for City projections without the addition of the Jail or Hotel (603 gpm < 758 gpm capacity). Thus, the cost of the 15-in upgrade could be split between the Jail and Hotel based on the following:

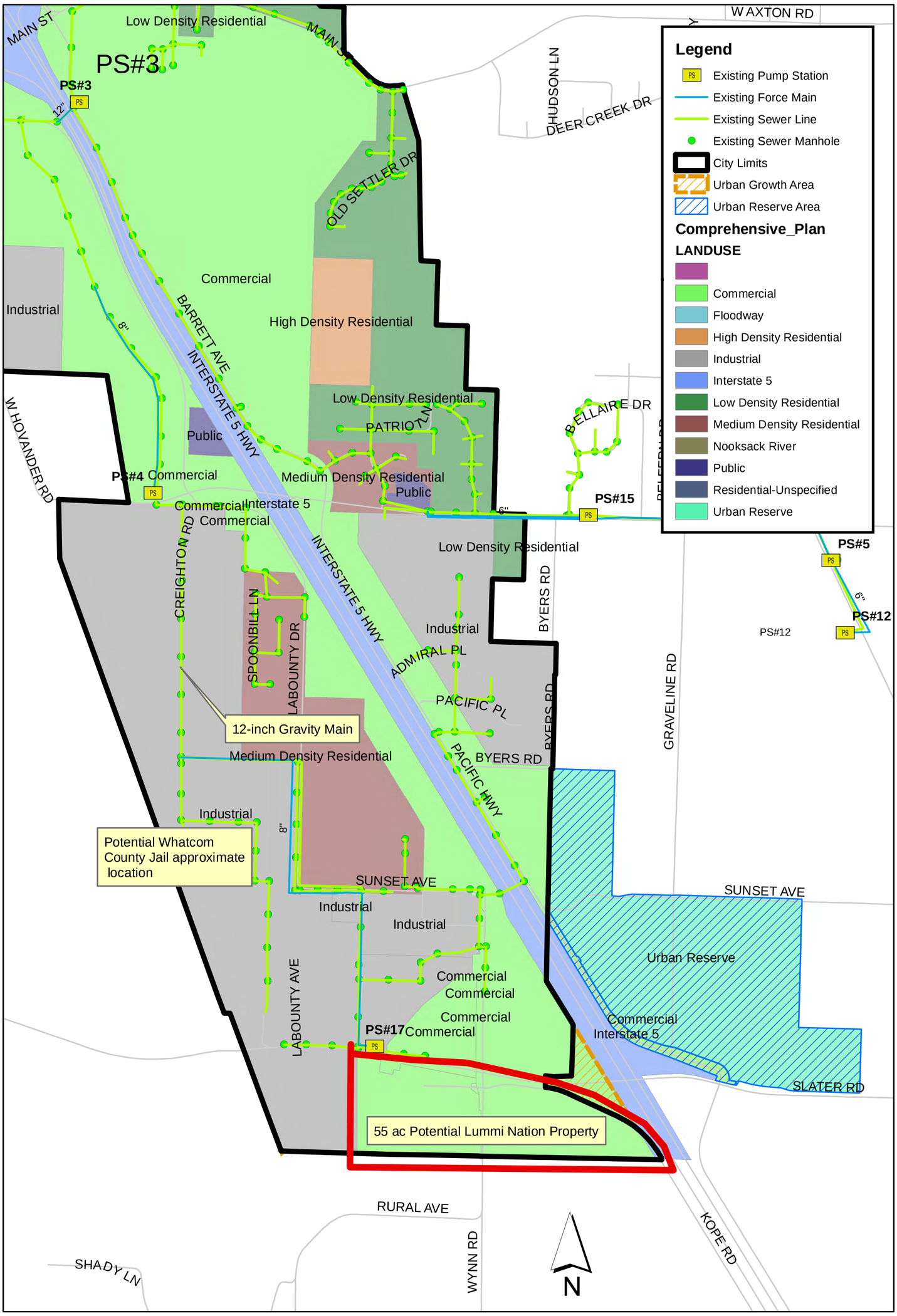
- Jail portion: 300 gpm / (300 gpm + 175 gpm) = 63%
- Hotel portion: 175 gpm / (300 gpm + 175 gpm) = 37%

PS#4 and Downstream

PS#4 is currently being upgraded to an approximate capacity of 1,050 gpm based on flow projections excluding the hotel project and existing force main capacity. Required capacity with yr-2034 development, jail project with improvements through yr-2050, and the hotel development is: 834 gpm + 200 gpm + 175 gpm = 1,209 gpm. The capacity of PS#4's force main will not be sufficient for anticipated 20-yr growth plus the potential jail and hotel projects. If the jail and hotel projects are developed within 20 years, the capacity of PS#4's force main will need to be upgraded with additional capacity to include forecasted flows into the next 20-yr planning period at the time of upgrade. Additionally, the force main's useful life expectancy (50-yrs life, installed yr-1977) would expire in yr-2027 and should be considered for replacement in this general time-frame. Assuming development of both projects within 6 years, the anticipated need for force main improvements is approximately yr-2022-2023.

PS#4 pumps to gravity trunk main GM1E, which is a CIP project identified for upgrades within 6-years. Capacity impacts on GM1E from potential jail and hotel projects beyond those discussed in the Sept. 2013 Jail Memo should be considered in the design phase.

PS#2 (downstream of PS#4) is currently in the design phase and upgrades have considered flows from both the jail (through yr-2050 flows) and hotel projects.



1,000 Feet

Coordinate System: WA State Plane North NAD 83

Data Sources: City of Ferndale, Wilson Engineering LLC

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 1

Potential Lummi Nation Development

DATE	SHEET
JULY 2014	1
SCALE	OF
1:12,000	1
JOB NUMBER	
2014-036	

EXHIBIT 2

City of Ferndale
I-5/Slater - Potential Lummi Nation Development
Hotel sewer loading calculations

Date: 7/15/2014
By: CDS

		Flow, gpd **	Average Daily Flow (gpd)
Hotel rooms	300	130	39,000
Restaurant, seats *	225	50	11,250
Laundry Room, machines	22	500	11,000
Swimming Pool, swimmers	46	10	460
	Total Ave Daily Flow =		61,710 gpd
			43 gpm
	Peaking Factor =		4.08
	Peak Hourly Flow =		**175 gpm**

* Rule of Thumb from Design Guide for Hotels, restaurant seats equal to 0.75 times the number of guestrooms.
** from WADOE Criteria for Sewage Works Design, Table G2-2,

Laundry Room info

No. of Hotel Rooms	Size of Laundry area, sf ***	Number of sets in area	Number of Washing Machines
100	500	15	7
200	1000	30	15
300	1500	45	22
400	2000	60	30
500	2500	75	37
1000	4000	121	60

Size of Laundry Set = 33 sf approx. 2.5 ft square per unit, plus 3 feet access in front, and 1 ft buffer between sets = (2.5+3)*(2.5+2.5+1) = 33 sq ft

Swimming Pool info

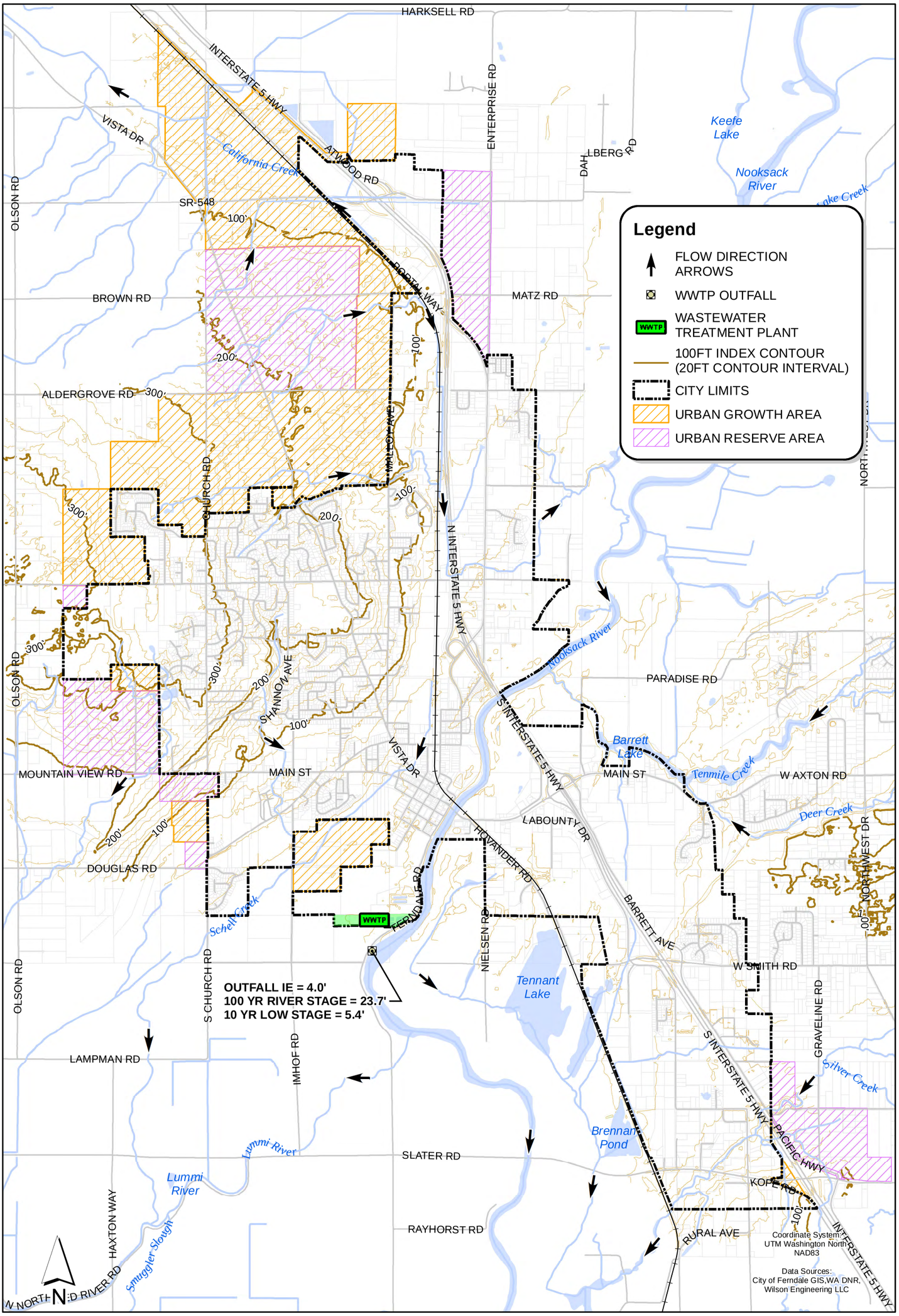
No. of Hotel Rooms	Size of Pool, sf ***	Number of Swimmers
100	667	33
200	800	40
300	933	46
400	1066	53
500	1200	60
1000	1500	75

Space per swimmer = 20 sf based on previous assumption for bather reccomended space per ehow.com

*** Per Design Guide for Hotels, found online at http://www.scribd.com/doc/7151503/Design-Guide-for-Hotels

EXHIBIT N

Area Physical Characteristics



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

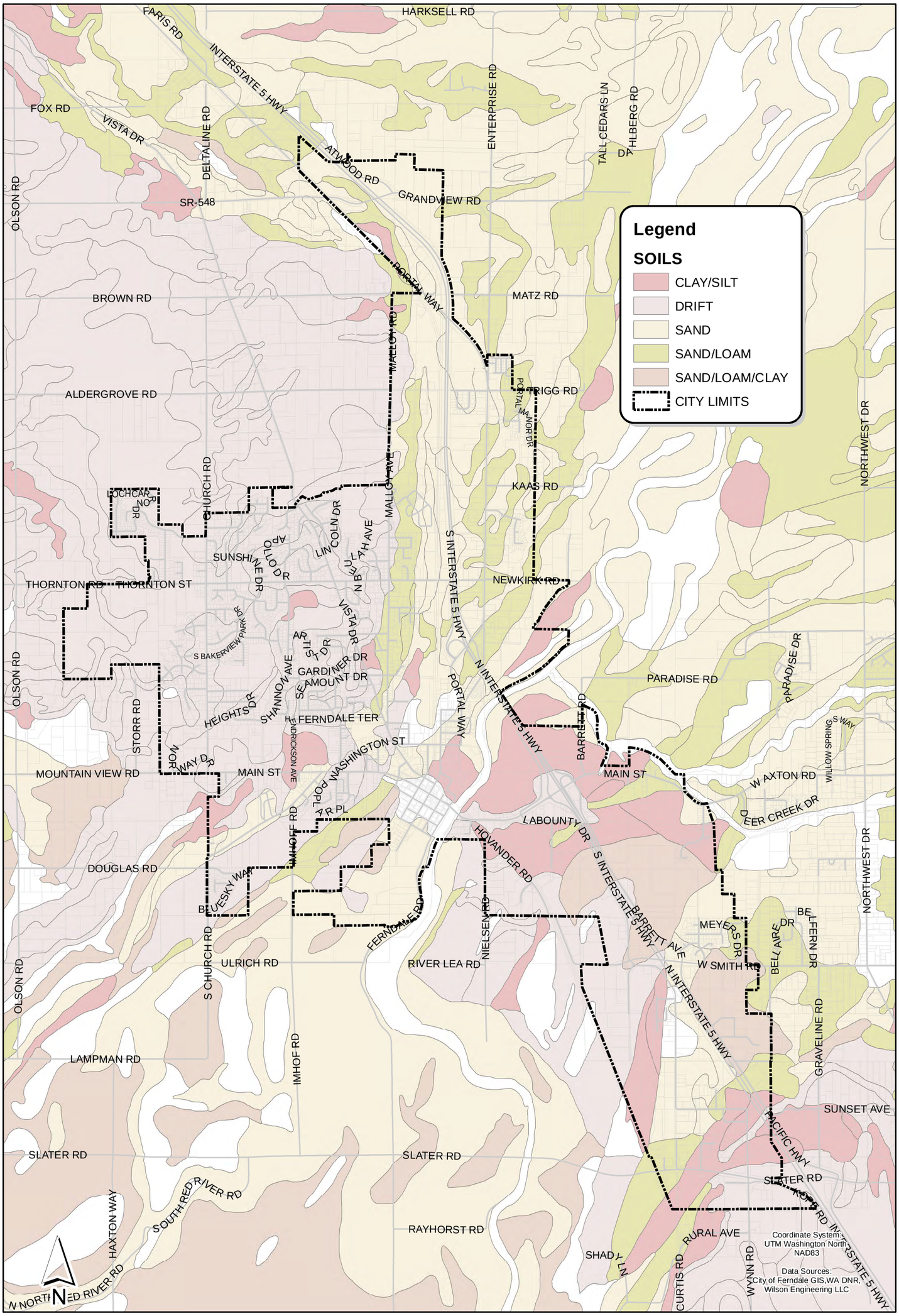
CITY OF FERNDALE, WA

WHATCOM COUNTY — WASHINGTON

EXHIBIT N

Topography & Hydrography

DATE	SHEET
SEP 2014	1
SCALE 1:31,680	OF 2
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 N

Soils Map

DATE	SHEET
SEP 2014	2
SCALE 1:31,680	OF 2
JOB NUMBER 2014-036	