Appendix H

Capital Facilities: Water, Sewer, and Stormwater

City of Monroe

Utility Systems Plan

Sanitary Sewer, Water and Stormwater

April 2, 2015

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City of Monroe

UTILITY SYSTEMS PLAN

Sanitary Sewer, Water and Stormwater

April 2, 2015

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PROJECT CERTIFICATION

City of Monroe

Utility Systems Plan
Sanitary Sewer, Water and Stormwater

The technical material and data contained in this plan was prepared by BHC Consultants, LLC under the supervision of the below listed individuals. Those responsible staff members who are registered professional engineers are licensed in the State of Washington.

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City of Monroe
Utility Systems Plan

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STORMWATER

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GLOSSARY

100-year flood: The magnitude of a flood likely to occur, on average, once every 100 years.
Average Wet Weather Flow: Wastewater flow during period when groundwater table is high and precipitation is at its peak, generally the four wet weather months, from November to February.
Class 1 Stream: A perennial or intermittent stream that is used by threatened or endangered fish or larger numbers of other fish, or that is used as a direct source of water for domestic use.
Force Main: Pressurized discharge pipe from a lift station.
Infiltration: Groundwater entering the sewage collection system through defective joints, pipes, and improperly sealed manholes.
Inflow: Sewage flows resulting from stormwater runoff entering the sewage collection system, typically through manhole covers, roof leaders, and area drains connected directly to sewer, cross connections from storm drains and catch basins, and direct flows into broken sewers.
Maximum Monthly Flow: Average daily flow during the highest flow month of the year.
Mini-Basin: Drainage catchment areas within the North Creek, Swamp Creek, Picnic Point, Everett or Little Bear Creek Drainage Basins. Mini-basins followed the King County delineation to the extent of the County's effort to define the mini-basins.
National Flood Insurance Program: Federally funded program providing flood insurance to property owners in flood plains provided the local government meets certain criteria for management of flood damage risk.
Orange Book: *Criteria for Sewage Works Design,* published by the Washington State Department of Ecology
Peak Hourly Flow: Wastewater flow during the highest flow hour.
Sensitive Area: Area in which development potential is limited by environmental factors such as steep slopes, wetlands, and valuable natural habitat.
Sewer Lateral: A sewer with no other common sewers discharging into it.
Sewer Submain: A sewer that receives flow from one or more lateral sewers.
Sewer Main or Trunk: A sewer that receives flow from one or more submains.
Sewer Interceptor: A sewer that receives flow from a number of main or trunk sewers, force mains, etc.
Urban Growth Area: Area in which urban development must be contained, as stipulated by the Growth Management Act.

ABBREVIATIONS

AAF	Average Annual Flow
ADWF	Average Dry Weather Flow
AWWD	Alderwood Water and Wastewater District
AWWF	Average Wet Weather Flow
BOD	Biological Oxygen Demand
CFR	Code of Federal Regulations
CIP	Capital Improvement Program
CWA	Clean Water Act
DOH	Washington State Department of Health
DOE	Washington State Department of Ecology
EPA	United States Environmental Protection Agency
ERU	Equivalent Residential Unit
ESA	Endangered Species Act
FEMA	Federal Emergency Management Act
FOG	Fats, Oils and Greases
FPS	Feet per second
FWPCA	Federal Water Pollution Control Act ("The Clean Water Act")
GMA	Growth Management Act
GPCD	Gallons per capita per day
GPAD	Gallons per acre per day
GPD	Gallons per day
HPA	Hydraulic Project Approval
I/I	Infiltration and Inflow
JARPA	Joint Aquatic Resources Permit Application
KCDNR	King County Department of Natural Resources
MMF	Maximum Month Flow
MBR	Membrane Bioreactor
MGD	Million Gallons per Day
mg/l	milligrams per liter
NEPA	National Environmental Policy Act
NPDES	National Pollutant Discharge Elimination System
OCD	Washington State Office of Community Development
OFM	Washington State Office of Financial Management
ppd	Pounds per day
PVC	Polyvinyl Chloride
PWWF	Peak Wet Weather Flow
RCW	Revised Code of Washington
SEPA	State Environmental Policy Act
SRF	State Revolving Fund
TSS	Total Suspended Solids
UGA	Urban Growth Area
USFWS	United States Fish and Wildlife Service
WAC	Washington Administrative Code
WWTP	Wastewater Treatment Plant

Chapter 1 Executive Summary

1.1 Introduction

This Utility Systems Plan for the sanitary sewer, water and stormwater utilities was developed as a supportive document to the City of Monroe's (City) Comprehensive Plan. This Plan is mandated by RCW 36.70A.130 (5a) and is to be completed by June 30, 2015. This Plan consists of several elements including utility system plans for the City-provided and City-owned utilities. The Comprehensive Plan is being lead by Studio Cascade. The evaluation of these three utility systems is presented and bound in this volume.

Since there are elements that are common to each of the three plans, the organization of this volume seeks to minimize repeated presentation of the same information. Consequently, the first chapters of this volume are common to all the utilities and are presented once. The utility-specific information is compiled and presented in separate sections of this volume. And lastly, the prioritization of the Capital Improvement Program (CIP) and the accompanying financial analysis is presented in a composite fashion in Chapter 12. The general format and presentation of this volume is as follows:

GENERAL INFORMATION

Chapter 1 –	**Executive Summary.** Presents the projected loadings and flows for all three utilities and a summary and prioritization of the CIPs
Chapter 2 –	**Introduction.** Overall history of the City's Utilities, organization of the system plans, and regulations that govern the utility plans
Chapter 3 –	**Land Use and Service Areas.** Presentation of the land use, topography and service areas for each of the three utilities.

SANITARY SEWERS

Chapter SS 4 –	**Existing Wastewater Facilities.** Defines the drainage basins and the wastewater infrastructure, including the collection system, lift stations and wastewater treatment plant.
Chapter SS 5 –	**Existing and Future Population and Flow Projections.** Existing and projected population, consisting of residential, employment and student, are presented for each of the drainage basins. The accompanying flows by drainage basin are also presented.
Chapter SS 6 –	**Wastewater Conveyance Analysis.** Mini-basin delineation and hydraulic model development and calibration.
Chapter SS 7 –	**Wastewater Treatment Plant.** Evaluation of the performance of the treatment plant in relation to the NPDES limitations. Projected flows and loadings are evaluated to determine the improvements needs to insure compliance in the coming years.
Chapter SS 8 –	**Water Reclamation and Reuse.**
Chapter SS 9 –	**Operations and Maintenance Program.** Define the O&M issues associated with the sanitary sewer utility. Estimate of the manpower required in the future.
Chapter SS 10 –	**Design Criteria**
Chapter SS 11 –	**Capital Improvements Plan.** CIP for the collection, conveyance, treatment and discharge components of the sanitary sewer utility. CIP cost estimates.

WATER

Chapter W 4 –	**Description of Water System.** Describes the source of supply, water storage, pumping facilities, transmission and distribution and telemetry.
Chapter W 5 –	**Existing and Future Population, Employment and Demand Projections.** Existing and projected population, consisting of residential, employment and student, are presented for the water service boundary
Chapter W 6 –	**System Analysis.** Hydraulic model development and calibration. Identification of deficiencies and development of Capital Improvements
Chapter W 7 –	**Water Use Efficiency, Water Right Evaluation, Source Water Protection, System Reliability and Interties**
Chapter W 8 –	**Source Water Protection.**
Chapter W 9 –	**Operations and Maintenance Program.** Define the O&M issues associated with the water utility. Estimate of the manpower required in the future.
Chapter W 10 –	**Distribution Facilities Design and Construction Standards.**
Chapter W 11 –	**Capital Improvement Program.**

STORMWATER

Chapter SW 4 –	**Existing Stormwater Facilities.** Describes the watersheds and stormwater infrastructure.
Chapter SW 5 –	**Current Stormwater Management Utility Program.**
Chapter SW 6 –	**Regulatory Requirements.**
Chapter SW 7 –	**Future Program Needs.** Review of the current program and the changes that should be implemented.
Chapter SW 8 –	**Problem Identification and Solution Development.** CIP for the four known areas plus additional infrastructure that need. CIP cost estimates.
Chapter SW 9 –	**Recommendations.** Define the CIP and O&M issues associated with the stormwater utility. Estimate of the manpower required in the future.
Chapter SW 10 –	Not Used
Chapter SW 11 –	Not Used

FINANCIAL PLAN

Chapter 12 –	**Financial Plan.** Presents a composite of all CIP and prioritizes/combines CIP. Presents impacts on rate structure.

The Utility Systems Plan reviews the City's current capacities and looks at the impact of projected growth on the City's utility infrastructure.

The analysis of the utilities was done using both the current and anticipated loadings and also evaluated the future of the utilities when subjected to tightening regulations.

The Systems Plan also identifies future facilities required to accommodate the anticipated flows and loadings as the City's population grows within the service area limits for the years 2021 (sewer), 2023 (water), 2035, and buildout conditions.

The plans were prepared in conformance with local, state and federal regulations as described in Chapter 2.

1.2 Planning Data

Population, and employment population forecasts were used to estimate the current and future loadings to the City's sanitary sewer and water systems. The stormwater utility is less sensitive to residential and employment population forecasts and tends to be confined to individual drainage basins. Consequently, City wide analysis and projection of the stormwater system is less relevant.

Planning data from the Puget Sound Regional Council (PSRC) provides population forecasts based on U.S. Census data as broken down by Forecast Analysis Zones (FAZ). The PSRC data tends to be widely used throughout the region and is the database that was used in developing and analyzing the flows.

After discussions with the City staff, the PSRC forecasted values were used for the baseline population and GIS delineation was used for the distribution of growth throughout the service areas.

The service area for each of the utilities is substantially different. For example, the service area for the sanitary sewer is limited to the UGA boundaries. The service area for water, on the other hand, is much broader. Consequently the residential population, and employment population for water and sanitary followed the same general protocol, but applied to differing service areas.

The definition of these population forecasts is addressed in the respective chapters for each of the utilities.

There are three segments that comprise the served population: residential, employment and Department of Corrections (DOC). These three sectors generally capture all the sources expected in the Monroe Service Area. This approach works well in largely developed, non-industrial service areas.

With these values of existing and projected users, a population equivalent was developed recognizing that an employee or an inmate contributes a differing fraction of a permanent resident. This ratio was developed based on historical records.

1.3 Projected Sanitary Sewer Flows, Loads and Analysis

A capacity analysis of the existing City sanitary sewer network was undertaken using a spreadsheet hydraulic modeling program.

Existing lift stations and their maximum capacities also were included in the model. The flow data from the City's WWTP was largely used in calibrating the model. The sanitary sewer service area was divided into smaller service basins which are referred to as mini-basins. These mini-basin areas were consistent with the basin boundaries used in the previous System Plan.

The model was developed using information from the City's GIS electronic database, supplemented by selected as-built drawings, pump records, flow monitoring data, and with other available data such as ground elevation LIDAR information.

Models were constructed to represent the network in 2021, 2035, and build out.

Loadings and flows for the water and sanitary sewer were developed and presented in the respective utility chapters.

With the flows determined and the known population equivalence, a flow per population equivalence was determined. This historical flow data was used to project future and anticipated flows.

The I/I component is captured in and part of the peak day and peak hour per population equivalent flow values. It is important to recognize that the I/I component is reflective of current conditions and that, as the pipes continue to age and degrade, the volume of I/I entering the system will continue to increase. An allowance for that continued degradation is incorporated into the per population equivalent values for 2021, 2035 and build out conditions.

The conservative nature of the hydraulic model tends to over-estimate the volume of the wastewater to be conveyed. This conservative approach is partially offset by allowing a brief and very infrequent surcharging of the gravity sewers. The allowability of such surcharging is limited to a depth over the crown of the pipe equal to the pipe diameter.

Where pipe sections were identified as requiring an upgrade, the proposed upgrade was sized to provide capacity equal to or greater than the estimated build out flows.

At lift stations where the estimated peak hour flows were shown to exceed the current maximum capacity, a suitable build out upgrade flow capacity was estimated. This capacity was incorporated into the model for the planning horizon showing evidence of capacity limitation. This enabled the impact of the increased flow on the downstream sewer network to be investigated. The actual mechanical and electrical improvements to the lift stations would not be sized for the build out conditions.

1.4 Projected Water Demands and Analysis

A hydraulic analysis of the existing City water system was undertaken using a computer based modeling program.

The computer model includes source connections to the Everett Supply Pipeline, transmission mains, distribution system piping, reservoirs, pump stations, and pressure reducing valve stations. The current computer model was developed from the model used in the previous Water System Plan.

Model scenarios were developed to represent the water system subjected to existing, 2021, 2023, and 2035 water system demands.

Water demands were developed and presented in Chapter W 5.

With the demands determined and the known population equivalence, a demand per population equivalence was determined. This historical flow data was used to project future and anticipated flows.

The water system design criteria are presented in Chapter W 6. These criteria include minimum pressures of 30 psi under peak hour demand conditions and 20 psi under maximum day plus fire flow demand conditions.

Where pipe sections were identified as requiring an upgrade, the proposed upgrade was sized to provide sufficient capacity for the 2035 demand conditions.

The results of the hydraulic analysis were used to develop the capital improvement program chapter for the water utility.

1.5 Stormwater Improvements and Analysis

The Stormwater Utility System Plan is significantly different from the content and format of either the sanitary sewer or water system plans. The requirements for both the sanitary sewer and water systems are specifically mandated by the respective section in the WAC. The Stormwater System Plan, on the other hand, has general guidelines that are outlined in the NPDES rules.

Where the sanitary sewer and water system utilities are directly impacted by growth and new development, the stormwater utility is sensitive to changes in residential and employment populations. Though new development brings more impervious pavement, redevelopment or more intense use of already developed parcels has minimal impact on the volume of stormwater runoff. Consequently, population projections used in the sanitary and water utilities are not as meaningful for the stormwater utility.

The stormwater improvements and analysis focused on four known stormwater problem areas:

- Blueberry Lane
- Intersection of Blueberry Lane and North Kelsey Street
- Lake Tye
- Lords Lake

The description, analysis and recommended solution of these problem areas are presented in Chapter SW 8.

Other recommendations to satisfy the NPDES requirements are presented in Chapter SW 9. These recommendations include:

- Public Outreach and Involvement
- Illicit Discharge and Elimination Program
- Controlling new development, redevelopment and construction sites
- Operations and Maintenance
- Compliance with TMDLs
- Stormwater Monitoring
- Stormwater Management Program reporting and coordination

1.6 Capital Improvements Projects

The capital improvement projects (CIP) developed in the respective chapters are presented by time period. It should be noted that this plan has neither proposed a routing to extend sewers to every lot within the service boundary, nor was it the intention of this plan to finance those line extensions. The CIP does not include the line extensions and pump stations needed to serve presently unserved areas. These line extensions are assumed to be initiated and financed by developers or through Local Improvement Districts (LIDs). Consequently, no City financing mechanism is proposed for these lines.

The CIP is limited to the following categories:

- Existing lines that need to be upgraded/upsized to convey flows as population and flows increase
- Existing infrastructure that needs to be upgraded to accommodate increasing flows.
- Existing infrastructure that need modifications or improvements. This might include equipment that has reached or are soon to reach their useful life, needed new features, and stations that are slated to be abandoned or rerouted.
- Chronic maintenance areas that can be resolved with a capital project.
- WWTP improvements to respond to increasing flows, loads or new regulations

Cost estimates for each CIP was prepared based on current year (2015) pricing. Detailed cost estimates can be found in the respective appendices. These projects were assigned a target period for completion based on the anticipated added flows and the expectation that capacity would be exceeded by the end of that period. Those improvements shown as 2015 to 2021 (sanitary sewer and stormwater) or 2015 to 2023 (water) projects are those projects that have current or soon anticipated capacity issues and should be pursued first.

For those CIPs that are linked to aging equipment or obsolescence, an estimated date for replacement or repair has been identified. The determination of this date is tied to age and expected remaining life. It should be understood that there is some latitude in these implementation dates.

For those CIPs that are linked to inadequate capacity, a triggering metric has been estimated. This threshold trigger is represented by additional Equivalent Residential Units (ERUs). Since the specific location of these added units is critical to the downstream impacts, it is recommended that those triggering points by carefully monitored as those thresholds are approached.

Those that are in subsequent periods of 2021 (or 2023) to 2035 and 2035 to Build Out are projects that should be completed on or before that end target year. Capital Improvements Projects to be financed as described in Chapter 12 and summarized in Table 1-1.

Table 1-1 Capital Improvement Projects			
CIP No.	Decription	2015 to 2021 - sewer and storm 2015 to 2023 - water	2021 to 2035 - sewer and storm 2023 to 2035 - water
Sanitary Sewer CIP - Conveyance and Treatment			
SS-1	Gravity Sewer Replacement from DOC to Park Place Pump Station	$550,000	
SS-2	Cate’s Pump Station Upgrades	$450,000	
SS-3	West Main Pump Station Upgrades	$450,000	
SS-4	$500,000/yr Pipe replacement projects	$3,000,000	
SS-5	WWTP Rerating Study	$30,000	
SS-6	Biosolids Management Study	$50,000	
SS-7	Primary Clarifier Equipment Replacement	$920,000	
SS-8	WWTP Engineering Report	$100,000	
SS-9	Mechanical Sludge Thickener	$1,350,000	
SS-10	Belt Filter Press Hood	$180,000	
SS-11	Operations and Dewatering Building Roof Replacement	$190,000	
SS-12	$100,000/yr WWTP Maintenance	$600,000	
SS-13	CEPT Implementation	$280,000	
SS-14	Digester Blower Replacement	$1,100,000	
SS-15	42-foot Diameter Secondary Clarifier Mechanism Replacement	$580,000	
SS-101	Park Place PS Upgrades		$950,000
SS-102	Fyelands PS and FM Upgrades		$2,900,000
SS-103	Beaton PS Upgrades		$450,000
SS-104	Fox Meadows PS Upgrades		$450,000
SS-105	Old Owens PS Upgrades		$450,000
SS-106	Valley View Pump Station Upgrades		$1,492,000
SS-107	South Freylands Pump Station Upgrades		$860,000
SS-108	New Dewatering Unit		$1,600,000
SS-109	Turbine Blowers		$500,000
SS-110	SCADA and Control Upgrade		$550,000
SS-111	Sludge Dryer		$8,300,000
SS-112	Secondary Clarifier Mechanism Replacement		$810,000
SS-113	RAS/WAS Pump Replacement		$700,000
SS-114	Effluent PS Replacement		$550,000
Water CIP			
W-1	DOC Storage	$3,000,000	
W-2	Spring Hill Reservoirs - Mixing NaOCl	$30,000	

Table 1-1 Capital Improvement Projects			
		2015 to 2021 - sewer and storm 2015 to 2023 - water	2021 to 2035 - sewer and storm 2023 to 2035 - water
W-3	Lord Hill Reservoir fencing	$25,000	
W-4	Flushing Devices at deadends	$10,000	
W-5	Replace 8" at Chain Lake Road	$1,737,000	
W-6	Replace 6" at Tester and Hwy 522	$1,146,000	
W-7	Replace 12" at Trombley reservoirs	$199,000	
W-8	Replace 12" at Fairgrounds	$430,000	
W-9	Replace 10" at Fairgrounds	$110,000	
W-10	Replace 8" Hwy 2 and Cascade View Dr	$839,000	
W-11	Extend 12" Cascade View Dr - theatre	$407,000	
W-12	Replace 8" along Wagner Rd to Salem Woods	$939,000	
W-13	Extend 12" along Wagner to Wagner 517	$1,119,000	
W-14	Install 8" along 127th	$160,000	
W-15	Replace 6" along 141st	$1,726,000	
W-16	177th PS - Equipment Replacement	$680,000	
W-17	Spring Hill PS - Equipment Replacement	$520,000	
W-18	Lord Hill PS Equipment Replacement	$580,000	
W-19	Annual Water Meter Replacements ($200,000/yr)	$1,600,000	
W-20	Park to Kelsey Replacement	$84,000	
W-21	182nd and 154th Replacement	$70,000	
W-22	Graden Replacement	$415,600	
W-23	132nd Replacement	$554,400	
W-24	Thrive Alley Replacement	$92,400	
W-25	Destination Alley	$108,500	
W-26	Strawberry Lane Repalcement	$96,300	
W-27	Ingraham Hill from Brown Rd to SR-2 and Old Owen	$2,800,000	
W-28	Trombley Hill from Reservoir to Airport/179th SE	$2,100,000	
W-29	132nd SE from Ingraham to Wagner Rd	$567,000	
W-30	134th SE/133rd SE/ 208th SE/209th SE	$490,000	
W-31	Alley between Madison and Sams/McDougall and Pike	$90,100	
W-32	Alley parallel to Main Street at Ferry to N. Blakely east to N. Madison	$199,500	
W-33	Alley parallel to Lewis and Blakely Freemont to McDougall	$80,500	
W-34	Connect Wagner to 116th SE to complete loop	$408,600	
W-35	Park to Kelsey in Powell	$85,800	
W-36	Park to Pike - Phase II	$83,000	

Table 1-1
Capital Improvement Projects

		2015 to 2021 - sewer and storm 2015 to 2023 - water	2021 to 2035 - sewer and storm 2023 to 2035 - water
W-37	S Taft Lane	$42,000	
W-38	182nd SE and 154th	$95,000	
W-39	180th Avenue - Phase I	$71,000	
W-40	180th Avenue - Phase II	$71,000	
W-41	181st Avenue	$107,000	
W-42	Orr to Kelsey abandon line under houses	$48,000	
W-43	Wilson Lane	$17,000	
W-44	Circle Drive to Sumac	$76,000	
W-45	Short Columbia	$127,000	
W-46	127th Ave SE at 150th SE	$88,000	
W-47	North Hill service along 116th SE and 227th SE; connect to Wagner 517; install PRVs	$1,879,000	
W-48	Replace 4" serving FH ($50,000/yr)		$900,000
W-49	AC Pipe Replacement ($100,000/yr)		$1,800,000
W-50	Tester Road PS - Equipment Replacement		$620,000
W-51	North Hill PS Equipment Replacement		$800,000
W-52	Trombley PS - Equipment Replacement		$850,000
W-53	Replace 6" along Old Owen Rd		$443,000
Stormwater CIP			
SW-1	Blueberry Lane - Infiltration/Conveyance	$1,470,000	
SW-2	Blueberry/North Kelsey - Infiltration/Conveyance	$581,000	
SW-3	Lake Tye - Bioswale	$95,000	
SW-4A	Lord's Lake - Treatment	$398,000	
SW-4B	Lord's Lake - Bioswale/ Wet Pond	$37,800	
SW-6	Crystalwood Drainage		
SW-7	Monroe St and Park Street		
SW-8	Monroe St and Kelsey		
SW-9	Park St and Roberts St		
SW-10	Dickenson and West Columbia		$5,000,000 1)
SW-11	115 Dickenson		
SW-12	West Main Round about		
SW-13	615 North St		
Total CIP of all Utilities		$38,615,500	$30,975,000

Notes: 1) $5,000,000 of improvements for CIP Nos. SW-6 through SW-13 to be spent over the 20-year period

Chapter 2 Introduction

2.1 Purpose and Need for System Plans

The 2015 Utility System Plans are prepared for the City as supportive documentation to the City's Comprehensive Plan. These system plans met the statutory requirements mandated by the Washington Administrative Code referenced in Table 2-1.

Table 2-1 Utility System Plan Requirements

Sanitary Sewer System Plan WAC 173-240-050		**Water System Plan WAC 246-290-100**		**Stormwater System Plan No WAC Stipulated Requirements**
WAC	***Description***	***WAC***	***Description***	***Description***
3a	Purpose for plan	4a	Description of the system	Purpose for plan
3b	Ownership and O&M responsibilities	4a(i)	Ownership and O&M responsibilities	History Utility goals & policies
3c	Service boundaries	4a(ii)	System history & background	Public involvement Study area description
3d	Existing sewers Proposed sewers Topography	4a(iii)	Coordination with other water system plans	Existing system Watershed delineation
	Streams, Lakes Water systems	4a(iv)	Service boundaries	Stormwater utility description
3e	Population trends	4b(i)	Current population water use and ERUs	O&M
3f	Wastewater facilities within 20 miles	4b(ii)	Identify water consumption trends	CIP and future needs
3g	I/I problems	4b(iii)	Designated land use Future population	Regulatory requirements City
3h	Adequacy of treatment systems		Water demand 6 & 20 yrs	State
3i	Industrial wastewater sources	4c&d		Federal
3k	Collection alternatives	4e	Demand forecasts with and without water conservation System analysis	Problem identification Hydraulic model analysis
3l	Treatment alternatives	4e(i)	Design standards	Financial analysis
	Disposal alternatives	4e(ii)	Water quality analysis	Public information
	Construction cost estimate	4e(iii)	System inventory	Public hearings/meetings
	O&M cost estimates	4e(iv)	System deficiencies	
	Financial plan	4f(i)	Design standards	
3m	Compliance with management plan	4f(ii)	Water supply alternate	
		4f(iii)	Emergency response	
3n	SEPA compliance	4f(iv)	Water rights	
		4f(v)	Supply reliability	

Table 2-1 Utility System Plan Requirements

Sanitary Sewer System Plan WAC 173-240-050		Water System Plan WAC 246-290-100		Stormwater System Plan No WAC Stipulated Requirements
WAC	***Description***	***WAC***	***Description***	***Description***
	OTHER REQUIREMENTS / ELEMENTS	4f(vi)	Interties	
		4g	Sources water protection	
	SSSHB 1338 Water reuse	4h	O&M program	
	CMOM	4i	CIP	
	Public information	4j	Financial program	
	Public hearings/meetings	4k(i)	SEPA	
		4k(ii)	Interlocal agreements	
			OTHER REQUIREMENTS / ELEMENTS	
			Public information	
			Public hearings/meetings	

The requirements for each of the utilities are addressed in the respective chapters dedicated to the specific utility. A roadmap of where each requirement can be found follows in Table 2-2 for the Sanitary Sewer Utility, in Table 2-3 for the Water Utility and in Table 2-4 for the Stormwater Utility.

Table 2-2 Sanitary Sewer Utility Plan Requirements per WAC 173-240-050

Reference Paragraph	Description of Requirement	Location in Document
3a	Purpose and need for proposed plan	Section 2.1
3b	Who will own, operate, and maintain system	Section 2.2
3c	Existing and proposed service boundaries	Chapter SS 4
3d	Layout map showing boundaries; existing sewer facilities; proposed sewers; topography and elevations; streams, lakes; and other water bodies; water systems	Figures 2.2, 2.3
3e	Population trends	Chapter SS 5
3f	Existing domestic and/or industrial wastewater facilities within 20 miles	Figure 2.1
3g	Infiltration and inflow problems	Section SS 5.4
3h	Treatment systems and adequacy of such treatment	Chapter SS 7
3i	Identify industrial wastewater sources	Section SS 5.2.1
3k	Discussion of collection alternatives	Chapter SS 6

Table 2-2 Sanitary Sewer Utility Plan Requirements per WAC 173-240-050

Reference Paragraph	Description of Requirement	Location in Document
3k	Discussion of treatment alternatives	Chapter SS 7
3k	Discussion of disposal alternatives	Chapter SS 7
3l	Define construction cost and O&M costs	Chapter SS 11 and Appendix SS-F
3m	Compliance with management plan	Section 3.3.1
3n	SEPA compliance	See EIS for City Comprehensive Plan
	OTHER REQUIREMENTS / ELEMENTS	
SSSHB 1338 CMOM	Water Reuse Capacity, Maintenance, Operations and Management	Chapter SS 8 Chapter SS 9

Table 2-3 Water System Utility Plan Requirements per WAC 246-290-100

Reference Paragraph	Description of Requirement	Location in Document
4a	Description of the system	Section W 4.3
4a(i)	Ownership and O&M responsibilities	Section W 4.1 and Chapter W 9
4a(ii) 4a(iii) 4a(iv) 4b(i)	System history & background Coordination with other water system plans Service boundaries Current population water use and ERUs	Section W 4.2 Section W 4.4 Section W 5.1 Section W 5.1
4b(ii)	Identify water consumption trends	Section W 5.1
4b(iii)	Designated land use	Section W 5.2
4c&d 4e	Future population Water demand 6 & 20 years Demand forecasts with and without water conservation System analysis	Section W 5.2
4e(i)	Design standards	Section W 6.1
4e(ii)	Water quality analysis	Section W 6.2
4e(iii)	System inventory	Section W 4.3
4e(iv)	System deficiencies	Section W 6.3
4f(i)	Design standards	Section W 6.1
4f(ii)	Water supply alternate	Section W 6.3.1
4f(iii)	Emergency response	Section W 9.5
4f(iv)	Water rights	Section W 7.6
4f(v)	Supply reliability	Section W 7.7
4f(vi) 4g	Interties Sources water protection	Section W 7.8 Chapter W 8

Table 2-3 Water System Utility Plan Requirements per WAC 246-290-100		
Reference Paragraph	**Description of Requirement**	**Location in Document**
4h	O&M program	Section W 9.5
4i	CIP	Chapter W 11
4j	Financial program	Chapter 12
4k(i)	SEPA	See City's Comprehensive Plan EIS
4k(ii)	Interlocal agreements	Appendix W-B and Section W 4.5
	OTHER REQUIREMENTS / ELEMENTS	
	Public information	See City's Comprehensive Plan
	Public hearings/meetings	See City's Comprehensive Plan

Table 2-4 Stormwater System Utility Plan Requirements		
Reference Paragraph	**Description of Requirement**	**Location in Document**
	Purpose for plan	Chapter SW 5
	History	Section 2.3.3
	Utility goals & policies	Chapter SW 6
	Public involvement Study area description Existing system Watershed delineation Stormwater utility description O&M	Section SW 5.3.5 Section SW 4.3 Section SW 4.3 Section SW 5.3
	CIP and future needs	Chapter SW 9
	Regulatory requirements	Chapter SW 6
	Problem identification Hydraulic model analysis	Chapter SW 8
	Financial analysis	Chapter 12
	Public information	See City's Comprehensive Plan
	Public hearings/meetings	See City's Comprehensive Plan

The Plan provides a comprehensive guide to assist the City with managing and operating the three utilities and coordinating expansions and upgrades to the infrastructure for the next twenty years. The Plan serves as a guide for policy development and decision making for the City. It also provides other agencies and the public with information on the City's plans for utility extensions within the City's service area. This approach allows the City to provide high quality service to its customers and to continue protecting environmental quality.

The Plan evaluates existing and future capacity of the utility systems based on current and anticipated future growth. Future sanitary and water flow rates are estimated from existing flow data and population growth projected within the service areas.

An implementation plan is provided, including an estimated timeline for constructing selected projects. The financial analysis and the means by which the improvements were to be financed were addressed in Chapter 12. This chapter was prepared by FCS Group in close coordination with BHC and the City.

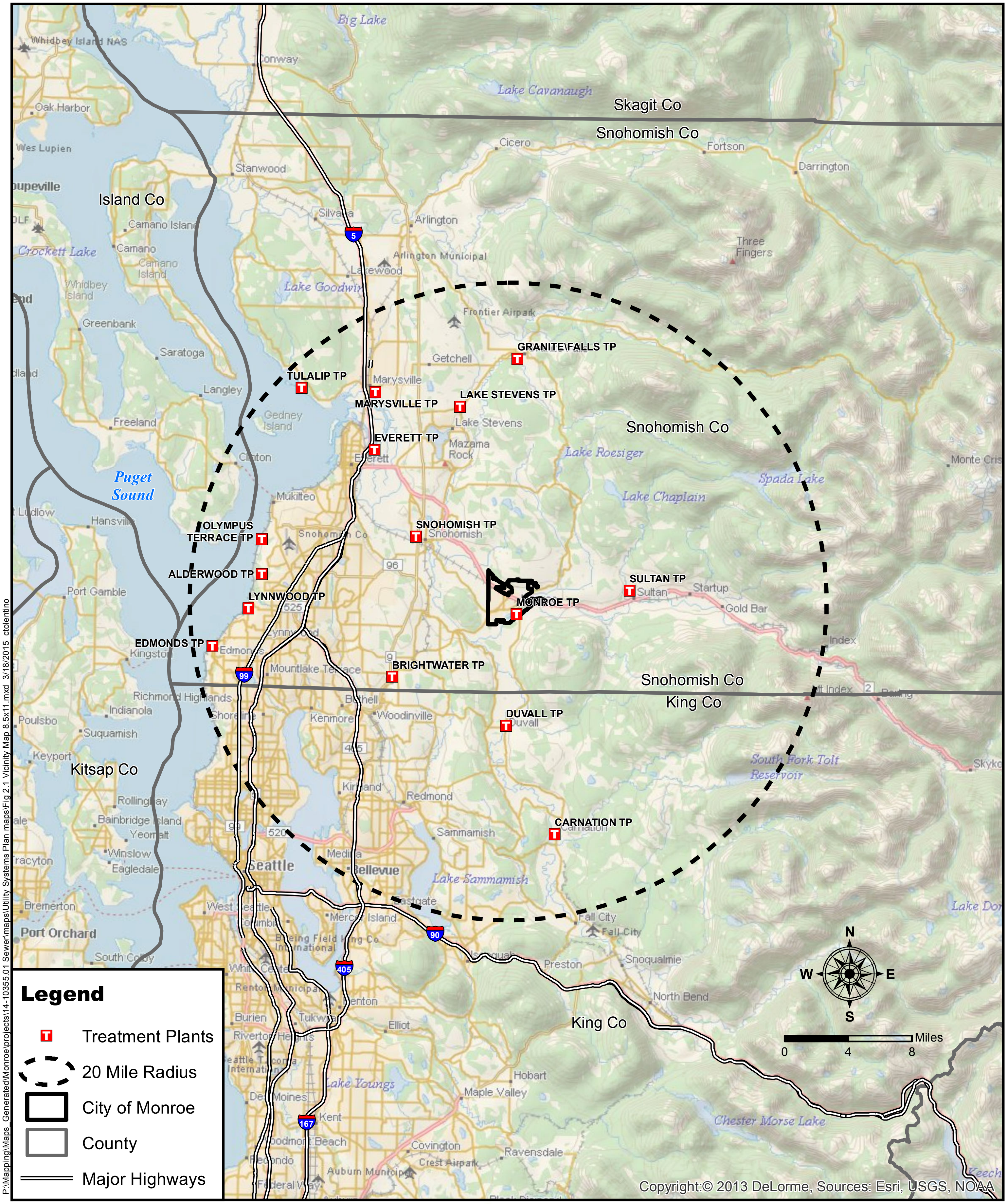
2.2 Ownership and Management

The City owns and maintains public utilities for the sanitary sewer, water and stormwater systems and is governed by a City Council. The City has interlocal agreements to provide these utilities to surrounding areas that are contiguous to the City corporate boundaries. These agreements are further explained in Chapter 3.

The City's sanitary sewer, water and stormwater systems are under the management of the Operations and Maintenance Division Manager. The treatment plant is operated and managed under the direction of the Plant Manager. Additional Engineering and Administrative and Engineering employees do not report to the Managers mentioned above.

2.3 System Histories and Background

The City of Monroe is located in southeastern portion of Snohomish County, immediately north of the King County – Snohomish County boundary, as shown on Figure 2.1, Vicinity Map. The City's corporate boundary is not contiguous to any other municipality. The City encompasses approximately 3,940 acres and but the service area for each of the three utilities varies as shown in Table 3-1.



P:\Mapping\Maps_Generated\Monroe\projects\14-10355.01 Sewer\maps\Utility Systems Plan maps\Fig 2.1 Vicinity Map 8.5x11.mxd 3/18/2015 ctolentino

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MONROE WASHINGTON

Vicinity Map

Utility Systems Plan
City of Monroe, Washington
March 2015

Figure

2.1

2.3.1 Sanitary Sewer System

Monroe was incorporated in 1902 but a sanitary sewer system was not developed until the 1940s. An Imhoff Tank, primary sewage treatment plant was constructed in 1945. This original plant was located on the same parcel as the current plant.

The treatment plant was upgraded to a secondary treatment plant using Rotating Biological Contactors (RBCs) as the biological treatment element in 1975. In addition, this upgrade included influent pumps, an aerated grit chamber, three side hill screens, two rectangular secondary clarifiers, two chlorine contact chambers, two aerobic digesters and a new outfall to the Skykomish River.

In 1993, another treatment plant expansion took place as a result of increased service areas within the City and additional flows resulting from that growth. This expansion included the construction of two rectangular primary clarifiers, four Submerged Biological Contactors (SBCs), a new circular secondary clarifier, an additional aerobic digester, and an effluent pump station.

In 2000, the next modification to the plant included three new activated sludge aeration basins with anoxic zones, a new secondary clarifier, additional Ultra Violet disinfection equipment and a belt filter press.

In 2010, the modifications to the plant included new headworks and grit collection facility and a modification to the Ultra Violet disinfection system. See Chapter SS 7 for a more thorough description of the City’s wastewater treatment plant.

In 2014-2015 the City entered into contract with an Energy Service Provider (TRANE) to make some energy efficiency modifications to the plant. This program is administered through the State’s Department of Commerce and offers guaranteed energy savings. This grant or low interest loan program is supplemented from matching funds from Snohomish PUD. These improvements include the replacement of the air diffusers in the aeration basin, replacement of the centrifugal blowers with turbo aeration blowers, revisions to the mixers and blowers for the aerobic digesters, and modification to the mixing equipment in the selector basins.

The City provides sanitary sewer service to customers within its sewer service area. Wastewater ultimately flows to Skykomish River through a series of four in-stream diffusers.

2.3.2 Water System

Prior to incorporation, water from a “spring on the hill back of Fern Bluff” was provided by J. E. Dolloff of the Spring Water Company by franchise issued by the Snohomish County Commissioners. Soon after incorporation the Monroe City Council granted a water service contract to Mr. S. A. Buck using water from wells on Buck Island and filtered water from the Skykomish River. In 1905 Mr. Buck turned his water system over to the Monroe Water and Light Company which used two steam pumps located on Buck Island to provide 750 gallons per minute at 90 pounds per square inch. In January of 1905 there were 118 customers of the water system. After years of legal challenges between Buck and Dolloff the City of Monroe developed its own gravity water system using Sykes Springs located approximately 8 miles north of town as the supply.

Sometime between 1905 and 1937 the City of Monroe developed a well field on Ingraham Hill. In 1937, “faced with a rapidly depleting reservoir and a highly unsatisfactory condition at the pumping station” Monroe investigated connecting to the City of Everett pipeline. It appears that this went no farther than investigating as the March 1954, Report of Preliminary Survey of Town of Monroe Domestic Water System states "water for the town of Monroe is obtained by pumping from a well located about two miles from the town".

In 1963 the City of Monroe began purchasing water from the City of Everett from a wood stave pipeline north of the city. At this time the use of all other sources was discontinued due to the high levels of iron and manganese in the water. The City of Everett replaced the wooden main in 1969 with a 51 inch steel pipe that is known as Transmission Main #5.

The City of Monroe grew with an average rate of 2.2 percent per year from its incorporation in 1902 until 1988 when the population was 3,350. During this time timber and dairy farming dominated the area's economy. System improvements during this time included:

Ingraham Hill Reservoir – an open in-ground 1.15 million gallon reservoir built in 1920

Wagner Road Transmission Main – 14,000 feet of 12 inch main installed in 1963 when the city connected to the City of Everett system.

179th Avenue Distribution Main – constructed in 1974 from SR 2 to Main Street to serve the developing west side of Monroe.

Chain Lake Road Transmission Main – 21,000 feet of 12 and 16 inch main installed in 1977 to connect the west side of Monroe to the Everett supply.

Trombley Hill Reservoir – a 2.0 million gallon steel reservoir constructed in 1984.

Brown Road Transmission Main – 5,500 feet of 16 inch main installed in 1984 to connect the Wagner Road and Chain Lake transmission mains.

Monroe began to grow rapidly, as the timber and farm industries declined, thanks to the easy access provided by the three state highways. Monroe's population almost doubled to 6,480 by 1996. Since then the population of Monroe has more than doubled to 16,550. This increase came partially from annexation of additional area but the majority was from new development. Monroe has taken on some of the character of a bedroom community. Many of the occupants of the new residential subdivisions commute to work in the Everett/Seattle/Bellevue area. In addition to providing housing, Monroe also has a thriving industrial area and numerous commercial operations, including four grocery stores and three new car dealerships. In response to this rapid growth, significant changes have taken place in the water system. The major capital improvements include:

Ingraham Hill Reservoir – a 2.0 million gallon steel reservoir built in 2001 to replace the original Ingraham Hill reservoir.

DOC Reservoir – the City acquired a 750,000 gallon reservoir along with a 1,100 gallon per minute booster pump station from the Department of Corrections in 2001.

Tester Road Booster Pump Station – a 1,500 gallon per minute booster pump station to supply the Department of Corrections and the Monroe High School.

North Hill Reservoir and Booster Pump Station — a 1.15 million gallon reservoir and 1,500 gallon per minute booster pump station to supply the upper pressure zone of the system.

Reservoir #5 Trombley Hill Reservoir and Booster Station – a 2.5 million gallon steel reservoir and booster pump station housing one 50 gpm, two 250 gpm and one 3,300 gpm pumps built in 2006 provides storage for the Everett, Trombley, Airport, DOC and Downtown pressure zones.

2.3.3 Stormwater System

The City of Monroe created its Stormwater Management Utility in 1996. The Public Works Department carries out the majority of the programmatic and field-based stormwater tasks.

The Stormwater Management Utility program consists of numerous program elements. These elements are organized into the following four categories based on the department or departments that perform the program element work.

- Design & Construction Division Stormwater Services and Capital Improvement Program
- Operation & Maintenance Division Stormwater Services
- Program Support and Administration

The City lies in the Skykomish River valley at the base of the Cascade foothills. The Skykomish River borders the City on the south. Most of the businesses and residences within the City are located well above the 100-year floodplain. Woods Creek essentially forms the eastern border of the City; although, a small section of the City lies south and east of the creek. The majority of the City, including the commercial corridor along US Highway 2 (US-2), the Fryelands development, and the developing areas north of US-2, lies within the French Creek watershed. French Creek, in turn, flows into the Snohomish River several miles west of the City.

The majority of the City is built on very shallow slopes, typically less than 0.5 percent. The soils within these flat areas are composed of loamy silty sands, which are well suited to farming activities. Beneath these soils lie areas of deep recessional outwash gravels which drain exceedingly well. The City utilizes this natural infiltration capability to assist with control of stormwater runoff.

Due to an increase in impervious surfaces and urbanization, as well as regulatory changes, stormwater quality management has become an important issue. Water quality degradation due to stormwater runoff can occur from many different sources. Stormwater runoff carries sediment from exposed construction sites and pollutants from residential, commercial, and industrial developments and agriculture and livestock into streams and other water bodies. Pollutants in stormwater runoff include metals such as lead, cadmium, zinc, and copper; oil and grease; pesticides and fertilizers; and bacteria. Urbanization within the Puget Sound basin has increased impervious surface areas such as rooftops, streets, and parking areas. Without stormwater control, impervious surfaces increase runoff volumes and peak flow rates. The increased pollutant loads and increased volumes of stormwater runoff result in impacts to downstream properties, to Puget Sound and to other downstream water bodies. Increased impervious surfaces also reduce infiltration to groundwater resources. Due to the listing of Puget Sound salmon species under the federal Endangered Species Act (ESA) and federal regulations under the National Pollution Discharge Elimination System (NPDES), implementation of stormwater control measures has become increasingly important. Approximately two-thirds of the City's stormwater conveyance system consists of pipe. Pipes range in size from eight inches to forty eight inches in diameter, and convey stormwater via outfalls into the receiving waters identified in Figure SW 4.2. Some stormwater pipes have storage or water quality treatment structures built into the system. The City owns approximately 50 miles of stormwater pipe with the pipe inventory consisting primarily of PVC, HDPE and concrete pipe. A portion of the downtown area is a combined sanitary/stormwater sewer which discharges to the wastewater treatment plant.

Culverts are short sections of pipe used to convey stormwater/streamflow and which generally connect open ditches or streams either under or adjacent to roads. Culvert pipes are usually concrete or corrugated metal. There are approximately 21 culverts within the City of Monroe storm drainage system.

Catch basins are underground sumps which are are used to collect stormwater. In Monroe, most catch basins discharge directly into a piped conveyance system. The sump at the bottom of a catch basin is used to capture sediment and other debris from incoming stormwater. Some catch basins are equipped with trapped outlets, which prevent most floating debris and oil from leaving the catch basin. The City owns 1,917 catch basins that are connected to stormwater conveyance piping. A number of catch basins in Monroe do not connect to a piped storm drain system but instead serve as a point for infiltration of the stormwater runoff. These types of catch basins are called “rock holes” and are located in the residential neighborhoods in the southeastern portion of the City between Main Street and the Skykomish River. The City owns approximately 25 rock hole catch basins in this area.

Ditches are constructed earth trenches lined with vegetation or concrete that convey stormwater in areas not served by piped conveyance systems. The City owns approximately 15 miles of ditches.

Biofiltration swales are grass-lined, flat-bottomed ditches whose purpose is to filter the runoff in order to provide water quality treatment. They differ from ditches in that the vegetation must be appropriately maintained to function properly. The shape, slope, width, and length of the swales are specifically designed to achieve appropriate levels of water quality treatment. Most of the biofiltration swales in the stormwater drainage system are privately owned.

Retention/detention ponds and underground storage facilities (such as vaults and pipes) store stormwater runoff. The purpose of these facilities is to temporarily store the runoff so that it can be released at a controlled rate to nearby receiving waters or infiltrated into the ground, preventing potential downstream flooding or erosion.

When land is developed, and no flow control facilities are installed, both the total volume of runoff and the peak flows typically increase due to:

- Loss of vegetation that slows the release of runoff.
- Compaction of the soil column that reduces infiltration rates.
- Placement of impervious surfaces (pavement, rooftops, etc.) that intercept rainfall, preventing soil infiltration and conveying a larger volume of runoff more quickly to a discharge location, thereby increasing the peak flow.

The controlled rate of release from these storage facilities is designed to generally mimic the rate of stormwater runoff that occurred from the land, prior to any development. The volume of runoff these facilities can store is that required to hold the additional volume of water that occurs after development, until it can be released at the appropriate/controlled rate. The City owns 15 detention ponds and nine underground vaults.

Infiltration Trenches. Some locations within the City contain soils that are suitable for stormwater infiltration, and as a result, several infiltration trenches have been constructed. The trenches are located underneath City streets and infiltrate locally generated stormwater runoff. Multiple infiltration trenches typically are located in each infiltration facility, along with water quality pretreatment and an overflow connection to local stormwater or combined piping systems. The stormwater drainage system contains both public and privately owned infiltration facilities.

Oil/water separators are generally underground vaults designed to trap sediments, oil, and floatable materials. The inlet and outlet are typically located on opposite ends of the vault, which is also equipped with baffle walls extending above and below the water surface and with a gap above the floor of the vault. Runoff flows underneath the baffles and out of the vault, while the oil floats to the surface and is retained in the vault by the baffle. Some oil/water separators contain oil-absorbing booms. The City owns seven oil/water separator.

The stormwater drainage system discharges to receiving waters in the Woods Creek, French Creek and Skykomish River watersheds.

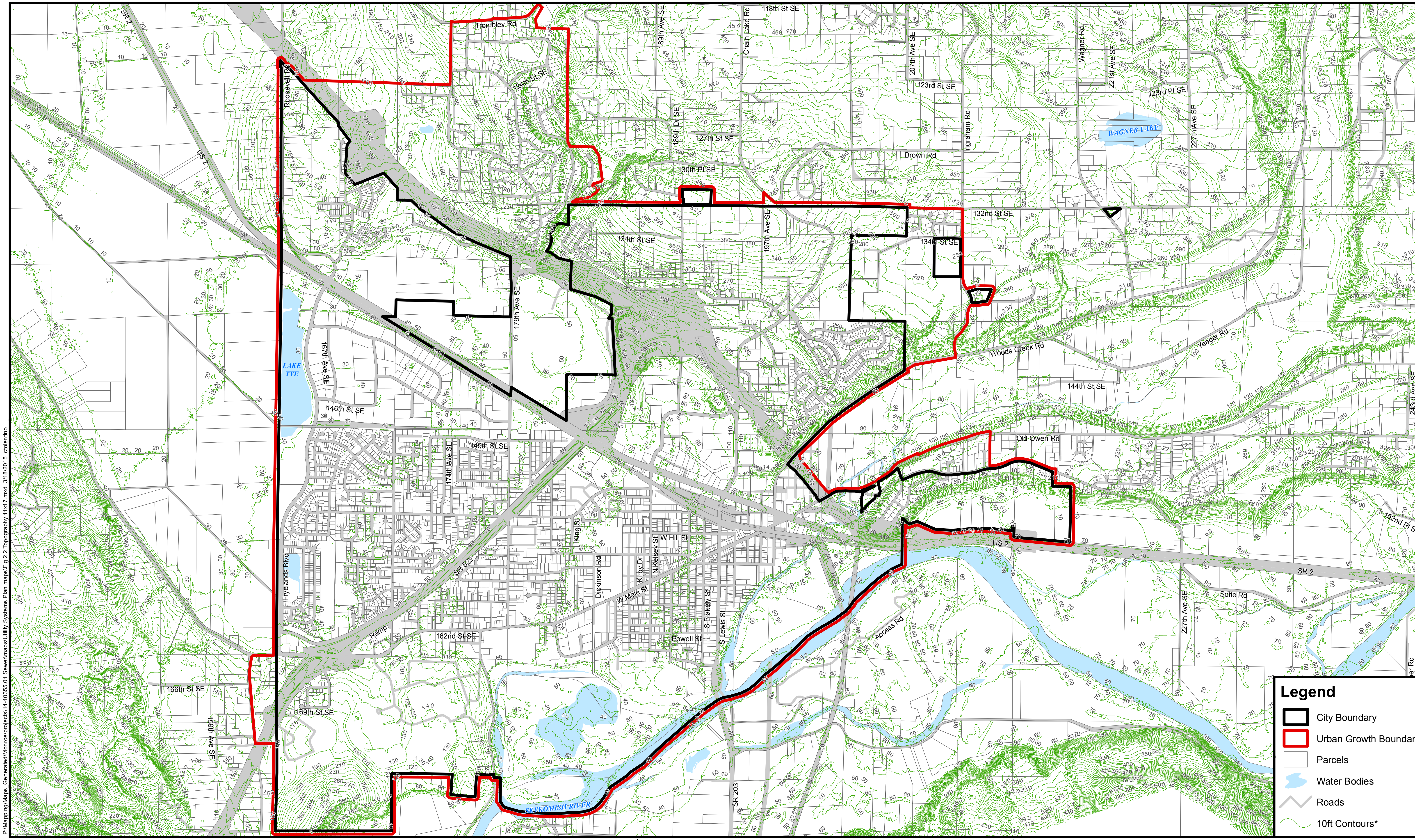
The only City-owned filter treatment systems are located along the storm drain line running from Lewis Street to the outfall into Woods Creek at the intersection of South Ann Street and Fremont Street. These consist of 30 individual canisters located in four vaults.

2.4 Service Area Characteristics and Topography

The City boundaries and the service areas lie entirely within Snohomish County. However, the service areas for the three utilities are varied and differ significantly. The delineation of the service areas for each of the utilities is presented in Chapter 3.

2.4.1 Topography

The geography of the City of Monroe is dominated by the Skykomish Valley outwash plain. The Skykomish valley is oriented east to west and is generally flat, with an elevation ranging from 30 to 80 feet above sea level. Figure 2.2 shows the topography of the Monroe area. The Skykomish River flows in a southwestern direction generally along the southern boundary of Monroe. A few miles southwest of the City, the Skykomish River merges with the Snoqualmie River to form the Snohomish River, which flows into Puget Sound between Everett and Marysville. Woods Creek flows into the Skykomish River through a narrow valley at the eastern end of the City.



P:\Mapping\Maps Generated\Monroe\projects\14-10355.01 Sewer\maps\Utility Systems Plan maps\Fig 2.2 Topography 11x17.mxd 3/18/2015 ctolentino

*10ft Contours extracted from LIDAR data. Source: Puget Sound LIDAR Consortium, Snohomish County Dataset 2005-2006.
Municipal Boundaries: City of Monroe July 2013
Snohomish County base data 2014
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NORTH

0 1,000 2,000 4,000 Feet

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MONROE WASHINGTON

Topography Map
Utility Systems Plan
City of Monroe, Washington
March 2015

Figure
2.2

The Rivmont Plateau, to the east of the City, is located between the Woods Creek valley and the Skykomish River valley, and rises abruptly to elevations of 200 feet. The service area includes several hills sloping upwards from the Skykomish River valley to the north, with maximum elevations of approximately 420 feet. The Monroe Correctional Complex is located on a knoll with a maximum elevation of 140 feet in the southwestern portion of the service area. At the extreme southwestern corner of the service area is a hill with a maximum elevation of 320 feet.

2.4.2 Water Features

Wetlands are found adjacent to the many creeks, small streams and lakes within the City service areas (see Figure 2.3).

Surface Water – The most dominant fresh water feature in the service area is Lake Tye which is located along the western boarder of the City Limits adjacent to the Frylands development. The lake has a surface area of approximately 38 acres.

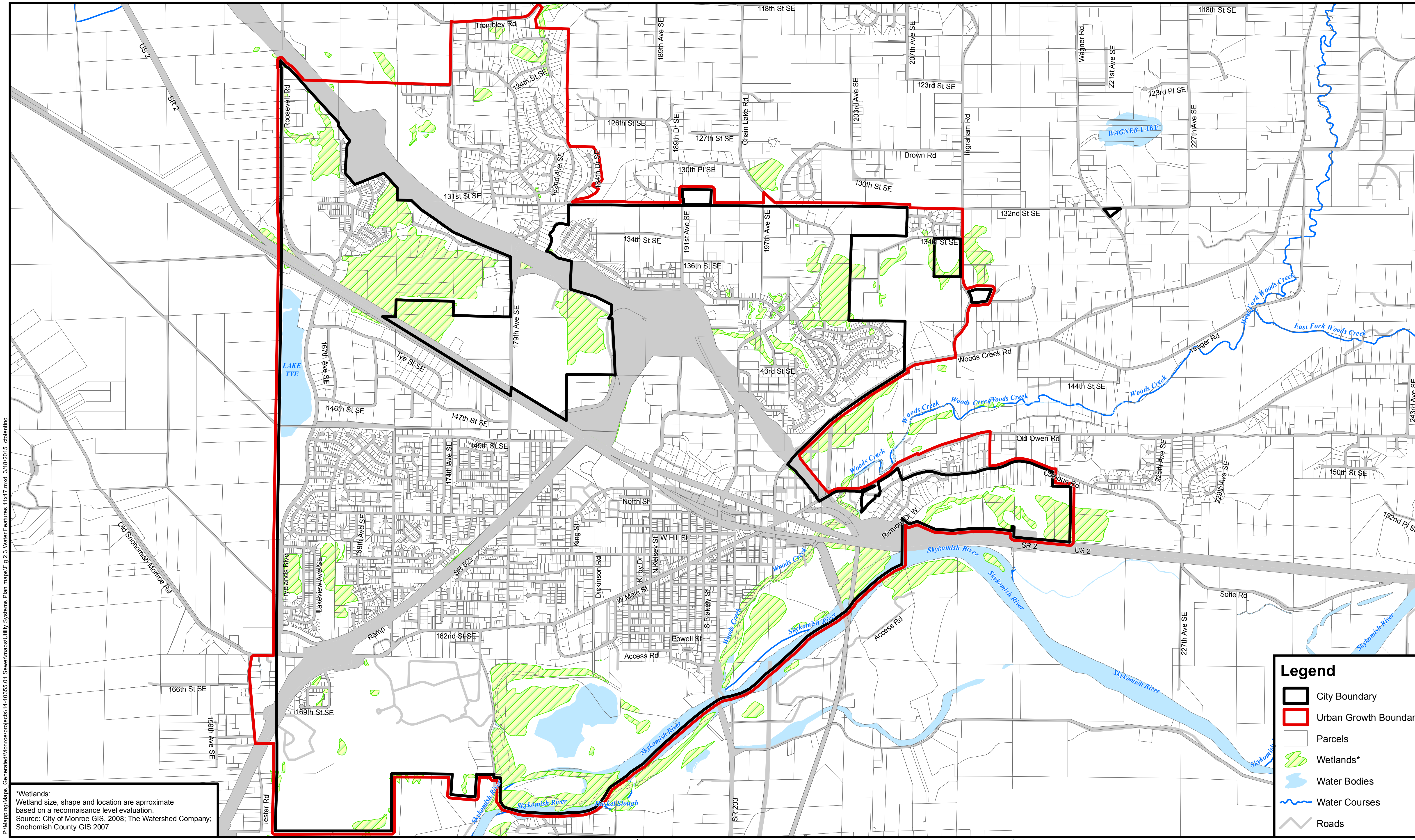
Woods Creek bisects the southeastern corner of the City which enters the Skykomish River at the SR 203 bridge.

Groundwater – A study done in 1997 by the US Geological Survey found that 94% of the groundwater in South Snohomish County was considered soft to moderately hard. No appreciable widespread groundwater contamination was found at the time of the study.

Concentrations of arsenic, iron and manganese were the most widespread groundwater problems in the area. The population growth in Snohomish County has increased dramatically in the last 10 years and has affected the quantity and the quality of groundwater. Most groundwater recharge in Snohomish County is from infiltration of precipitation, and impervious surfaces caused by increased development prevent infiltration. Consequently, less groundwater is becoming available as land development increases.

2.4.3 Geology

The retreat of glaciers at the end of the last ice age formed the rolling terrain characteristic of the City. Erosion and flooding of low lying areas during that period resulted in soil deposits of two primary classifications as identified by the Washington State Department of Natural Resources, 2005. These soil types are described below and displayed on Figure 2.4.



P:\Mapping\Maps Generated\Monroe\projects\14-10355.01 Sewer\maps\Utility Systems Plan maps\Fig 2.3 Water Features 11x17.mxd 3/18/2015 ctolentino

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Water Bodies & Courses: Snohomish County.

Snohomish County base data 2014
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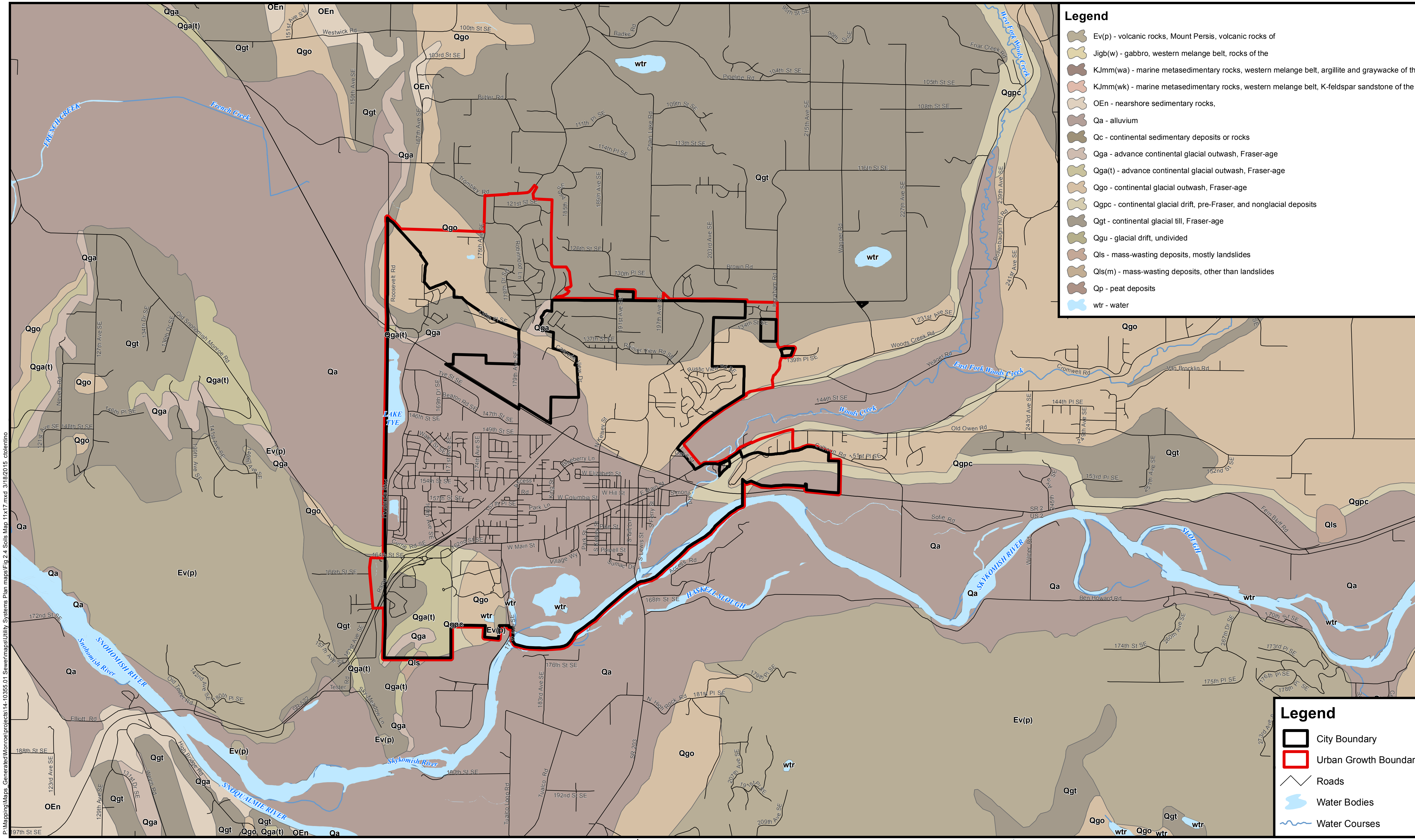
NORTH

0 1,000 2,000 4,000 Feet

MONROE WASHINGTON

Water Features
Utility Systems Plan
City of Monroe, Washington
March 2015

Figure
2.3



P:\Mapping\Maps_Generated\Monroe\projects\14-10355.01 Sewer\maps\Utility Systems Plan maps\Fig 2.4 Soils Map 11x17.mxd 3/18/2015 ctolentino

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Soils data: Washington State Department of Natural Resources 2005

Snohomish County base data 2014
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NORTH

0 1,750 3,500 7,000 Feet

MONROE WASHINGTON

Soils Map
Utility Systems Plan
City of Monroe, Washington
March 2015

Figure
2.4

The Skykomish River valley primarily consists of alluvial soils, at depths up to 100 feet. The primary soil type in central Monroe is an alluvial soil, with upper layers of silt loams and silty clay loams, with underlying very fine sandy loam or sand. The soil has moderately low permeability and during the winter has a high groundwater table (2 to 4 feet below grade). The western portion of the service area also contains a few areas with other types of alluvial soils, including some that are poorly drained.

The hills north of the City Limits consist of glacial till. Glacial till includes large rocks and pockets or streaks of sand and gravel. Glacial till is essentially impervious. The upper layers of soils are typically gravelly loam, underlain by hardpan or glacial till. Permeability through the hardpan is very slow, and a perched water table may occur during heavy rains in some areas.

The Rivmont plateau has primarily Everett gravelly sandy loam soils, which are somewhat excessively drained.

The southwest portion of the service area, including the Monroe Correctional Complex, consists of silt loam soils, which have low permeability. The service area includes soils that have the potential for commercial sand and gravel operations, especially near current and previous riverbeds, and on steep slopes.

Soil factors in the Skykomish River valley that may affect planning are the potential for flooding or poor drainage, especially in the western portion of the service area. Soil factors on the hills surrounding the valley that may affect planning include steep slopes and erosion/landslide potential. In addition, areas with glacial till have low permeability and some areas may not be suitable for septic tank drainfields.

2.5 City Extension Policies

Development of the City's Comprehensive Sewer Plan is currently guided by the Comprehensive Plans from the adjacent agencies.

The City's policy for services recognizes that its function is not to plan land uses for the service area but to respond to land uses planned by the land use planning agencies.

The public utility systems in the City may be extended by one of two methods, one being a developer extension agreement, where a developer, property owner or a group of property owners request and construct a sewer under the terms and conditions of a developer extension agreement. The second method is a Local Improvement District (LID) process following RCW 35.43.040 and 35.43.042, where a group of property owners petition the City to extend utilities to their area and then are assessed for the improvements.

It is the City's policy that the property owners desiring utility service initiate a request for service. After entering a Developer's Extension Agreement with the City, the proposed design will be reviewed by the City to ensure compliance with the standards and design criteria. All utility extensions shall follow the current version of the City of Monroe's design and construction standards and as defined in the City's "Developer Extensions Manual." Once the improvements have been constructed and confirmed through the City inspection to meet established standards, then it shall be deeded to the City.

The City Council has the authority to set policies, ordinances, and zoning. The City may find it necessary from time to time to reevaluate their policies based on Snohomish County land use, policies and ordinances.

Chapter 3 Land Use and Service Area

3.1 Service Area Description

The existing utility service area for the City can be described as comprising of two general areas, City of Monroe and Snohomish County. Aside from water associations or water districts, there are no other governmental jurisdictions in the service area.

Table 3-1 presents the service area of each of the three utilities and separates those service areas into portions within the corporate boundaries, outside the City Limits but within the UGA boundary and that portion that is outside the UGA boundaries. The 'total' acres shown are the ultimate service area.

Table 3-1 Utility Service Area

	Sanitary Sewer Utility (acres)	Water System Utility (acres)	Stormwater Utility (acres)
Within Monroe Corporate Boundaries	3,940	3,940	3,940
Outside City Limits but within UGA	953	450	0
Outside UGA	298[1]	5,700	0
Total Acreage	5,191	10,090	3,940

Notes:
1) Southwest Study Area

City of Monroe. The City of Monroe's municipal boundaries comprise of 3,940 acres. All of the Monroe corporate area is within the service area of the utilities. All of the area served by the sanitary sewer utility is collected and treated by the City's WWTP. Similarly, all of the City water customers are served with Monroe water purchased from Everett Public Utilities. The stormwater utility can be extended beyond the UGA, but currently no such extensions exist. The City both owns and maintains these portions of the system and is responsible for treatment, conveyance, distribution and storage.

Snohomish County. Portions of Snohomish County fall within the service areas of the utilities. Before providing sanitary sewer service to parcel outside the corporate boundaries, it is the City's policy to annex those parcels into the City. Extending sanitary service beyond the UGA boundary is allowed only under very unique circumstances. Water service is provided into Snohomish County. Stormwater service can be, but currently is not extended into Snohomish County.

3.2 Surrounding Vicinity Characteristics

3.2.1 Topography

Figure 2.2 shows the topography of the City and the surrounding areas. This figure also includes City's service area boundary and the corporate boundaries as described in Section 3.1.

The topography of the City ranges from flat and gently rolling to hilly, with a few steep slopes along the stream corridors. Wetlands, lakes and many creeks and small streams are found throughout the City.

3.2.2 Water Resources

The City's municipal water system provides service to the entire population within the City limits. The other residents outside the City limits are served by adjacent water purveyors as described in Chapter W 4.

All water supplied to the City customers is currently purchased from the Everett Public Utilities through the Sultan River source and is delivered from the Everett pipeline.

Interties are also provided as shown on Figure W 4.2.

3.3 Land Use

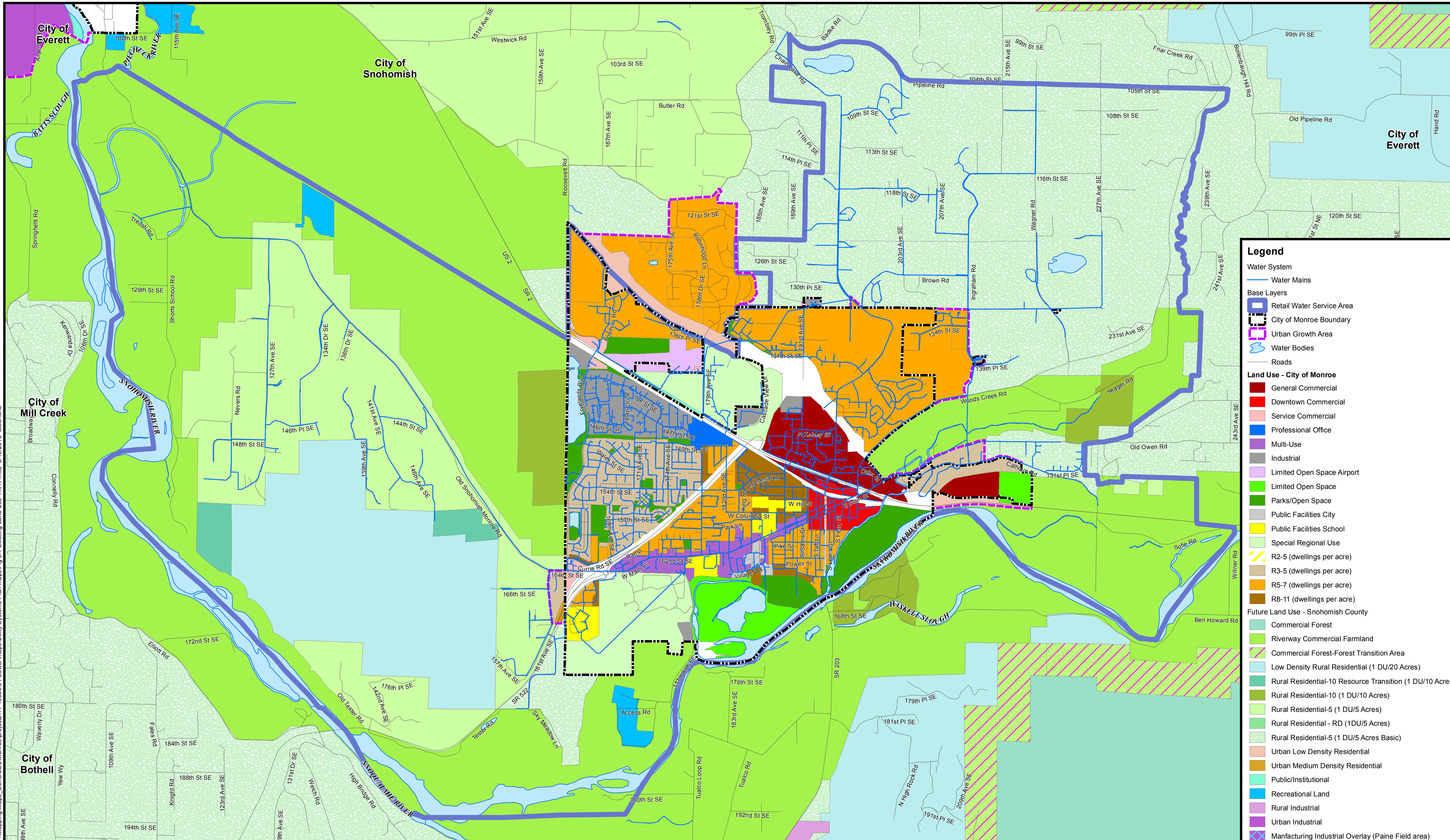
3.3.1 Growth Management Act

The State of Washington adopted the Growth Management Act with the intent of concentrating most new development and population gains within urban areas of the more populous and rapidly growing counties. These counties are required to define an urban growth boundary within which urban services like sewers are provided, and any new parcels created outside that boundary must be low density with sufficient acreage to support onsite sewage disposal systems conforming to State Health regulations.

The entire sanitary sewer service area is within the GMA boundaries of the City for urban development. Extending sewers beyond the GMA boundaries for essential governmental facilities and documented health hazard areas has not arisen. The Southwest Study Area is outside the GMA boundaries, and consequently is not included as part of the Service Area. Consideration of this area was investigated assuming a potential expansion of the GMA boundaries in the future.

The service area for water does not have the same limitations as sanitary sewer. Consequently, the water service does extend beyond the GMA boundaries.

Zoning within the City Limits area can be classified as commercial/industrial, low density multi-family, high density multi-family, single family, and undeveloped lands such as public right of ways, parks, and open space. These zoning areas are depicted in Figure 3.1. Low density multi-family zoning allows a variety of low-density, multi-family housing including townhouses, multi-family structures and attached or detached homes on small lots.



P:\Mapping\Maps_Generated\Monroe\projects\14-10355.01 Sewer\maps\Utility Systems Plan maps\Fig 3.1 Existing Land Use 11x17.mxd 3/19/2015 ctolentino

Land Use: City of Monroe August 2014
Future Land Use: Snohomish County November 2013

Water System: City of Monroe 2014
Snohomish County base data 2014
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MONROE WASHINGTON

Existing Land Use
Utility Systems Plan - Water
City of Monroe, Washington
March 2015

Figure
3.1

3.4 Relationships with Adjacent Agencies

The issue of managing and coordinating which agency provides services can be an emotionally charged matter. Consequently, adjudicating such issues typically falls to a county-supported Board Review Board.

In Monroe's case, there are no adjacent agencies that can provide sanitary sewer service. The nearest provider is the City of Sultan. Neither Monroe nor Sultan extends sewer service beyond their GMA boundaries and consequently, there are no overlapping issues with neighboring agencies.

Stormwater utilities are typically provided by municipalities. Like the sanitary sewer service, the nearest stormwater utility is in the City of Sultan. Stormwater, even more than sanitary sewer service, is dictated by the topography. No adjacent municipalities have stormwater utilities that reach to the service area of Monroe.

Providing water service, however, is complicated by the fact that GMA limitations do not apply and the fact that there are several water districts or associations adjacent to Monroe's water service boundary. These water purveyors are presented on Figure W 4.4.

The adjacent water purveyors are listed below.

- Cross Valley Water District
- City of Snohomish
- Roosevelt Water Association
- Meadow Lake Water Association
- SnoPUD Integrated 2
- SnoPUD Integrated 3
- Highland Water District

3.5 Service Areas

3.5.1 Sanitary Sewer

Figure SS 4.1 shows the extent of the existing sanitary sewer system. This figure also shows the current Urban Growth Area (UGA). The UGA boundary establishes the line beyond which sanitary sewers cannot be extended.

The general policy that governs UGA is that urban type services are not to be extended beyond those limits. However, in certain circumstances this limitation can be modified and sewer service can be provided. In the case of documented Health Hazard areas or critical/essential governmental facilities, sewers can be provided beyond the UGA boundary.

3.5.2 Water

Figure W 4.2 shows the extent of the current water system. The water utility does not fall under the same UGA limitations as applied to the sanitary sewer system and consequently, the water utility reaches far beyond the UGA boundaries. This figure also shows the surrounding water purveyors in relation to the City's water service boundaries.

3.5.3 Stormwater

Within the corporate City limits, there are three main drainages. These three include the Woods Creek, Skykomish River and French Creek. The extent of these drainages reaches far beyond any corporate boundaries or UGA boundaries. Figure SW 4.1 shows some or all of the catchment area of these drainage basins.

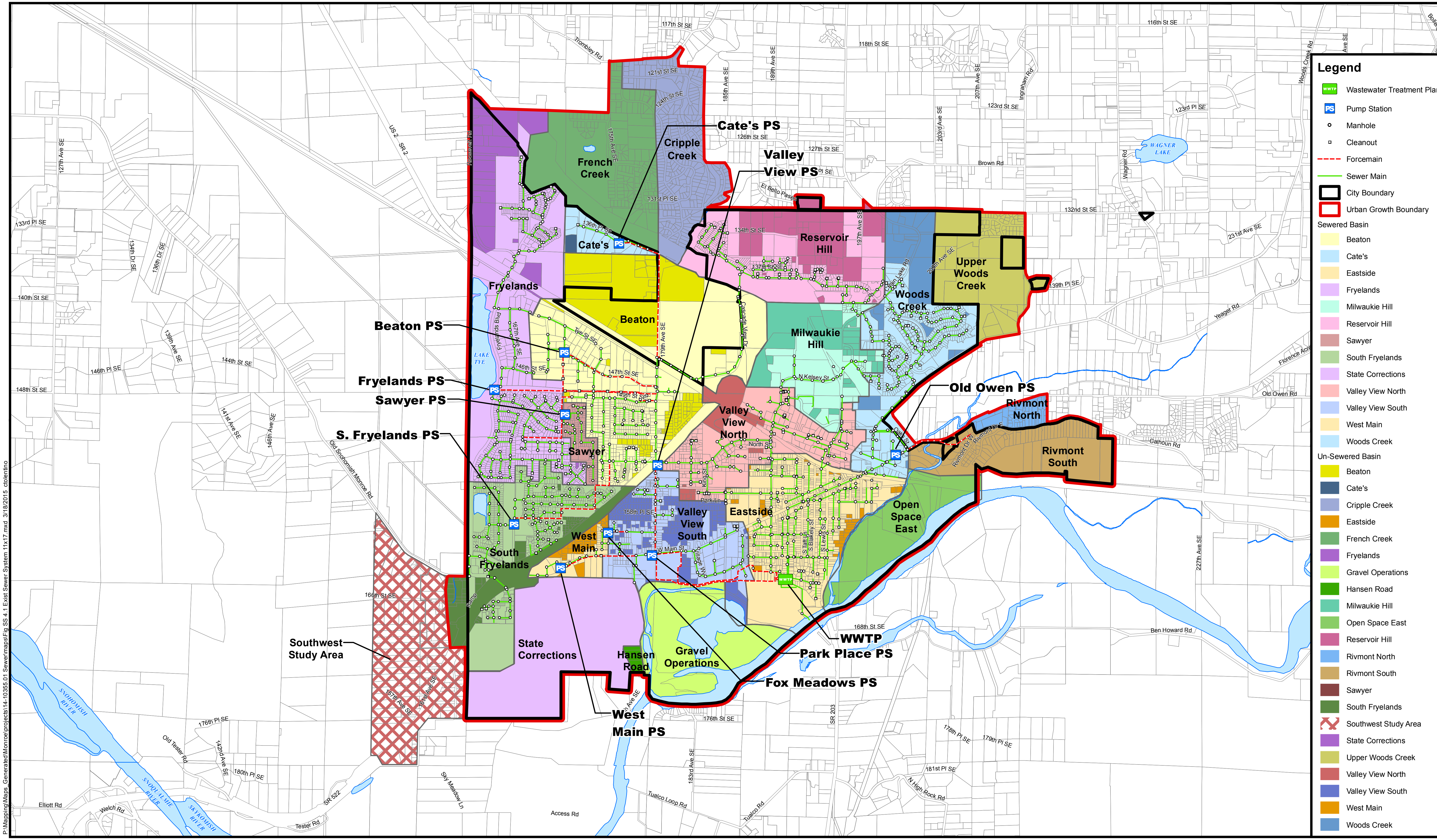
Chapter SS 4 Existing Wastewater Facilities

4.1 Collection and Conveyance Facilities

The existing wastewater collection and conveyance system is comprised of gravity lines, force mains, ten operating lift stations, the wastewater treatment plant (WWTP) and the river outfall. The collection system (including pipes, pumps, manholes, and clean outs) is shown in Figure SS 4.1. Individual maps for each mini-basin is included as Appendix SS-A. The City's sewer system is composed of divided sections henceforth referred to as "mini-basins". In addition, the mini-basin referred to as "Southwest Study Area" is a region in the southwest portion of Figure SS 4.1 that is currently not within the existing UGA boundary. The City plans on pursuing incorporation of this area into its existing UGA boundary in 2017. A list of mini-basins, as well as their areas, is presented in Table SS 4-1.

Table SS 4-1 City of Monroe Sewer Basins

Basin Name	Basin Area (acres)
Beaton	662
Cates	42
Cripple Creek	202
Eastside	334
French Creek	276
Fryelands	557
Gravel Operations	236
Hansen Road	7
Milwaukee Hill	208
Open Space East	167
Reservoir Hill	317
Rivmont North	34
Rivmont South	173
Sawyer	32
South Fryelands	359
State Corrections	299
Upper Woods Creek	188
Valley View North	239
Valley View South	244
West Main	49
Woods Creek	305
Total City and UGA Area	**4,929**
Southwest Study Area	298
Total Area	**5,227**



BHC CONSULTANTS

Sewer System: City of Monroe 2014
Snohomish County base data 2014
Data sources supplied may not reflect current or actual conditions. This map is a geographic representation based on information available. It does not represent survey data. No warranty is made concerning the accuracy, currency, or completeness of data depicted on this map.
BHC Consultants LLC., assumes no responsibility for the validity of any information presented herein, nor any responsibility for the use or misuse of the data.

MONROE WASHINGTON

Existing Sewer System
Utility Systems Plan - Sewer
City of Monroe, Washington
March 2015

Figure
SS 4.1

4.1.1 Gravity Sewer

Gravity sewer pipes in the City's collection system range in diameter from 4 inches to 24 inches. There is approximately 42.3 miles of gravity pipe in the collection system. The pipe material for these pipes includes polyvinyl chloride (PVC), clay, concrete, and ductile iron. The first sewers were constructed in the early 1920s as a combined sewer system, but the system continued to expand since as a separate system.

The sewer pipe inventory is summarized in Table SS 4-2 below. Pipe lengths are approximated from GIS data provided by the City. Appendix SS-B includes the slope, diameter, and capacity of the hydraulically modeled trunk sewer segments.

Table SS 4-2 Gravity Pipe Inventory

Diameter (in)	Total Length (ft)	Number of Segments Between SSMHs
4	105	1
6	8,992	48
8	155,472	748
10	19,549	84
12	23,431	98
15	1,378	6
18	6,789	28
20	551	3
24	7,333	25
Total	**223,600 (42.3 mi)**	**1,041**

4.1.2 Pump Stations

The City's existing wastewater collection system includes ten lift stations (shown on Figure SS 4.1). In addition, the Evergreen State Fairgrounds, the Department of Corrections, and other entities own operating pump stations that discharge into the City's sewer system. The pump stations corresponding to collection basins, number and type of pumps, and the capacity of the pumps are summarized in Table SS 4-3.

Furthermore, all lift stations owned by the City have telemetry monitoring and are linked to the Supervisory Control and Data Acquisition (SCADA) system at the WWTP. The City has equipped the SCADA system with an auto-dialer that alerts their staff of alarms at any of the pump stations.

Table SS 4-3 Monroe Pump Stations

Pump Station	Location	Type	Pumps			Year Constructed
			No.	Capacity (each, gpm)	Firm Capacity (gpm)	
Beaton	17102 147th St SE	Wet Well/Top Mounted	2	580	580	Mid 1980's
Cate's	17562 136th Pl SE	Submersible	2	150	150	Late 1980's
Fox Meadows	17502 160th St SE	Wet Well/Top Mounted	2	125	125	2001
Fryelands	14810 Fryelands Blvd	Wet Well/Top Mounted	2	750	750	1994
Old Owen Rd	Old Owen Rd at Eagle Park Dr	Wet Well/Top Mounted	2	250	250	Late 1980's
Park Place	17866 W Main St	Submersible	3	1,300	1,700	2010
Sawyer	17108 Sawyer St SE	Submersible	2	175	175	1998
South Fryelands	16653 Currie Rd	Wet Well/Dry Well	2	450	450	1996
Valley View	15411 179th Ave SE	Wet Well/Dry Well	3	1,325	1,650	1977
West Main	17097 164th St SE	Submersible	2	115	115	1987

4.1.3 Force Mains

The wastewater conveyance system has approximately 30,700 feet (5.8 miles) of force mains of 4, 6, 8, and 12-inch diameter pipe for conveying wastewater to the WWTP or to gravity conveyance sections of the system. Force main lengths are approximated from GIS data provided by the City. The force mains attributes are summarized in Table SS 4-4, and are shown on Figure SS 4.1.

Table SS 4-4 Force Main Inventory

Pump Station	Diameter (in)	Length (ft)	Force Main Material	Year Constructed
Beaton	8	4,031	PVC	Mid 1980's
Cate's	4	4,166	DI	Late 1980's
Fox Meadows	4	576	PVC	2001
Fryelands	6	4,667	DI	1994
Old Owen	6	51	PVC	Late 1980's
Park Place	16	3,988	PVC	2010
Sawyer	8	134	PVC	1998
South Fryelands	8	4,561	PVC	1996
Valley View	12	7,865	DI	1977
West Main	4	2,232	PVC	1987
	Total	32,731 (6.2 mi)		

4.2 Wastewater Treatment Plant

The City's WWTP is described in detail in Chapter SS 7.

Chapter SS 5 Existing and Future Population and Flow Projections

Chapter SS 5 provides a summary of the historical and projected populations for residential, non-residential, and Department of Corrections (DOC), as well as the historical and projected wastewater flows within the City's UGA.

5.1 Population

5.1.1 General

Residential and non-residential population estimates for the City's service area have been developed for each mini-basin for the 2021, 2035, and build-out planning horizons. The City's sewer service area includes the City and its Urban Growth Area (UGA). The service area is divided into 22 mini-basins irrespective of existing jurisdictional boundaries, which are shown on Figure SS 4.1.

5.1.2 Existing Population

The three different populations contributing sewage are residential, non-residential, and DOC inmates. The methodology used combined various available resources to establish the most accurate population estimates and projections for the purpose of sewer modeling and CIP identification. A detailed methodology and list of resources can be found in Appendix SS-C.

The baseline year is the most recent year data is available, however the baseline year varied for each contributing population. Baseline residential population estimates were calculated using 2010 Census data. Census block population data was distributed to parcels based on population density and residential acreage. Baseline employment population estimates were calculated using 2013 Covered Employment estimates and the 2012 American Community Survey (ACS) self-employment estimate. Baseline population estimates were aggregated per mini-basin and used as the first known data point to interpolate existing (2015) and future populations. Baseline populations for the DOC were taken from online average daily population data for 2010 to 2013.

Existing residential and employment population estimates were calculated by interpolating between baseline data and Snohomish County 2035 Population and Employment Growth Targets for the UGA.

Table SS 5-1 provides a summary of the existing population and forecasted population for the City and its UGA through the planning horizon.

5.1.3 Future Population

Residential, non-residential, and DOC inmate populations were forecasted for the existing (2015), 6-year (2021), 20-year (2035), and build-out planning horizons. Residential and non-residential population projections for 2035 were derived from a combined analysis of Snohomish County's adopted 2035 Growth Targets and the 2012 Buildable Lands Report for Snohomish County (BLR). For the Monroe UGA, Countywide Planning Policies for Snohomish County adopted a 2035 Population Growth Target of 25,126 and a 2035 Employment Growth Target of 11,780. These adopted targets were distributed throughout the UGA based on development capacity and aggregated by mini-basin.

The BLR data was obtained for the Monroe UGA and utilized to establish the development capacity per parcel as a means to distribute projected population growth. The BLR data identifies parcels as vacant, partially used, or redevelopable given a 2025 planning horizon. The BLR data provides the additional housing units (HU) and/or employment capacity per parcel. The development capacity is calculated for each parcel as its additional capacity divided the total UGA capacity, resulting in the percentage of residential and/or employment population growth captured per parcel. Year 2035 population figures were used as the second data point to interpolate for 2015 and 2021 populations, and to extrapolate for the build-out scenario. Baseline residential and non-residential population years were 2010 and 2013, respectively. The populations listed in Table SS 5-1 below represent total City and UGA populations, while Table SS 5-2 lists the sewered populations.

Table SS 5-1 Population Forecasts for the City of Monroe and UGA

Year	Residential Population(1)	Non-Residential Population(1)	DOC Population	
			Inmates(3)	Employees
2010	16,315 (2)	7,344	2,536	1,204
2013	17,032	7,709(2)	2,548	1,210
2015	17,510	7,957	2,500	1,187
2021	18,943	8,699	2,601	1,235
2035	22,288	10,432	2,838	1,348
Build-out	26,925	12,140	3,092	1,468

Notes:
1) Population does not include the Southwest Study Area.
2) These numbers represent baseline populations for their respective categories.
3) The inmate population represents the average daily population. Data is available at http://www.doc.wa.gov/aboutdoc/docs/msPrisonPopulationFY2009-2014.pdf.

Table SS 5-2 Sewered Population Forecasts for the City of Monroe and UGA

Year	Residential Population[1]	Non-Residential Population[1]	DOC Population	
			Inmates[2]	Employees
2010	11,392	7,189	2,536	1,204
2013	12,109	7,561	2,548	1,210
2015	12,587	7,809	2,500	1,187
2021	14,548	8,563	2,601	1,235
2035	19,865	10,345	2,838	1,348
Build-out	26,925	12,140	3,092	1,468

Notes:
1) Population does not include the Southwest Study Area.
2) The inmate population represents the average daily population. Data is available at http://www.doc.wa.gov/aboutdoc/docs/msPrisonPopulationFY2009-2014.pdf.

The Southwest Study Area mini-basin is located beyond the Monroe UGA. Since the adopted County growth targets and BLR pertain only to urban lands, a separate population analysis was conducted. Population figures were interpolated between baseline and the potential build-out scenario. The projected population for the Southwest Study Area is presented in Table SS 5-10, and a detailed methodology is provided in Appendix SS-C.

5.2 Existing Wastewater Flows

The City's WWTP Discharge Monitoring Reports (DMRs) from 2011, 2012, and 2013 and hourly flow data from the WWTP flow meter were used to determine existing wastewater flows in the City. The following is a description of each calculated flow parameter:

- **Average Annual Flow** – This flow condition is defined as the average of daily flows during the year.
- **Maximum Month Flow** – This flow condition is defined as the highest monthly average flow. This flow condition is of particular interest for the WWTP because the NPDES permit is written with monthly discharge limitations based on this flow.
- **Maximum Day Flow** – This flow condition is defined as the maximum day flow in a given year.
- **Peak Hour Flow** – This flow condition is defined as the peak sustained flow rate occurring during a one-hour period. It is used to size the collection and interceptor sewers, pump stations, flow meters, and WWTP hydraulic processes.
- **Average Dry Weather Flow** – This flow condition is defined as the average daily flow for a period during the months of July through October when no rainfall was recorded. The intent of presenting this data is to capture the base domestic flow conditions with the minimum impact from infiltration and inflow (I/I).
- **Average Wet Weather Flow** – This flow condition is defined as the average daily flow from the months of November through March. All flows during this period were analyzed regardless of the amount of precipitation. The value of this flow condition is used to determine the I/I contribution to the system.

The average annual and maximum month flows were calculated using the WWTP's DMRs for 2011, 2012, and 2013. The peak hour flow was determined using hourly flow rate data from the WWTP effluent flow meter for 2013 through November 12, 2014 because hourly data is not available prior to 2013. Appendix SS-D is the DMR data.

5.2.1 Average Annual Flow

Table SS 5-3 summarizes average annual flow characteristics from 2011 through 2013. The development of the populations was described earlier in this chapter. The wastewater is broken into residential, non-residential, and Department of Corrections (DOC) components. The non-residential includes all wastewater contributors outside of the DOC and residential, e.g. commercial, schools, and government. While there is a non-residential sewage component, there are no significant industrial discharges to the City's sewer system. The per capita flow rates were developed using water records to develop water per capita flow rates as described in Chapter W 5, and comparing those rates to base sanitary flow rates for dry weather. The dry weather per capita rates were then calibrated to the measured dry weather sanitary flows. The difference between the wet weather water per capita rates and the calibrated dry weather sanitary flow rates is assumed to be the baseline I/I. The annual average per capita rates were then derived using the dry weather ratio of residential, non-residential, and DOC flow to the total flow and increasing the per capita rates for average annual flows. The development of the average annual per capita rates is summarized in Table SS 5-3.

Table SS 5-3 Sewer Per Capita Flow Rates

Flow Category	Wet Weather Per Capita Water Demand (gpcd)(1)	Infiltration/Inflow (gpcd)(2)	Per Capita Dry Weather Sewer Flows (gpcd)(2)	Per Capita Average Annual Sewer Flows (gpcd)(3)
Residential	46.3	9.7	56.0	67.4
Non-Residential	33.4	7.0	40.4	48.6
DOC	159.4	0.0	159.4	159.4(4)

Notes:

1) Wet weather per capita water demand was determined by taking the water records for the wettest month of the year for each of 2011 through 2013 and averaging the per capita demands for each flow category.
2) Per capita dry weather sewer flows were developed by multiplying the residential and non-residential wet weather per capita demands by 1.21 to calibrate the total dry weather flow to measured flows. The calibration factor is assumed to be the baseline I/I contribution. The DOC per capita rates are assumed constant because the 2011 to 2013 monthly variations do not vary with the seasons.
3) Per capita average annual sewer flows were determined by assuming that the ratio of residential to non-residential is constant and increasing the value to match the average of the measured average annual flows presented in Table SS 5-4.
4) DOC per capita flows are total flows divided by the inmate population.

5.2.2 Monthly Average Day Flow

The monthly average day flows are summarized in Table SS 5-4.

Table SS 5-4 Monthly Average Daily Flow Summary (2011 - 2013)

Month/Year	Flow (mgd)		
	2011	2012	2013
January	1.885	1.614	1.936
February	1.631	1.742	1.690
March	1.784	1.865	1.715
April	1.768	1.645	1.763
May	1.590	1.662	1.471
June	1.372	1.611	1.461
July	1.302	1.404	1.303
August	1.208	1.311	1.418
September	1.256	1.280	1.448
October	1.323	1.452	1.352
November	1.510	1.716	1.520
December	1.358	2.216	1.541
Average	**1.499**	**1.627**	**1.552**

5.2.3 Maximum Month and Maximum Day Flows

The maximum month and maximum day flows recorded at the Monroe WWTP from 2011 through 2013 are summarized in Table SS 5-5.

Table SS 5-5 Maximum Month and Maximum Day Flows

Year	Maximum Month (mgd)	Month	Maximum Day (mgd)	Day
2011	1.885	January	2.887	January 14, 2011 (1)
2012	2.216	December	3.643	May 23, 2012
2013	1.936	January	3.175	January 10, 2013
Average	**2.012**		**3.235**	

Notes:
1) Estimated based on rainfall event.

5.2.4 Peak Hour Flows

The peak hour flows recorded at the Monroe WWTP from for 2013 through November 12, 2014 are summarized in Table SS 5-6.

Table SS 5-6 Peak Hour Flows

Year(1)	Peak Hour (mgd)
2013	6.866
2014	6.680
Average	6.773

Notes:
1) 2011 and 2012 data do not exist, therefore peak hour based on the average peak hour flow for 2013 and 2014 (through November 12, 2014).

5.3 Existing Sewage Peaking Factors

Peaking factors based on historic flow records are used to project future sewage flows. Peaking factors are calculated by taking the various flow events and dividing them by the annual average flow. The peaking factors are summarized in Table SS 5-7.

Table SS 5-7 Existing Peaking Factors

Year	Annual Average Factor	Maximum Month Factor	Maximum Day Factor	Peak Hour Factor(1)
2011	1.00	1.26	1.93	No Data
2012	1.00	1.36	2.24	No Data
2013	1.00	1.25	2.05	4.43
2014(1)	-----	-----	-----	4.11
Average	**1.00**	**1.29**	**2.07**	**4.27**

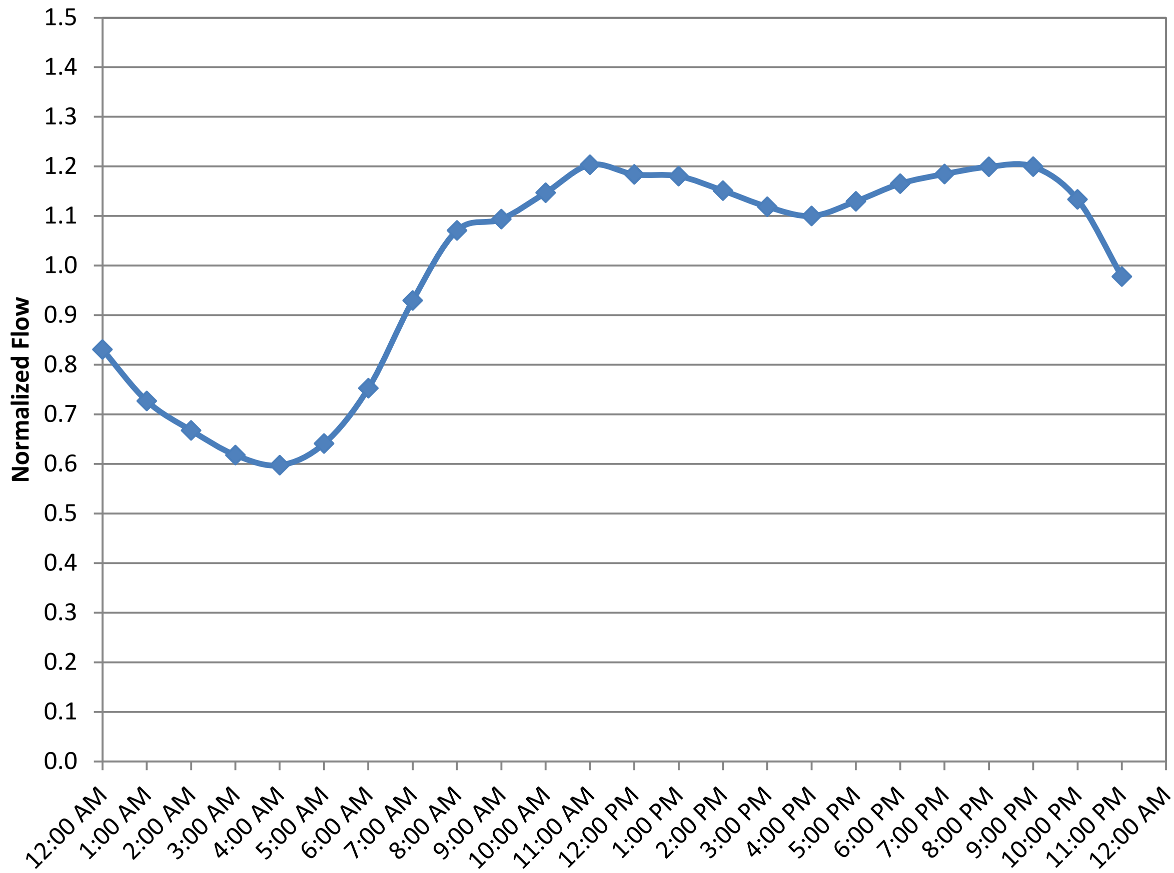
Notes:
1) 2011 and 2012 data do not exist, therefore peak hour based on the average peak hour flow for 2013 and 2014 (through November 12, 2014).

The peaking factors presented in Table SS 5-7 are typical of similar communities and area used as the basis for future flow projections.

5.3.1 Diurnal Curve

Typically, sewer flows are lowest at night and highest during the morning and evening. This distribution of flow throughout the day is described by a diurnal curve. The average diurnal curve for 2013 is presented as Figure SS 5.1.

Figure SS 5.1 Average Diurnal Curve



The diurnal curve is unusual in that the peak normalized flow is typically larger. The lower value for the City is likely due to the influence of the DOC that provides a dampened daily flow through their lagoons causing the composite diurnal pattern to flatten out.

5.4 Infiltration and Inflow (I/I) Analysis

Infiltration is the sewage component associated with groundwater seepage into the sewer system through loose connections and cracked or broken sewer lines. Higher infiltration flows are observed during wet weather months when groundwater is higher. Inflow is the sewage component associated with illegal connections and stormwater connections to the sewer. Typical sources of inflow include storm sewers/roof drains directly connected to the sewer, basement sump pumps, and submerged manhole lids. Rain-dependent infiltration/inflow (RDII) is the sewage component consisting of stormwater surface runoff entering the sewer system plus additional infiltration from storm-saturated ground conditions. Increased infiltration occurs as precipitation saturates the ground and higher groundwater more easily leaks into the pipe system.

Previous investigations and the current review of recent flow data indicate that I/I is non-excessive in the City's sewer system. The per capita average annual sewer flows indicate non-excessive I/I in that they are lower than typical per capita rates. Similar to the conclusions of earlier studies, treatment of I/I is likely less costly than repair and replacement of gravity sewers.

5.5 Projected Flows

The total projected sewage flow for the years 2021, 2035, and build-out include all residential, non-residential, DOC, and infiltration and inflow. It is assumed that current per capita flows will remain unchanged in the future. Details of the projected sewage flows are summarized in the following paragraphs. These projected flows are aggregated for the entire collection system and are most relevant for evaluation of the WWTP facilities. Projected flows for the mini-basins comprising the City's service area are developed in Chapter SS 6.

5.5.1 Annual Average Flow

Domestic flows are calculated as the product of the unit flows developed in Section SS 4.4 and the projected sewered population. The projected average annual sewage flows received at the WWTP throughout the planning horizon are tabulated in Table SS 5-8.

5.5.2 Average Day of the Max Month Flow

The projected average day of the max month flow, as determined from the unit flows and peaking factors derived above, are presented in Table SS 5-8.

5.5.3 Peak Hour Flow

The peak hour flow would occur when a design storm happens at the same time as the diurnal flow peaks. The projected peak hour flows, as determined from the unit flows and peaking factors, are presented in Table SS 5-9.

5.5.4 Southwest Study Area

The Southwest Study Area mini-basin is located beyond the Monroe UGA and so a separate flow analysis was conducted, and is summarized in Table SS 5-9. Because the Southwest Study Area is outside the City's UGA, the flow is not accounted for in the collection system and WWTP analyses presented in Chapters SS 6 and SS 7, respectively. However, a brief narrative is included as to the potential impacts that the increased flows and loads from the Southwest Study Area have on the collection system and WWTP.

Table SS 5-8 Projected Wastewater Flows

Year	Sewered Residential Population	Sewered Non-Residential Population	DOC Inmate Population	Average Annual Flow (mgd)	Maximum Month		Maximum Day		Peak Hour	
					Peaking Factor	Flow (mgd)	Peaking Factor	Flow (mgd)	Peaking Factor	Flow (mgd)
2021	14,548	8,563	2,601	1,812	1.29	2.336	2.07	3.752	4.27	7.730
2035	19,865	10,345	2,838	2,295	1.29	2.959	2.07	4.752	4.27	9.791
Build-out	26,925	12,140	3,092	2.898	1.29	3.737	2.07	6.002	4.27	12.367

Table SS 5-9 Projected Wastewater Flows in Southwest Study Area

Year	Residential Population	Non-Residential Population(1)	Average Annual Flow (mgd)	Maximum Month		Maximum Day		Peak Hour	
				Peaking Factor	Flow (mgd)	Peaking Factor	Flow (mgd)	Peaking Factor	Flow (mgd)
2021	150	45	0.012	1.29	0.016	2.07	0.026	4.27	0.053
2035	677	147	0.053	1.29	0.068	2.07	0.109	4.27	0.225
Build-out	1,648	300	0.126	1.29	0.162	2.07	0.260	4.27	0.536

Notes:
1) Non-residential population is constant because the only commercial zoned area is the Cornerstone Academy that is assumed to be at capacity.

Chapter SS 6 Wastewater Conveyance Analysis

6.1 Introduction

The City of Monroe's wastewater conveyance system was analyzed to determine its ability to serve the future land use presented in Chapter SS 3 and projected wastewater flow rates and population presented in Chapter SS 5. Hydraulic sewer modeling was conducted to analyze the capacities of the primary conveyance system's gravity trunk lines at existing (2015), 2021, 2035, and build-out for wet weather peak hour flow rates. The trunk conveyance system was defined to be that portion of the gravity system which conveyed flow from an entire mini-basin. The existing primary sewer conveyance system is shown on Figure SS 4.1.

6.2 Sewage Flows by Mini-Basin

Projected sewer flow rates are based on existing measured flow rates at the WWTP and existing population data. Peak hour flow rates at pump stations were determined using the hydraulic model. The capacities of the pump stations and their respective force mains were calculated using the projected flow rates. These results were used to identify conveyance system components in need of rehabilitation or replacement.

Residential, non-residential, and DOC inmate average annual per capita sewage flow rates were estimated to be 67.4, 48.6, and 159.4 gallons per capita per day (gpcd), respectively, as discussed in Chapter SS 5.

The per capita sewage flow was multiplied by the population to obtain the annual average flow for each mini-basin. This was performed for each scenario. The total annual average flow was multiplied by a peak hour factor to determine the peak hour flow.

6.3 Existing Sewer System Data Collection

Data for the existing sewer conveyance system layout was compiled from multiple previous studies, City provided GIS information, as-built drawings, and survey work performed as part of this Plan. Pump station information, including number of pumps, pump station capacity, and motor horsepower (see Table SS 4-3) was provided by the City.

6.4 Model Construction

6.4.1 Modeling Description

The hydraulic model of the City's wastewater conveyance system is presented in this section, including a description of the model development and the assumptions made along the way. The spreadsheet model was created to analyze the conveyance system's major gravity sewer lines and force mains. The model utilizes Manning's equation to determine the calculated capacity of each gravity line and force main segment. The maximum allowable capacity of the gravity lines was considered when hydraulic grade line reached 200 percent of the pipe diameter. The pump station capacities were obtained from the City and compared against the modeled peak hour flows at each pump station.

After exporting the City's existing GIS information into the model, it was determined that approximately 56 percent of the existing manholes for the sewer system were missing invert elevations. In order to fill these data gaps, the City provided as-built drawings of the conveyance system at several locations with missing inverts. After receiving this data, the portion of manholes with missing invert elevations was reduced to approximately 40 percent. KPG Inc. was contracted to survey approximately 60 manholes at predetermined locations, and missing invert elevations of the remaining manholes were linearly interpolated between known elevations.

The model is divided into mini-basins in order to calculate flow rates at each pump station and at other points in the system to determine deficiencies throughout the planning horizon. The model does not take into account backwater effects. If a given pipe is surcharged at a d/D ratio greater than two, where "d" is flow depth and "D" is pipe diameter, it is considered undersized and will need to be replaced. The model does not account for flow attenuation through the conveyance system, which results in a conservative model, particularly in downstream reaches.

6.4.2 Modeling Scenarios

Three scenarios were developed to analyze the Monroe wastewater conveyance system, as summarized by the following:

- Existing Scenario (2015) – The existing facilities were calibrated against 2011, 2012 and 2013 flow data. Projected 2015 sewered population of 15,087 residents and 8,996 employees was distributed within the current City limits and used for analyzing the existing system.
- 2021 Scenario – Projected sewered population of 17,149 residents and 9,798 employees was distributed within the current City limits.
- 2035 Scenario – Projected sewered population of 22,703 residents and 11,693 employees was distributed within the current City limits.
- Build-out Scenario – Projected sewered population of 30,017 residents and 13,608 employees was distributed within the current City limits and the UGA area. Assumes the current City limit is fully developed.

As it is unknown exactly how undeveloped parcels within the UGA will develop, assumptions about where sewer facilities for future mini-basins will connect to existing facilities were made based on topography and proximity. These assumed connection points or nodes were then used as mini-basin input nodes for the future facilities. In these cases the assumed connection points were likely locations for connection of gravity sewers. The model details are provided as Appendix SS-B.

6.4.3 Calibration

Since totalizing flow meters are not installed at the pump stations and several invert elevations at manholes were estimated by linear interpolation, the best effort was made to calibrate the model to WWTP flow meter data. The conservative nature of the model and the relatively low flows of a majority of the mini-basins compared to the size and conveyance capacity of the sewer pipes minimize the effect of the lack of calibration data.

6.5 Hydraulic Modeling Analysis

6.5.1 Modeling Deficiency Criteria

The purpose of the modeling work is to determine deficiencies in the City's collection system. Deficiencies in the collection system are defined as:

- Gravity Pipe Segments: the flow depth is equal to twice the pipe diameter, or d/D of 2.
- Force Mains: the flow velocity exceeds 8 feet per second (fps).
- Pump Stations: the rated capacity is exceeded

6.5.2 Existing (2015) System Performance

The 2013 sewer system was evaluated to calibrate the model to 2013 flows and populations. The existing sewer system was analyzed using the 2015 projected populations to determine if there are existing deficiencies. Tables SS 6-1 and 6-2 provide a summary of the deficiencies in the existing collection system and pump stations.

Table SS 6-1 Existing (2015) Collection System Piping Deficiencies

Location[1]	Capacity at d/D of 2 (gpm)	Modeled Peak Hour Flow (gpm)
Along West Main St. to Park Place PS	1,143	1,428
Along 177th Ave SE (DOC effluent) to West Main St	792	1,229

Notes:
1) The two locations listed correspond to a single gravity pipe reach.

Appendix SS-B provides the results of the hydraulic analysis.

6.5.3 2021 Modeling Results

Following calibration of the model, 2021 projected peak hour flows were modeled to determine if there are projected deficiencies in 2021. For this scenario, there are no additional deficient gravity sewers, pump stations, or force mains from the 2015 scenario.

6.5.4 2035 Modeling Results

2035 projected peak hour flows were modeled to determine if there are deficiencies when the City reaches the projected population for 2035. For this scenario, there are no additional deficient gravity pipes to the previous scenarios. However, there are additional deficiencies associated with pump station capacity exceedance. Table SS 6-2 provides a summary of the projected pump station deficiencies for the 2035 scenario. Furthermore, the Fryelands Pump Station force main flow velocity exceeds the criteria of 8 fps. This deficiency is summarized in Table SS 6-3.

Table SS 6-2 2035 Sewage Pump Station Deficiencies

Pump Station	Existing Capacity (gpm)	Modeled Peak Hour Flow (gpm)
Fryelands	750	779
South Fryelands	450	454
Valley View	1,650	1,851

Table SS 6-3 2035 Force Main Deficiencies

Pump Station	Force Main Length (ft)	Force Main Capacity[1] (gpm)	Modeled Peak Hour Flow (gpm)	Modeled Velocity (fps)
Fryelands	4,667	705	779	8.84

Notes:
1) Force main capacities calculated using the maximum velocity criteria of 8 ft/s.

6.5.5 Build-out Modeling Results

Build-out projected peak hour flows were modeled to determine if there are projected deficiencies when the City is at build-out. Tables SS 6-4, 6-5 and 6-6 provide a summary of the projected deficiencies in the collection system, pump stations, and force mains for the build-out scenario.

Table SS 6-4 Build-Out Collection System Piping Deficiencies

Location	Capacity at d/D of 2 (gpm)	Modeled Peak Hour Flow (gpm)
Fryelands Blvd. (Fryelands PS influent)	595	607

Table SS 6-5 Build-Out Sewage Pump Station Deficiencies

Pump Station	Existing Capacity (gpm)	Modeled Peak Hour Flow (gpm)
Fox Meadows	125	133
Park Place	1,700	2,021
West Main	115	126

Table SS 6-6 Build-Out Force Main Deficiencies				
Pump Station	**Force Main Length (ft)**	**Force Main Capacity$^{(1)}$ (gpm)**	**Modeled Peak Hour Flow (gpm)**	**Modeled Velocity (fps)**
Valley View	7,865	2,820	2,975	8.44

6.5.6 Southwest Study Area Hydraulic Analysis

A separate model scenario was run that included the Southwest Study Area. The calculated peak hour flows were loaded into the existing system at the intersection of Fryelands Blvd. and West Main St. where the system flows by gravity to the South Fryelands Pump Station. The Southwest Study Area flows did not cause any additional deficiencies in the sewer system. The model details are provided as Appendix SS-B.

Chapter SS 7 Wastewater Treatment Plant

7.1 Introduction

Chapter SS 7 provides a summary of the analysis that was performed to evaluate the City's Wastewater Treatment Plant (WWTP) for its ability to meet treatment objectives over the planning period.

The WWTP liquid stream consists of a headworks structure with two mechanical fine screens, an influent lift station and a mechanical vortex type grit removal system. The screened and degritted influent flows by gravity to two rectangular primary clarifiers, three aeration basins with anoxic and aerobic zones, two circular secondary clarifiers, ultraviolet light (UV) disinfection and an effluent pump station. The disinfected WWTP effluent is discharged to the Skykomish River.

The solids stream includes three aerobic digesters in series, sludge transfer pumps and a belt press for dewatering. The dewatered sludge is truck hauled to the former compost facility site at the Monroe Correctional Complex where it is stored for a period and then reloaded onto larger trailers for delivery to a Beneficial Use Facility by a contract hauler. The sludge cake is incorporated into the soil (beneath the surface) in order to meet the vector attraction reduction requirement.

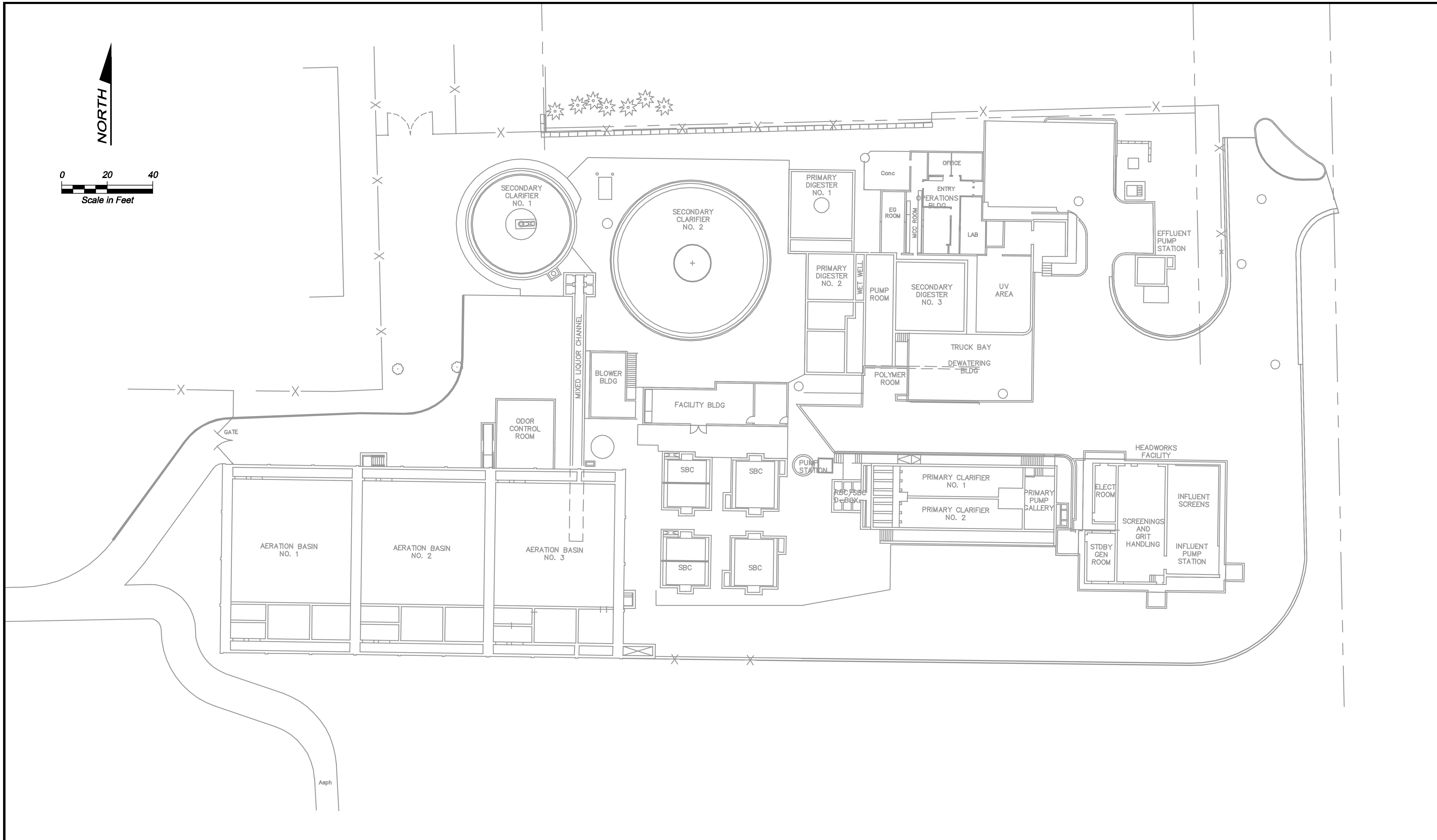
A detailed description of the existing unit processes is presented in Section SS 7.8.

The original primary WWTP was built in the late 1950s and was expanded in 1975 to secondary treatment using rotating biological contactors (RBCs). In 1995, the WWTP was upgraded for added capacity. These Phase I Improvements included the addition of rectangular primary clarifiers, submerged biological contactors (SBCs), a new circular secondary clarifier, a primary aerobic digester, and a new outfall into the Skykomish River. In 2000, the City replaced the chlorine gas disinfection system with UV light disinfection.

The Phase II Improvements in 2002 included removal of the rectangular secondary clarifiers and the RBCs (from 1975), and the installation of three new aeration basins and a second circular secondary clarifier. This improvement also included a new belt filter press dewatering system.

The Phase III Improvements in 2012 included a new headworks with new influent screens, influent pumps and grit removal, increased UV disinfection capacity; and new effluent pumps. In 2014 an energy conservation project was implemented to add two new turbine blowers and fine bubble panel diffusers.

The WWTP layout is presented as Figure SS 7.1.



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MONROE WASHINGTON

Existing WWTP Site Plan

Monroe Comprehensive Sewer Plan
March 2015

Figure
SS 7.1

7.2 Treatment Requirements

The WWTP operates under the terms of NPDES Permit No. WA-002048-6 last re-issued on April 26, 2012. The permit expires on May 31, 2017. There were no significant changes from the prior permit effluent limits, except the requirements to test for mercury and toxicity were dropped based on low detected concentrations during the prior permit cycle. A copy of the draft permit is included as Appendix SS-E.

The treatment WWTP effluent requirements established by the permit are a maximum monthly concentration of 30 milligrams per liter (mg/L) for biochemical oxygen demand (BOD), 30 mg/L for total suspended solids (TSS), and 200 per 100 mL for fecal coliform. There is no effluent limit for ammonia or total nitrogen.

7.3 Treatment Performance

Based on a five year record of WWTP daily monitoring reports (DMRs, included as Appendix SS-D), the WWTP effluent quality has been excellent. Over the last year effluent BOD and TSS concentrations have averaged approximately 5.5 and 12.5 mg/L, respectively. Effluent ammonia and total Kjeldahl nitrogen (TKN) concentrations have averaged approximately 0.26 mg/L and 2.7 mg/L, respectively.

7.4 NPDES Permitted Capacity and Historical Loading

The NPDES permit specifies the permitted capacity of the WWTP. The WWTP is permitted to treat a maximum monthly flow of 2.84 MGD, a maximum month BOD load of 6,090 pounds per day (lbs/day) and a maximum month TSS load of 5,940 lbs/day. The "maximum month" criterion is the highest monthly average loading in one calendar year.

Section S4.B of the NPDES Permit states that the City needs to submit a plan and schedule to the Department of Ecology (Ecology) to maintain capacity if the influent flow or load reaches 85 percent of the design criteria for three consecutive months. The three consecutive monthly measurements that will trigger the Section S4.B requirement for flow, BOD, or TSS are 2.41 MGD, 5,177 lbs/day, and 5,049 lbs/day respectively. Table SS 7-1 shows the historic influent flow and load record for the period from 2009 through 2013.

Table SS 7-1 WWTP Historic Flows and Loads (with DOC Lagoons on-line)

Year	Flow, MGD			BOD, lbs/day			TSS, lbs/day		
	Avg Annual	Max Month	Max Day	Avg Annual	Max Month	Max Day	Avg Annual	Max Month	Max Day
2009	1.48	1.84	2.96	3,465	4,227	7,525	3,383	4,457	16,015
2010	1.48	1.74	3.19	3,481	4,376	8,588	3,116	5,179	8,658
2011	1.50	1.89	2.89	3,154	4,405	7,902	3,536	4,447	10,392
2012	1.63	2.22	3.64	3,698	4,405	9,120	3,221	4,314	7,422
2013	1.55	1.94	3.18	3,140	4,018	4,879	3,329	4,963	13,489
Permit Limit		**2.84**			**6,090**			**5,940**	
85 % of Limit		2.41			5,177			5,049	

Notes:
1) Gray shaded cells denote maximum value over the analyzed period.

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The influent flows and loads are well below the rated WWTP capacity. The maximum month flows have averaged about 1.93 MGD over the last five years and are only about 68 percent of the WWTP design flow capacity. The maximum month BOD loads have averaged about 70 percent of the WWTP design BOD capacity. TSS loading has averaged nearly 80% of the permitted limit and exceeded the 85 percent limit for one month in 2010.

7.5 Violations and Bypasses

The WWTP has consistently met the effluent limitations and remained in compliance with the NPDES Permit. The WWTP has never had to bypass.

7.6 Future Capacity Evaluation

A capacity analysis has been conducted as part of this Plan to predict equipment or processes, if any, that are likely to exceed their ability to treat WWTP flows and loads over the planning period. The capacity analysis assumes a worst-case loading with the Department of Corrections Monroe Correctional Complex (DOC) Lagoons out of service and providing no treatment prior to discharging into the collection system.

Projections for future BOD and TSS loads were extrapolated through the predicted population growth and associated flows for the City of Monroe service area in Chapter SS 5. The flow projections for the WWTP predict a maximum monthly flow of 2.34 in 2021 and 2.96 MGD in 2035. The predicted build-out maximum month flow is 3.24 MGD.

It is projected that the WWTP capacity will reach 85 percent of the permitted capacity in 2023, and the permitted capacity in 2032.

Projected future flows in Table SS 7-5 were determined in Chapter SS 5.

7.6.1 DOC Loading Criteria

To determine the effect of bypassing the DOC Lagoons and their impact on the WWTP capacity, the previously performed *Sanitary Sewer System Plan* by Gray & Osborne, Inc. (2008) and *Final Engineering Report/Facility Plan* by Earth Tech, Inc. (2000) were evaluated for historical DOC loading data. A preliminary analysis was conducted to develop the extent of treatment that was being provided by the DOC Lagoons. Evaluating the recorded historical the estimated annual average loading BOD and TSS removal in the Lagoons is approximately 83 percent and 82 percent respectively assuming both DOC Lagoons in operation.

To determine loading pounds per inmate per day (lb/inmate/d), the influent DOC data from the previous studies were applied to estimate average per inmate loadings produced prior to any treatment. Table SS 7-2 represents the extracted data from the two studies:

Table SS 7-2 Department of Corrections Loading Criteria			
Constituent	**Earth Tech (2000) (lb/inmate/d)**	**G&O (2008) (lb/inmate/d)**	**Average[(1)] (lb/inmate/d)**
Annual Average BOD	0.46	0.32	0.37
Max Month BOD	0.65	0.51	0.57
Annual Average TSS	0.33	0.33	0.33
Max Month TSS	0.49	0.74	0.65

Notes:
1) Calculated by a weighted average of the DOC population given in each study.

7.6.2 Residential/Non-Residential Loading Criteria

The DOC Lagoon removal efficiencies and Table SS 7-2 loading criteria were applied to determine the DOC Lagoon discharge loadings for the evaluation period of 2011 through 2013. Multiplying the per-inmate loading by the DOC population and DOC Lagoon removal percentage determined the WWTP loading from the DOC Lagoons:

> (Pounds per inmate per day) X (number of inmates) X (1.0 - % removal by lagoons) = estimated pounds per day DOC Lagoon effluent loading on WWTP

Subtracting the DOC Lagoon treated effluent load from the Daily Monitoring Reports (DMRs) from the WWTP then determines the residential/non-residential loading from the City of Monroe. Table SS 7-3 provides a summary of the residential/non-residential loading criteria determined by dividing the calculated City of Monroe loadings by the current population.

Table SS 7-3 Residential and Non-residential Loading Criteria					
Year	**Residential / Non-Residential Population**	**Annual Average BOD Loading (lb/cap/d)**	**Max Month BOD[(1)] Loading (lb/cap/d)**	**Annual Average TSS Loading (lb/cap/d)**	**Max Month TSS[(1)] Loading (lb/cap/d)**
2011	18,941	0.16	0.21	0.18	0.22
2012	19,305	0.18	0.21	0.16	0.21
2013	19,670	0.15	0.19	0.16	0.24
Average	**19,305**	**0.16**	**0.20**	**0.17**	**0.22**

Notes:
1) Calculation assumes DOC annual average loading during max month WWTP loading.

7.6.3 Projected WWTP Loading

Applying the above average loading criteria's in Tables SS 7-2 and 7-3, the projected 2015 WWTP loading with no DOC Lagoon treatment was computed. Table SS 7-4 below shows the impact of loading at the WWTP if the Lagoons were bypassed.

Table SS 7-4 Projected Monroe WWTP Loading

Year	Residential/Non-Residential Population	DOC Inmate Population	BOD (ppd)		TSS (ppd)	
			Annual Average	Max Month(1)	Annual Average	Max Month(1)
2015	20,395	2,500	4,292	5,545	4,215	6,100
2021	23,112	2,601	4,779	6,155	4,702	6,765
2035	30,210	2,838	6,042	7,731	5,965	8,484

Notes:
1) Calculation assumes max month DOC and residential/non-residential events occur simultaneously.
2) Gray shaded cells denote loads that exceed the NPDES limits presented in Section SS 7.4.

The projected BOD loading in 2021 is anticipated to exceed the WWTP NPDES permitted maximum month of 6,090 lbs/day BOD by the year 2020. The projected TSS in 2015 is anticipated to exceed the WWTP NPDES permitted max month of 5,940 lbs/day TSS if the DOC Lagoons are bypassed.

7.7 NPDES TSS and BOD Limits

The WWTP projected TSS and BOD loads are likely to be exceeded during the planning period and is interpolated to occur in 2015 and 2020 respectively as previously mentioned. This NDPES limit exceedance case is based on bypassing the DOC Lagoons. Current operations utilize the DOC Lagoon and when considering them as on-line the projected loadings to the WWTP are:

- 85 percent permitted TSS loading would likely be exceeded if DOC Lagoons come off line and the NPDES TSS limit likely exceeded in 2023.
- 85 percent permitted BOD loading will likely be reached in 2021 with no DOC Lagoons in operation and the NPDES BOD limit likely exceeded in 2032.

Note that exceeding 85 percent permitted levels for three consecutive months triggers the DOE required plan and schedule to maintain capacity as previously mentioned.

However, preliminary evaluation of the biological process suggests sufficient capacity beyond the NPDES loading limits without any changes to the WWTP process. A WWTP capacity study prior to the next NPDES permit renewal can be utilized to rerate the WWTP NPDES permitted BOD and TSS loads.

7.8 Unit Process Descriptions

The following is a detailed narrative description of the existing unit treatment components that are included in Table SS 7-5 for capacity evaluation.

7.8.1 Headworks

Wastewater enters the facility by gravity at the headworks structure, which includes influent screening, lift pumps and grit removal. The screening facility includes two mechanical screens with a screen opening of 3 mm and a capacity of 6.17 MGD each, and one manual bypass bar screen with an opening of 3/8 inches. Screenings are conveyed to a washer/compactor and are discharged to a dumpster.

Figure SS 7.2 Headworks mechanical screens

Figure SS 7.3 Screening washer/compactor

The screened sewage is discharged to two wet wells. The east wet well contains three (2 duty plus one standby) submersible pumps, each with a capacity of 4.0 MGD. The west wet well contains two submersible pumps, each with a capacity of 1.0 MGD. The total capacity is approximately 14.0 MGD and the total firm capacity (the capacity with the largest pump out of service) is 10.0 MGD. Each pump has a separate discharge pipe that discharges to a common grit influent channel. Each discharge line has a flow meter.

The grit capture system is a 12-foot diameter mechanical vortex basin with a capacity of 12.0 MGD. The captured grit is pumped to two, 250 gpm each, cyclone washing units and then to a grit classifier.

7.8.2 Primary Clarifiers

Sewage from the headworks flows by gravity to a splitter box and then to one of two rectangular primary clarifiers. The primary clarifiers provide for gravity settling of settleable solids and skimming of floatables. The primary clarifiers are designed for 45 percent removal of suspended solids and 25 percent removal of BOD prior to the secondary process. Each primary clarifier is 13 feet wide by 66 feet long, for a surface area of 858 square feet (sf) each, or 1,716 sf total. Based on a maximum design peak hour surface overflow rate of 2,500 gpd/sf, the primary clarifiers have a peak hour flow capacity of 4.3 MGD.

Figure SS 7.4 Primary Clarifiers

The primary clarifiers were constructed with the Phase I improvements in 1995, so the equipment is approximately 19 years old and is nearing the end of its 20 year expected life. *It is recommended that the equipment and the drives, main and cross collector chains and flights, the scum skimmers and launders be replaced in the next several years.*

7.8.3 Aeration Basins

Effluent from the primary clarifiers flows into a splitter box and then by gravity to the aeration basins or SBC basins. The SBC basins are not being used because they were not designed to nitrify.

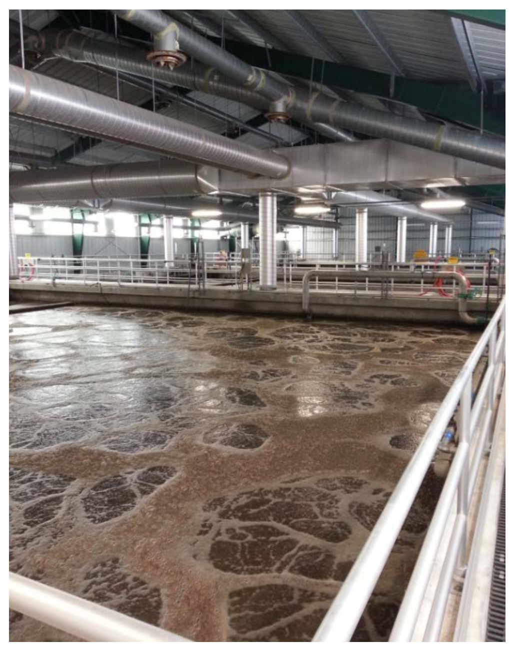

Figure SS 7.5 Aeration Basins

The aeration basins consist of three trains, each include four small anoxic selector and denitrification tanks in series with a total volume of 98,600 gallons per train, followed by a larger aerobic aeration tank with a volume of 368,000 gallons per train. The aeration basin has a design solids retention time of 10.9 days, which is sufficient for complete ammonia nitrification.

Nitrification uses alkalinity and there is insufficient influent alkalinity to buffer the demand. As a result, the WWTP has had to add about 120 gpd of alkalinity. Improving the denitrification process by eliminating dissolved oxygen in the anoxic zones is part of the on-going aeration improvement project by eliminating air mixing.

Two new turbine blowers and mechanical mixers have recently been installed to improve the aeration process. The blowers have a capacity of 2,000 scfm each. *It is recommended that the two existing centrifugal blowers be replaced with one turbine blower to improve efficiency in the* *future when all three basins are online and to relieve additional control strategies and operational issues between turbine and non-turbine blowers.*

7.8.4 Secondary Clarifiers

Figure SS 7.6 Secondary Clarifier No. 2

Mixed liquor from the aeration basins flows by gravity through a channel to a distribution box, where the flow can be manually split to two circular secondary clarifiers. Clarifier No. 1 was built in 1995 and has a diameter of 42 feet. Clarifier No. 2 was built in 2002 and has a diameter of 64 feet.

Sludge collected in the clarifiers is recycled to the head of the aeration basins using four return activated sludge (RAS) pumps, two per clarifier. Two waste activated sludge (WAS) pumps convey a portion of the sludge to the aerobic digesters.

Clarifier No. 1 is being run as a combination secondary clarifier and sludge thickener. RAS rates are purposefully reduced to maximize WAS and RAS densities outside conventional secondary clarifier strategies. Even though Clarifier No.1 has 30 percent of the total surface area, only 20 percent (approximate) of the flow is directed to this clarifier. The cone bottom, scraper clarifier is able to achieve WAS concentrations of 16,000 to 20,000 mg/L. Clarifier No. 2, which is a flat bottom draft tube type clarifier, only achieves approximately 7,000 to 8,000 mg/L.

7.8.5 UV Disinfection

Clarified effluent from the secondary clarifiers flows by gravity to four in-line, closed vessel, medium-pressure, high-intensity ultraviolet light (UV) disinfection units. The units were installed with the Phase III upgrades in 2012. Each UV reactor has a design capacity of 2.5 MGD, for a total capacity of 10 MGD, and a firm capacity of 7.5 MGD. The UV system design was based on providing a dose of 25mJ/cm^2 with a minimum transmittance of 55 percent.

7.8.6 Outfall and Receiving Waters

The outfall receiving water is the Skykomish River. UV disinfected effluent flows by gravity through the outfall pipeline that consists of 24-inch and 30-inch diameter concrete pipes to four 12-inch diameter diffusers submerged in the river. The total length of the outfall is

Figure SS 7.7 UV in-line units

approximately 1,500 feet. Effluent pumping is necessary when the water surface elevation of the river exceeds 50.41 feet at MMF or 46.19 feet at peak hour flow (PHF) of 9.8 MGD. The Skykomish River water level in the vicinity fluctuates from as low as approximately 37 feet to as high as the 100 year flood elevation of 56 feet.

7.8.7 Effluent Pump Station

Normally, disinfected effluent flows by gravity to the outfall in the Skykomish River. However, during periods of high flow and/or high river levels effluent pumping is necessary. The Effluent Pump Station, which was built in 2002 and upgraded in 2012, consists of 3 pumps (2 duty; 1 standby) each with a rated capacity of 5.0 MGD. The total capacity is approximately 15.0 MGD and the total firm capacity (the capacity with the largest pump out of service) is 10.0 MGD.

7.8.8 Sludge Handling

The primary and secondary sludge is pumped to three aerobic digester tanks in series, which provide partial digestion. The three tanks have a total volume of about 240,000 gallons and provide a solids retention time of about 6.5 days at 2.0 percent solids concentration. Although this is far short of the 42-day retention time necessary to meet pathogen reduction criteria for Class B biosolids based on retention time and does not yield the 38 percent volatile solids destruction typically used to meet the vector attraction reduction standard (VAR), there is also significant sludge stabilization occurring in the extended aeration secondary treatment process. For that reason, the City is able to meet the Class B pathogen standard by testing for pathogen densities, and is meeting the VAR standard by incorporating the solids beneath the soil at the land application site.

Figure SS 7.8 Belt filter press

It is recommended that the WWTP install a mechanical thickener prior to aerobic digestion to increase solids retention time. A mechanical thickener on the waste activated sludge stream solids would result in a solids retention time of approximately 20 days. The thickener will also increase the solids inventory in the tanks. These improvements will yield improved stabilization, pathogen reduction and volatile solids destruction.

After partial digestion the sludge is dewatered using a 1.5 meter belt filter press with a hydraulic capacity of 120 gpm. The dewatered sludge cake is hauled in the City's 5 cubic yard dump truck to the former composting site at the DOC. The City normally operates the belt press for 5 or 6 days per week and makes three truck runs for each dewatering day (approximately 15 to 18 per week). At the DOC the loads are consolidated into commercial haul trucks for transport to the agricultural land application site.

The existing belt filter press produces sludge cake with about 16 percent total solids. *It is recommended the City evaluate installing an enclosed, smaller footprint dewatering unit capable* *of achieving higher cake solids concentrations.* Dewatering units can produce 20 percent and higher total solids. This decreases cake volumes for hauling and land application by a minimum of 20 to 25 percent or approximately 3 to 4 cubic yards per day.

7.8.9 Odor Control

Foul air generated by the WWTP is treated in order to avoid consequent odor impacts on the adjacent Skykomish River Centennial Park and nearby residences. The WWTP has two foul air collection and treatment systems: one system collects foul air from the headworks, primary clarifiers, SBCs, aerobic digester tanks, and sludge dewatering area, and the second collects air from the aeration basins. The hydrogen sulfide, ammonia, and other odorous compounds are removed from the collected foul air using packed-bed towers with sodium hypochlorite (NaOCL) and sodium hydroxide (NaOH) combined with water spray.

To improve current operations, it is recommended that the City install a ventilation hood above the existing belt press to improve odor control in the dewatering facility.

7.9 WWTP Unit Process Capacity Evaluation

In addition to the overall WWTP NDPES limits, the capacity of the WWTP's individual unit processes were evaluated against typical design values, as shown in literature that is widely consulted in the wastewater engineering field, including *"Wastewater Engineering: Treatment and Reuse"*, Metcalf & Eddy; *"Design of Municipal Wastewater Treatment Plants"*, prepared jointly by the Water Environment Federation (WEF) and American Society of Civil Engineers (ASCE); and *"Criteria for Sewage Works Design"* (Orange Book) by the Washington State Department of Ecology.

Using these projections the capacities of the unit processes were compared with commonly accepted design values, as summarized in Table SS 7-5. The capacity for the mechanical equipment used was based on the manufacturer's rating and the WWTP design data.

7.9.1 Unit Process Capacity

The process unit WWTP capacity limitations that were identified for the projected flows and loads are summarized in Table SS 7-5. Table SS 7-5 is based on the DOC Lagoons being out of service. Shaded cells show processes which exceed normal design standards or the NDPES permit. Following Table SS 7-5 is an evaluation of each identified capacity limitation.

Table SS 7-5 Monroe WWTP Flows and Loads (No DOC Lagoon)

Design / Plant Component	Design	DMR Data 2011 to 2013	NPDES Permit	Projected 2015	Projected 2021	Projected 2035	Metcalf and Eddy Typical	Metcalf and Eddy Range	Orange Book Range
Flow, MGD									
Average Annual	2.19	1.56		1.63	1.81	2.30			
Maximum Month	2.84	2.01	2.84	2.10	2.34	2.96			
Maximum Day	5.10	3.24		3.37	3.75	4.76			
Peak Hour	7.90	6.77		6.94	7.73	9.80			
BOD_5, lbs/day									
Average Annual	4,710	3,337		4,292	4,779	6,042			
Max Month AVG	6,090	4,405	6,090	5,545	6,155	7,731			
TSS, lbs/day									
Average Annual	4,700	3,355		4,215	4,702	5,965			
Max month AVG	5,940	4,963	5,940	6,100	6,765	8,484			
Total Kjeldahl Nitrogen (TKN), lbs/day									
Average annual				611	680	862			
Max month AVG	950			787	877	1,111			
Screening									
Mechanical screens:									
Number, each	2								
Opening size, mm (in)	3 (1/8)								
Capacity, each, MGD	6.17								
Capacity, total, MGD	12.3								
Manual screen:									
Number, each	1								
Opening size, mm (in)	9 (3/8)								

Table SS 7-5 Monroe WWTP Flows and Loads (No DOC Lagoon)

Design / Plant Component	Design	DMR Data 2011 to 2013	NPDES Permit	Projected 2015	Projected 2021	Projected 2035	Metcalf and Eddy Typical	Metcalf and Eddy Range	Orange Book Range
Influent Pumps									
Type	Submersible centrifugal pumps								
Large pumps:									
Number, each	2 + 1								
Capacity, each, MGD	4.0								
Small pumps:									
Number, each	2								
Capacity, each	1.0								
Total firm capacity , MGD	10.0	(with largest out of service)							
Grit Removal									
Type	Mechanical vortex								
Number, each	1								
Diameter, feet	12.0								
Capacity, MGD	12.0								
Primary Clarifiers									
Number, each	2						Tables 5-21		
Straight Length, feet	66						80-130	50-300	> 10
Width, feet	13						16-32	10-80	< 24
Side water depth, average, feet	10						14	10-16	8-14
Settling Area each, sq feet	858								
Volume/unit, gal	64,178								
Hydraulic Loading/unit, MGD									
@ design avg annual flow	1.10	0.78		0.81	0.91	1.15			
@ design max month flow	1.42	1.01		1.05	1.17	1.48			

Table SS 7-5 Monroe WWTP Flows and Loads (No DOC Lagoon)

Design / Plant	Design	DMR Data	NPDES Permit	Projected			Metcalf and Eddy		Orange Book
Component		2011 to 2013		2015	2021	2035	Typical	Range	Range
@ peak hour flow	3.95	3.39		3.47	3.87	4.90			
Surface loading rate/unit, gpd/sf:							Table 5-20		
@ design avg annual flow	1,276	908		948	1,056	1,338	1200	800-1200	800-1200
@ design max month flow	1,655	1,173		1,222	1,362	1,725			
@ peak hour flow	4,604	3,947		4,045	4,507	5,710	2500	2000-3000	2000-3000
Detention Time/unit, hr									
@ design avg annual flow	1.57	2.20		2.11	1.90	1.50	2.0	1.5-2.5	
@ design max month flow	1.21	1.71		1.64	1.47	1.16			
@ peak hour flow	0.39	0.45		0.44	0.40	0.31			
Anoxic Tank									
Number, each	3								
Length, feet	57								
Width, feet	15								
Side water depth, feet	16								
Total volume each, cubic feet	13,680								
Volume each, MG	0.102								
Total volume, MG	0.31								
Total Detention Time, hr									
@ design avg flow	3.4	4.7		4.5	4.1	3.2			
@ design max month flow	2.6	3.7		3.5	3.2	2.5	0.2 to 2.0		
@ peak hour flow	0.9	1.1		1.1	1.0	0.8			

Table SS 7-5 Monroe WWTP Flows and Loads (No DOC Lagoon)

Design / Plant	Design	DMR Data	NPDES Permit	Projected			Metcalf and Eddy		Orange Book
Component		2011 to 2013		2015	2021	2035	Typical	Range	Range
Aeration Basins									
Number, each	3								
Length, feet	57								
Width, feet	54								
Side water depth, feet	16								
Total volume each, cubic feet	49,248								
Volume each, MG	0.368								
Total volume, MG	1.11								
Hydraulic loading/unit, MGD									
@ design avg annual flow	0.73	0.52		0.54	0.60	0.77			
@ design max month flow	0.95	0.67		0.70	0.78	0.99			
Total Detention Time, hr									
@ design avg flow	12.1	17.0		16.3	14.6	11.5	Table 8-16		
@ design max month flow	9.3	13.2		12.6	11.3	9.0		3 - 6	6 - 15
MLSS Conc, mg/L	3,000						2500	1500-4000	1500-3500
MLSS mass/basin, lbs.	9,217								
BOD loading/ basin, lbs	assumes 30% BOD removal in PC's								
@ design avg annual BOD	1,099	779		983	1,097	1,410			
@ design max month BOD	1,421	1,028		1,294	1,436	1,804			
F:M Ratio, max mo.	0.154	0.112		0.140	0.156	0.196		0.2 - 0.6	
Sludge Yield, lbs/lb BOD	0.62	0.62		0.62	0.62	0.62			0.6 - 0.75
SRT, days									
@ average annual BOD	13.5	19.1		15.1	13.6	10.5			5-15 days
@ design max month BOD	10.5	14.5		11.5	10.4	8.2	8-10 days	3-15 days	

Table SS 7-5 Monroe WWTP Flows and Loads (No DOC Lagoon)

Design / Plant Component	Design	DMR Data 2011 to 2013	NPDES Permit	Projected 2015	Projected 2021	Projected 2035	Metcalf and Eddy Typical	Metcalf and Eddy Range	Orange Book Range
Aeration Blowers									
Turbine Blowers									
Number, each	2 duty								
Capacity,each, scfm @8 psi	2,000								
Centrifugal Blowers									
Number, each	2 standby								
Capacity, cfm @8 psi	1,020								
Total firm capacity, scfm	4,000								
Actual O_2 req'd, lbs/ day @ mm				6,805	7,563	9,531			
AOR/SOR	0.48								
Std O_2 req'd, lbs/ day @ mm				14,177	15,756	19,855			
Air Required, scfm				1,451	1,655	2,401			
Secondary Clarifiers									
Number, each	2								
Number 1:									
Diameter, feet	42								
Side water depth, feet	13.0								
Settling area, each, sf	1,385								
Number 2:									
Diameter, feet	64								
Side water depth, feet	16.0								
Settling area, each, sf	3,217								
Total surface area, sf	4,602								

Table SS 7-5 Monroe WWTP Flows and Loads (No DOC Lagoon)

Design / Plant Component	Design	DMR Data 2011 to 2013	NPDES Permit	Projected 2015	Projected 2021	Projected 2035	Metcalf and Eddy Typical	Metcalf and Eddy Range	Orange Book Range
Surface loading rate/ gpd/sf:							Table 8-7		
@ design avg flow	714	508		530	591	749		400-700	
@ design max month flow	926	656		684	762	965			
@ peak hour flow	2,947	2,527		2,589	2,885	3,655		1,000-1,600	
Solids loading rate/unit, lb/sf·h	assumes 50% return activated sludge (RAS)								
@ design avg flow	0.74	0.53		0.55	0.62	0.78		0.8 - 1.2	
@ design max month flow	0.97	0.68		0.71	0.79	1.01			
@ peak hour flow	2.68	2.30		2.36	2.63	3.33		1.6	
UV Disinfection									
Type	In-line medium pressure, high intensity UV								
Peak design flow, each, MGD	2.5								
Number of units	3 + 1								
Total firm capacity, MGD	7.5	(with largest out of service)							
Peak Hour Flow		6.8		6.9	7.7	9.8			
Design transmittance, %	≥ 55								
Total suspended solids, mg/L	≤45								
UV Dose, mJ/cm2	25,000								
Effluent Pumps									
Type	Vertical turbine								
Number, each	2 + 1								
Capacity each, MGD:	5.0								
Total firm capacity , MGD	10.0								

Table SS 7-5 Monroe WWTP Flows and Loads (No DOC Lagoon)

Design / Plant Component	Design	DMR Data 2011 to 2013	NPDES Permit	Projected 2015	Projected 2021	Projected 2035	Metcalf and Eddy Typical	Metcalf and Eddy Range	Orange Book Range
Primary Sludge Production	Based on 50% TSS removal								
Primary sludge, lbs/day									
@ design avg	2,761	1,678		2,107	2,351	2,982			
@ design max month	2,997	2,482		3,050	3,382	4,242			
Primary sludge concentration	4.0%								
Primary sludge , gpd									
@ design avg	8,276	5,029		6,317	7,047	8,940			
@ design max month	8,984	7,439		9,143	10,139	12,715			
Secondary Sludge Production	Based on 0.62 lbs / lb BOD removed								
Secondary sludge, lbs/day									
@ design avg	1,866	2,069		2,613	2,915	3,746			
@ design max month	2,419	2,731		3,438	3,816	4,793			
Secondary sludge concentration	1.0%								
Secondary sludge , gpd									
@ design avg	22,374	24,811		31,332	34,951	44,913			
@ design max month	29,005	32,747		41,225	45,753	57,470			
Total Sludge, gpd									
@ design avg	30,650	29,839		37,649	41,998	53,853			
@ design max month	37,989	40,186		50,367	55,892	70,185			
Total Sludge, ppd									
@ design avg	4,627	3,747		4,720	5,266	6,728			
@ design max month	5,416	5,213		6,488	7,198	9,035			

Table SS 7-5 Monroe WWTP Flows and Loads (No DOC Lagoon)

Design / Plant	Design	DMR Data	NPDES	Projected			Metcalf and Eddy		Orange Book
Component		2011 to 2013	Permit	2015	2021	2035	Typical	Range	Range
Aerobic Digesters									
Number, each	3								
Volume, total, cf	32,000								
Volume, total, gallons	239,360								
Retention time, days							Aerobic EPA Class B Regulations		
@ design avg	7.8	8.0		6.4	5.7	4.4	60 Days @ 15 ºC (single digester)		
@ design max month	6.3	6.0		4.8	4.3	3.4	42 d @ 15 ºC (two digesters in series)		
Volatile solids loading, lbs/cf/day	Assumes 75% volatile								
@ design avg	0.11	0.08		0.10	0.11	0.14			
@ design max month	0.14	0.10		0.13	0.14	0.18		0.10-0.30	
VS destruction	45%								
VS destruction, lbs/day									
@ design avg	1,562	1,265		1,593	1,777	2,271			
@ design max month	1,828	1,759		2,190	2,429	3,049			
Digester Total Solids, dry lbs/day									
@ design avg	3,065	2,482		3,127	3,489	4,457			
@ design max month	3,588	3,453		4,298	4,769	5,986			
Digested sludge concentration	3.5%								
Digested sludge volume, gpd									
@ design avg	10,501	8,504		10,714	11,951	15,270			
@ design max month	12,292	11,831		14,726	16,337	20,506			
Belt Filter Press Dewatering									
Number each	1								
Hydraulic capacity, gpm	120								

Table SS 7-5 Monroe WWTP Flows and Loads (No DOC Lagoon)

Design / Plant Component	Design	DMR Data 2011 to 2013	NPDES Permit	Projected 2015	Projected 2021	Projected 2035	Metcalf and Eddy Typical	Metcalf and Eddy Range	Orange Book Range
Solids capacity, lbs/ hr	720								
Belt press run time, hrs/week									
@ design avg	10	8		10	12	15			
@ design max month	12	12		14	16	20			

Note:
1) Gray shaded cells denote exceeded NDPES permit or unit process capacity

7.9.2 Capacity Limitations

Primary Clarification

The primary clarifiers have experienced a peak day surface overflow rate (SOR) of 3,998 gpd/sf (6.86 MGD) each in 2013. This exceeds typical design capacity peak day overflow rates of 2,500 gpd/sf (4.29 MGD). The WWTP aeration likely mitigates solids carryover during these events. There is sufficient capacity in the aeration process for these occurrences but the inert solids that can accumulate in the aeration basins can lead to issues. Heavy inert solids accumulation may become problematic requiring basin shutdowns and increased diffuser maintenance as peak hour flows increase in flow and duration.

Chemically enhanced primary treatment (CEPT) can be implemented to operate during peak hour flows. CEPT is one option but it would be advantageous for the WWTP because it alleviates expensive capital and valuable space for more primary clarifier tanks.

CEPT involves the addition of flocculants, such as alum or other metal salts and polymer, to the influent to the existing primary clarifiers. With the addition of flocculants the suspended solids coagulate into large particles that settle faster. As a result, the peak surface overflow rate can be increased from 2,500 gpd/sf to over 5,000 gpd/sf. At 5,000 gpd/sf, the existing primary clarifiers with chemical addition would have a maximum performance-based capacity of 1,716 sf x 5,000 gpd/sf = 8.58 MGD. Implementing CEPT will increase peak hour flow capacity until approximately 2027. The design SOR can be estimated by similar applications but is better determined by pilot testing. CEPT SORs depend on the water quality, chemical type, and dose.

Implementing CEPT decreases loading to the aeration basins but significantly increases primary solids production. Due to the increased primary solids the CEPT process should only be operated during peak flows. CEPT is ideal for quick start up due to the simple mechanical operation of chemical addition and flow control automation. The estimated opinion of probable project cost to implement CEPT is approximately $280,000, but does not include chemical cost. The cost of chemicals is essentially the operating cost for the CEPT process. The estimated cost to operate the CEPT process for an approximate 10 peak days per year in 2015 is $20,000 to $30,000 per year. This includes the cost for increasing sweep flocculation particle removal with a cationic polymer and pH adjustment with lime.

Alternatively, the configuration of the two existing Primary Clarifiers can facilitate the addition of a third clarifier which was envisioned in the 1995 improvements. Both CEPT and the additional of a third clarifier should be evaluated in a subsequent Engineering Report.

Secondary Clarification

The secondary clarifiers have a capacity for annual average SOR up to about 700 gpd/sf (2.15 MGD) in the year 2031 and peak day SOR is exceeding the typical design capacity of 1,600 gpd/sf (4.9 MGD) now. The projected secondary clarifier SORs assume a return activated sludge flow rate of 50%. Depending on duration of peak hour flows, the secondary clarifiers can be evaluated based on peak day flows. Short peak hour flows can be relatively attenuated in the WWTP unit processes upstream. A solids flux evaluation and increased flow metering in a rerate study can provide more information regarding capacity. Currently capacity is lost due to the Secondary Clarifier No. 1 being under loaded because it is used for waste activated sludge

(WAS) gravity thickening. A mechanical thickener will allow for Clarifier No. 1 to operate at full design flows.

Disinfection Capacity

The in-line UV units used for disinfection are calculated to treat WWTP flows through the planning period. The units do not have installed redundancy, but spare parts, alarms, and regular maintenance offset the lack of redundancy. Additionally, the Orange Book reliability requirement for disinfection contact basin design flow capacity is that if one of the largest units is out the remaining units shall be able to handle at least 50 percent of flow. The WWTP exceeds that requirement with 75 percent flow capacity remaining during 2035 peak hour flows

7.9.3 Sludge Handling Improvements

Thickening

If the WWTP reduced their waste activated sludge liquid volume, the solids retention time in the digesters will be increased. Installing a new disk thickener, floc tank, polymer system, converting an existing grit chamber to WAS storage, and new progressive cavity WAS and TWAS pumps would be required to implement this recommendation. The addition of a disc thickener, as discussed previously, would also allow the existing smaller 42-foot secondary clarifier to have greater capacity, as it would no longer have to be under-loaded to provide gravity thickening of WAS. Thickened sludge would likely also result in higher solids content to sludge dewatering. This would reduce runtime of the belt filter press and yield more concentrated sludge cake, which would then reduce the volume to be hauled away. The total project cost to install the thickening system is approximately $1,350,000.

Partially Digested Solids

The aerobic digesters at the WWTP do not have sufficient capacity to meet EPA Class B biosolids regulations by prescription. The biosolids are tested, processed and land applied in a manner that meets regulations, but this method may not always be available or the most cost effective. Application sites which are capable of sub-surface injection are limited. An additional concern for the WWTP sludge handling is the dewatered biosolids storage location at the DOC site. As mentioned previously, the City does not have controlling interest in the use of the site and there is the potential that the dewatered solids storage area may not be available in the future. The WWTP should conduct a biosolids management study to determine the most cost effective handling alternatives compared to the current biosolids practice, and to evaluate the alternatives that could relieve the use of the DOC storage site.

Two potential solids handling alternatives that should be further evaluated for implementation in a biosolids study are:

Dryer Installation

One alternative that may relieve storage issues and meet Class B or A biosolids regulations for the WWTP is to install a dryer. A dryer could accept partially, or even undigested, dewatered sludge from the existing belt filter press. Heat dryers produce Class A sludge pellets that have over 90 percent solids content. The pellets have the appearance of dry fertilizer and can be used as fertilizer for landscaping and agricultural land.

The primary advantage of the heat drying system is the significant reduction in volume compared with digested, dewatered sludge cake. The projected 2035 sludge production is 5,986 dry pounds per day during the maximum month in year 2035. Assuming a minimum 90% total solids product and approximately one ton per cubic yard of material; the plant would generate approximately 3.3 cubic yards of material per day at maximum month loading in 2035.

Biosolids dewatered to approximately 16 percent solids and 5,986 lb/d will require a dryer with a capacity of 2,500 wet pounds per hour. The estimated dryer size assumes running continuously for 4 days per week at 2035 max month loading. For operating costs, the dryer requires approximately 2.1 million BTUs (mmbtu) per hour of fuel input. Using natural gas at approximately $3.50 per mmbtu will cost about $7.35 per hour, or nearly $37,000 per year.

Dryers require a large space and need to be in relatively close proximity to the dewatering facility. A twin-screw conductive dryer with a capacity of 2,500 wet pounds per hour (such as the Therma-Flite IC 1800 or Komline-Sanderson) will require a space approximately 1,600 square feet. Space of this size is available at the SBC tanks which have been mostly abandoned at this point.

The cost of a 2,500 wet pounds per day dryer is approximately $1.25 million. The preliminary estimated opinion of probable project cost for installation, including design, construction services, new building, and materials handling equipment is approximately $8 to $9 million. Currently the dryer is the City's preferred alternative for expanding their on-site sludge handling capacity.

Anaerobic Digestion

An additional sludge handling process is to expand the digestion process to meet Class B regulations. Due to the limited space available at the WWTP site, it is not recommended that the aerobic digestion process be expanded (42-day retention), but instead to convert to anaerobic digestion (15-day retention). Anaerobic digestion requires a smaller tank volume and operation of aerobic digesters for a Monroe sized treatment plant is very expensive because of the electrical power required for aeration and mixing.

Class B sludge produced through anaerobic digestion for land application is a common sludge handling alternative used for wastewater treatment plants in a similar size range as the City's WWTP.

Based on the projected ultimate sludge production and a solids retention time of 15 days, an anaerobic digester of 50 feet in diameter by 25 feet deep would be required. This space is available at the SBC tanks, although the auxiliary equipment/process (e.g. heating, mixing systems, digested sludge holding tank) will require additional space that may be available in the existing aerobic digester building.

One of the advantages of anaerobic digestion is the volatile solids reduction and digester gas produced that can be beneficially used for heating, cogeneration, or drying.

The probable opinion total project cost of a new anaerobic digester with adjacent support building and support equipment for mixing, gas handling, heating, etc. is approximately $9 to $12 million.

7.10 Future Regulatory Issues for WWTP

The existing liquid stream processing at the WWTP regularly produces compliant effluent and the capacity of the WWTP can easily handle the projected flows and loads. However, there is one potential regulatory issue that may impact the WWTP requirements at some future date beyond the expiration date of the current permit.

Ecology is reviewing and revising surface water quality standards, WAC173-201A, with respect to human health-based standards for toxic materials. This could affect the allowable discharge standards for toxic materials, such as heavy metals, PCBs, dioxins, etc.

Ecology is basing the new standards on human risk of exposure from eating fish and shellfish that have accumulated these toxics in their tissue over time. If the quantity of fish and shellfish being consumed by humans is increased, then the concentrations of toxics being discharged will need to be reduced to result in the same exposure.

Ecology is also revising how it computes aquatic life-based standards with respect to toxics which are immediately harmful to fish in the outfall discharge zone. Ecology has previously used 7Q10 (the smallest values over 7 consecutive days in a 10 year period) to compute river low flow periods. The lowest river flow was then used to compute the allowable discharge concentrations that result in the maximum concentrations in the discharge zone. Ecology is proposing to use a new computer model to more accurately compute minimum river flows. This may also lower discharge standards for ammonia and heavy metals.

7.11 WWTP Improvements and Additional Needs

7.11.1 Structure Age / Condition

In general, concrete structures and masonry buildings have a normal service life of 50 to 60 years. The existing Main Building was constructed in 1975, so it is 39 years old and nearing the end of its useful life. Actual cost will vary per structure, but it can be conservatively estimated that the cost for selective demolition and renovation would be approximately $300 per square foot. The roof on the existing operations and dewatering buildings are in poor condition and will require replacement within the next five years. The total project cost to remove and install a new corrugated or ribbed metal roofing system is about $40 per square foot.

7.11.2 Equipment Age / Condition

In general, major sewage treatment process equipment has a service life of about 15 to 20 years. Some of the major process equipment, such as the primary clarifier sludge collection mechanisms and secondary Clarifier No. 2 sludge collection mechanism were installed in 1995. Some other equipment, such as the blowers Primary Digester No. 2 and the Secondary Digester, is even older being installed in 1975. These 20+ year old units have reached their expected service life and are being recommended for replacement. The WWTP can conduct a condition assessment survey during the next facility plan to identify major process equipment to be replaced in addition to the clarifier collection mechanisms and digester blowers identified above.

7.11.3 Equipment Obsolescence

In addition to age and condition issues, some equipment is functionally obsolete.

The WWTPs Supervisory Control and Data Acquisition (SCADA) system should be reviewed for functional obsolescence as it is 15 years old. Programmable logic controllers (PLCs), computers and other instrumentation and control equipment is generally functionally obsolete in less than 10 years, making service of older systems increasing difficult.

7.12 WWTP Conclusions and Recommendations

In conclusion, the WWTP has sufficient capacity to treat the projected BOD loads throughout the planning period. The WWTP is capable of meeting current effluent permit conditions and no changes are required to meet permit conditions at least through the next permit cycle (through 2017) assuming the DOC Lagoons stay online. Some WWTP improvements will likely be necessary during the planning period due to structure and equipment age, improved process performance and efficiency, condition and/or obsolescence.

It is recommended that an Engineering Report be prepared to explore and address the following issues in detail:

- Replacement (or standby) of the belt filter press with a new dewatering unit
- Major process equipment replacement, including schedule and capital cost estimates
- Replace two (2) existing centrifugal blowers with one (1) new turbine blower
- SCADA and other instrumentation and control equipment update/replacement
- Primary clarification peak hour capacity

The proposed studies and improvements in Table SS 7-6 should be included within the 6 year capital improvements plan for the WWTP. Those not identified to be evaluated in an Engineering Report are either considered maintenance items, or the City is contemplating inclusion of these into a project with a certified Energy Services Company.

Table SS 7-6 Summary of Proposed Studies and Improvements

Proposed Items	Total Project Costs
WWTP Rerating Study	$30,000
Biosolids Management Study	$50,000
Primary clarifier capacity and process equipment replacement	$970,000
Engineering Report	$100,000
Mechanical Sludge Thickener	$1,350,000
Belt Filter Press Hood	$180,000
Operations and Dewatering Building Metal Roof Replacement	$190,000
$100,000 per year for WWTP maintenance	$600,000
CEPT Implementation (or Third Primary Clarifier)	$280,000
Digester Blower Replacement	$1,100,000
42-ft Secondary Clarifier Mechanism Replacement	$580,000
Total Estimated Project Costs	**$5,380,000**

7.13 Southwest Study Area Loading

The Monroe population projections include an analysis of adding the Southwest Study Area to the City's sewer service area. The flows and loads were added to the previous analysis to identify capacity limitations at the WWTP. Table SS 7-7 is the estimated Southwest Study Area BOD and TSS loads using the same loading criteria presented in Table SS 7-3.

Table SS 7-7 Projected WWTP Southwest Study Area Loading

Year	Population	BOD (ppd)		TSS (ppd)	
		Annual Average	Max Month	Annual Average	Max Month
2021	195	32	40	33	43
2035	824	136	167	140	181

The 2021 additional loadings are nearly negligible as their impacts move the identified capacity and NDPES limit exceedance less than one year earlier. Slightly more significant are the future 2035 flows and loads which are projected to increase the flows and loads by approximately 2 percent.

7.13.1 NPDES BOD and TSS Limits

The WWTP projected BOD and TSS loads within the 6 year capital improvement planning period will see minimal changes in loading due to the Southwest Study Area.

Current operations utilize the DOC Lagoon and when considering them in operation the projected loadings to the WWTP are:

- NPDES BOD limit will likely be exceeded in 2031 (compared to 2032 previously)
- NPDES TSS limit will likely be exceeded in 2022 (compared to 2023 previously)

7.13.2 WWTP Process Flow Pumping

The major area of concern identified within the planning period for the WWTP that arises by adding the Southwest Study Area is the Headwork Pump Station and Effluent Pump Station. Both pump stations have a firm capacity of 10 MGD with one of the largest units out of service. The estimated 2035 flows approach the hydraulic capacity of the WWTP and may result in the standby unit being called to operate.

7.13.3 WWTP Capacity with Southwest Study Area Loading

The Southwest Study Area will not significantly impact the WWTP capacity at the projected loading. The limitations identified previously will likely occur approximately one year earlier if the collection system is expanded. This conclusion is based on evaluating the WWTP with the DOC Lagoons being out of service.

The process unit WWTP capacity evaluation in Table SS 7-8 includes the projected Southwest Study Area flows and loads in addition to the previous analysis in Table SS 7-5. Shaded cells show processes which exceed normal design standards or the NDPES permit.

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Table SS 7-8 Monroe WWTP Flows and Loads + Southwest Study Area

Design / Plant Component	Design	DMR Data 2011 to 2013	NPDES Permit	Projected (No DOC Lagoon) 2015	2021	2035	Metcalf and Eddy Typical	Range	Orange Book Range
Flow, MGD									
Average Annual	2.19	1.56		1.63	1.82	2.35			
Maximum Month	2.84	2.01	2.84	2.10	2.35	3.03			
Maximum Day	5.10	3.24		3.37	3.78	4.86			
Peak Hour	7.90	6.77		6.94	7.79	10.02			
BOD_5, lbs/day									
Average Annual	4,710	3,337		4,214	4,731	6,171			
Max Month AVG	6,090	4,405	6,090	5,545	6,191	7,890			
TSS, lbs/day									
Average Annual	4,700	3,355		4,214	4,732	6,096			
Max month AVG	5,940	4,963	5,940	6,099	6,805	8,657			
Total Kjeldahl Nitrogen (TKN), lbs/day									
Average annual				611	685	881			
Max month AVG	950			787	883	1,136			
Screening									
Mechanical screens:									
Number, each	2								
Opening size, mm (in)	3 (1/8)								
Capacity, each, MGD	6.17								
Capacity, total, MGD	12.3								
Manual screen:									
Number, each	1								
Opening size, mm (in)	9 (3/8)								

Table SS 7-8 Monroe WWTP Flows and Loads + Southwest Study Area

Design / Plant Component	Design	DMR Data 2011 to 2013	NPDES Permit	Projected (No DOC Lagoon) 2015	2021	2035	Metcalf and Eddy Typical	Range	Orange Book Range
Influent Pumps									
Type	Submersible centrifugal pumps								
Large pumps:									
Number, each	2 + 1								
Capacity, each, MGD	4.0								
Small pumps:									
Number, each	2								
Capacity, each	1.0								
Total firm capacity , MGD	10.0	(with largest out of service)							
Grit Removal									
Type	Mechanical vortex								
Number, each	1								
Diameter, feet	12.0								
Capacity, MGD	12.0								
Primary Clarifiers									
Number, each	2						Tables 5-21		
Straight Length, feet	66						80-130	50-300	> 10
Width, feet	13						16-32	10-80	< 24
Side water depth, average, feet	10						14	10-16	8-14
Settling Area each, sq feet	858								
Volume/unit, gal	64,178								

Table SS 7-8 Monroe WWTP Flows and Loads + Southwest Study Area

Design / Plant	Design	DMR Data	NPDES	Projected (No DOC Lagoon)			Metcalf and Eddy		Orange Book
Component		**2011 to 2013**	**Permit**	**2015**	**2021**	**2035**	**Typical**	**Range**	**Range**
Hydraulic Loading/unit, MGD									
@ design avg annual flow	1.10	0.78		0.81	0.91	1.17			
@ design max month flow	1.42	1.01		1.05	1.18	1.51			
@ peak hour flow	3.95	3.39		3.47	3.89	5.01			
Surface loading rate/unit, gpd/sf:							Table 5-20		
@ design avg annual flow	1,276	908		948	1,063	1,369	1200	800-1200	800-1200
@ design max month flow	1,655	1,173		1,222	1,371	1,765			
@ peak hour flow	4,604	3,947		4,045	4,537	5,841	2500	2000-3000	2000-3000
Detention Time/unit, hr									
@ design avg annual flow	1.41	1.98		1.89	1.69	1.31	2.0	1.5-2.5	
@ design max month flow	1.08	1.53		1.47	1.31	1.02			
@ peak hour flow	0.39	0.45		0.44	0.40	0.31			
Anoxic Tank									
Number, each	3								
Length, feet	57								
Width, feet	15								
Side water depth, feet	16								
Total volume each, cubic feet	13,680								
Volume each, MG	0.102								
Total volume, MG	0.31								
Total Detention Time, hr									
@ design avg flow	3.4	4.7		4.5	4.0	3.1	0.2 to 2.0		
@ design max month flow	2.6	3.7		3.5	3.1	2.4			
@ peak hour flow	0.9	1.1		1.1	0.9	0.7			

Table SS 7-8 Monroe WWTP Flows and Loads + Southwest Study Area

Design / Plant	Design	DMR Data	NPDES	Projected (No DOC Lagoon)			Metcalf and Eddy		Orange Book
Component		2011 to 2013	Permit	2015	2021	2035	Typical	Range	Range
Aeration Basins									
Number, each	3								
Length, feet	57								
Width, feet	54								
Side water depth, feet	16								
Total volume each, cubic feet	49,248								
Volume each, MG	0.368								
Total volume, MG	1.11								
Hydraulic loading/unit, MGD									
@ design avg annual flow	0.73	0.52		0.54	0.61	0.78			
@ design max month flow	0.95	0.67		0.70	0.78	1.01			
Total Detention Time, hr									
@ design avg flow	12.1	17.0		16.3	14.5	11.3	Table 8-16		
@ design max month flow	9.3	13.2		12.6	11.3	8.8		3 - 6	6 - 15
MLSS Conc, mg/L	3,000						2500	1500-4000	1500-3500
MLSS mass/basin, lbs.	9,217								
BOD loading/ basin, lbs	assumes 30% BOD removal in PC's								
@ design avg annual BOD	1,099	779		983	1,105	1,441			
@ design max month BOD	1,421	1,028		1,294	1,445	1,843			
F:M Ratio, max mo.	0.154	0.112		0.140	0.157	0.200		0.2 - 0.6	
Sludge Yield, lbs/lb BOD	0.62	0.62		0.62	0.62	0.62			0.6 - 0.75
SRT, days									
@ average annual BOD	13.5	19.1		15.1	13.5	10.3			5-15 days
@ design max month BOD	10.5	14.5		11.5	10.3	8.1	8-10 days	3-15 days	

Table SS 7-8 Monroe WWTP Flows and Loads + Southwest Study Area									
Design / Plant	**Design**	**DMR Data**	**NPDES**	**Projected (No DOC Lagoon)**			**Metcalf and Eddy**		**Orange Book**
Component		**2011 to 2013**	**Permit**	**2015**	**2021**	**2035**	**Typical**	**Range**	**Range**
Aeration Blowers									
Turbine Blowers									
Number, each	2 duty								
Capacity,each, scfm @8 psi	2,000								
Centrifugal Blowers									
Number, each	2 standby								
Capacity, cfm @8 psi	1,020								
Total firm capacity, scfm	4,000								
Actual O_2 req'd, lbs/ day @ mm		4,846		6,805	7,613	9,741			
AOR/SOR	0.48								
Standard O_2 req'd, lbs/ day @ mm		10,095		14,177	15,860	20,294			
Air Required, scfm		983		1,452	1,667	2,457			
Secondary Clarifiers									
Number, each	2								
Number 1:									
Diameter, feet	42								
Side water depth, feet	13.0								
Settling area, each, sf	1,385								
Number 2:									
Diameter, feet	64								
Side water depth, feet	16.0								
Settling area, each, sf	3,217								
Total surface area, sf	4,602								

Table SS 7-8 Monroe WWTP Flows and Loads + Southwest Study Area

Design / Plant Component	Design	DMR Data 2011 to 2013	NPDES Permit	Projected (No DOC Lagoon) 2015	2021	2035	Metcalf and Eddy Typical	Range	Orange Book Range
Surface loading rate/ gpd/sf:								**<u>Table 8-7</u>**	
@ design avg flow	714	508		530	595	766		400-700	
@ design max month flow	926	656		684	767	987			
@ peak flow	2,575	2,208		2,263	2,538	3,267		1,000-1,600	
Solids loading rate/unit, lb/sf·h	assumes 50% return activated sludge (RAS)								
@ design avg flow	0.74	0.53		0.55	0.62	0.80		0.8 - 1.2	
@ design max month flow	0.97	0.68		0.71	0.80	1.03			
@ peak flow	2.68	2.30		2.36	2.65	3.41		1.6	
UV Disinfection									
Type	In-line medium pressure, high intensity UV								
Peak design flow, each, MGD	2.5								
Number of units	3 + 1								
Total firm capacity, MGD	7.5	(with largest out of service)							
Peak Hour Flow		6.8		6.9	7.8	10.0			
Design transmittance, %	≥ 55								
Total suspended solids, mg/L	≤45								
UV Dose, mJ/cm2	25,000								
Effluent Pumps									
Type	Vertical turbine								
Number, each	2 + 1								
Capacity each, MGD:	5.0								
Total firm capacity , MGD	10.0								

Table SS 7-8 Monroe WWTP Flows and Loads + Southwest Study Area

Design / Plant Component	Design	DMR Data 2011 to 2013	NPDES Permit	Projected (No DOC Lagoon) 2015	2021	2035	Metcalf and Eddy Typical	Range	Orange Book Range
Primary Sludge Production	Based on 50% TSS removal								
Primary sludge, lbs/day									
@ design avg	2,761	1,678		2,107	2,367	3,051			
@ design max month	2,997	2,482		3,050	3,404	4,333			
Primary sludge concentration	4.0%								
Primary sludge , gpd									
@ design avg	8,276	5,029		6,317	7,096	9,145			
@ design max month	8,984	7,439		9,143	10,204	12,987			
Secondary Sludge Production	Based on 0.62 lbs / lb BOD removed								
Secondary sludge, lbs/day									
@ design avg	1,866	2,069		2,613	2,935	3,830			
@ design max month	2,419	2,731		3,438	3,840	4,896			
Secondary sludge concentration	1.0%								
Secondary sludge , gpd									
@ design avg	22,374	24,811		31,332	35,191	45,924			
@ design max month	29,005	32,747		41,225	46,048	58,710			
Total Sludge, gpd									
@ design avg	30,650	29,839		37,649	42,287	55,069			
@ design max month	37,989	40,186		50,367	56,251	71,697			
Total Sludge, ppd									
@ design avg	4,627	3,747		4,720	5,302	6,881			
@ design max month	5,416	5,213		6,488	7,244	9,229			

Table SS 7-8 Monroe WWTP Flows and Loads + Southwest Study Area

Design / Plant Component	Design	DMR Data 2011 to 2013	NPDES Permit	Projected (No DOC Lagoon) 2015	2021	2035	Metcalf and Eddy Typical	Range	Orange Book Range
Aerobic Digesters									
Number, each	3								
Volume, total, cf	32,000								
Volume, total, gallons	239,360								
Retention time, days							Aerobic EPA Class B Regulations		
@ design avg	7.8	8.0		6.4	5.7	4.3	60 Days @ 20 ºC (single digester)		
@ design max month	6.3	6.0		4.8	4.3	3.3	42 d @ 20 ºC (two digesters in series)		
Volatile solids loading, lbs/cf/day	Assumes 75% volatile								
@ design avg	0.11	0.08		0.10	0.11	0.14			
@ design max month	0.14	0.10		0.13	0.15	0.19		0.10-0.30	
VSS destruction	45%								
VSS destruction, lbs/day									
@ design avg	1,562	1,265		1,593	1,789	2,322			
@ design max month	1,828	1,759		2,190	2,445	3,115			
Total solids from digester, dry lbs/day									
@ design avg	3,065	2,482		3,127	3,513	4,559			
@ design max month	3,588	3,453		4,298	4,799	6,114			
Digested sludge concentration	3.5%								
Digested sludge volume, gpd									
@ design avg	10,501	8,504		10,713	12,034	15,617			
@ design max month	12,292	11,831		14,726	16,442	20,946			
Belt Filter Press Dewatering									
Number each	1								
Hydraulic capacity, gpm	120								

Table SS 7-8 Monroe WWTP Flows and Loads + Southwest Study Area

Design / Plant Component	Design	DMR Data 2011 to 2013	NPDES Permit	Projected (No DOC Lagoon) 2015	2021	2035	Metcalf and Eddy Typical	Range	Orange Book Range
Solids capacity, lbs/ hr	720								
Belt press run time, hrs/week									
@ design avg	10	8		10	12	15			
@ design max month	12	12		14	16	20			

Note:
1) Gray shaded cells denote exceeded NDPES permit or unit process capacity

Chapter SS 8 Water Reclamation and Reuse

8.1 Water Reclamation and Reuse Evaluation

8.1.1 Introduction

The State Legislature has declared there is “a primary interest in the development of facilities to provide reclaimed water to replace potable water in non-potable applications, to supplement existing surface and groundwater supplies, and to assist in meeting the future water requirements of the state.” In accordance with this declaration and RCW 90.48 this sanitary sewer plan must evaluate the potential for water reuse.

Wastewater reclamation and reuse can have benefits for a community’s water supply and wastewater management. Production of reclaimed water for use in non-potable applications can be especially beneficial to public water systems facing water supply shortages through physical or water rights supply limitations. Reclaimed water can delay or eliminate the need for additional water rights or potable water system capital improvements. The utility may be able to generate additional revenue by selling reclaimed water. Reclaimed water, in some cases, may be stored in the groundwater aquifer and recovered for later use by the utility. Water reclamation may also provide benefits to wastewater disposal responsibilities, where receiving water constraints preclude increased discharge into a surface water body. Beyond the benefits to utilities, reclaimed water may provide environmental and aesthetic benefits to the community, such as augmenting stream flow, creating wetlands habitat or improving recreation facilities.

This chapter is an update to the 2008 Plan regarding reclaimed water, and presents a brief evaluation of the feasibility of reclaiming effluent from the WWTP and reusing it in the City. Costs from the 2008 Plan were updated using a combination of ENR indices from December 2008 to January 2015 for Seattle, WA and engineering judgment on contingencies and engineering design and services during construction costs.

8.1.2 Water Reclamation and Reuse Standards in the State of Washington

In contrast to effluent disposal, water reclamation (i.e., reuse of treated effluent) is management of integrated water resources. In the State of Washington, any type of direct beneficial reuse of municipal wastewater is defined as water reuse or reclamation. Water Reuse and Reclamation (WRR) Standards have been issued jointly by the Departments of Health (DOH) and Ecology. This discussion is based on the current standards dated September 1997, which are adopted by reference in RCW Chapter 90.46, Reclaimed Water Use.

Reuse standards for the State of Washington were developed following an analysis of similar standards used in the States of California, Arizona, Texas, and Florida where reuse of municipal wastewater has been underway for many years.

The State of Washington reuse standards for municipal wastewater can be broken down into the four following areas:

1. Treatment Standards
2. Allowable Uses of Reclaimed Water

3. Use Area Requirements
4. Operational and Reliability Requirements

A key difference between water reuse and effluent disposal is in the level of reliability required within the treatment process, distribution, and use areas. The State of Washington's reuse treatment standards call for continuous compliance, meaning that the treatment standard must be met on a constant basis or the treated water cannot be used as reclaimed water.

8.1.3 Treatment Standards

The State of Washington's standards for municipal wastewater reuse have four classifications (Classes A, B, C and D) based on the type of treatment provided, as shown in Table SS 8-1. Class A reclaimed water, the highest classification, is generally required for uses with potential for public contact. Under RCW 90.46, Class A reclaimed water means reclaimed water that, at a minimum, is at all times an oxidized, coagulated, filtered, disinfected wastewater. To meet Class A reclaimed water standards, the facility effluent must be coagulated and filtered in order to meet a turbidity standard. Reclaimed water must be disinfected to meet a coliform standard that is much stricter than the standard for secondary effluent.

Table SS 8-1 State of Washington Reclaimed Water Treatment Standards

Reuse Class	Continuously Oxidized(1)	Continuously Coagulated(2)	Continuously Filtered(3)	Disinfection Total Coliform Density(4)	
				7-Day Median Value	Single Sample
D	YES	NO	NO	≤240/100 mL	no standard
C	YES	NO	NO	≤23/100 mL	240/100 mL
B	YES	NO	NO	≤2.2/100 mL	23/100 mL
A	YES	YES	YES	≤2.2/100 mL	23/100 mL

Notes:

1) Oxidized wastewater is defined as wastewater in which organic matter has been stabilized such that the BOD_5 does not exceed 30 mg/L and the TSS do not exceed 30 mg/L (monthly average basis), is non-putrescable (does not have a foul smell), and contains dissolved oxygen.
2) Coagulated wastewater is defined as an oxidized wastewater in which colloidal and finely divided suspended matter have been destabilized and agglomerated prior to filtration by the addition of chemicals or an equally effective method.
3) Filtered wastewater is defined as an oxidized, coagulated wastewater that has been passed through natural undisturbed soils or filter media, such as sand or anthracite, so that the turbidity as determined by an approved laboratory method does not exceed an average operating turbidity of 2 nephelometric turbidity units (NTU), determined monthly, and does not exceed 5 NTU at any time.
4) Disinfection is a process that destroys pathogenic organisms by physical, chemical or biological means. The disinfection standards use coliform density as the measure of pathogen destruction. DOH recommends that a chlorine residual of 0.5 mg/L be maintained during conveyance from the reclamation facility to the use area to avoid biological growth.

8.1.4 Allowable Uses of Reclaimed Municipal Wastewater

Allowable water reuse methods are presented in Table SS 8-2. Most of these methods provide limited potential due to the relatively small quantities and seasonal nature of the reuse method. Two reuse methods that offer the potential for 100 percent reuse on a year-round basis are groundwater recharge and stream flow augmentation.

However, the general basis for the reuse criteria is that when unlimited public access to the reclaimed water is involved, the criteria will require a Class A reclaimed water. Essentially, this means that for a water reclamation project to have any degree of flexibility as well as a potential for relatively unrestricted use, the reclaimed water should meet the Class A reuse standard.

Table SS 8-2 Allowable Uses of Reclaimed Water

Use	Class of Reclaimed Water Required			
	Class A	Class B	Class C	Class D
Irrigation of Non-Food Crops				
Trees and fodder, fiber, and seed crops1	YES	YES	YES	YES
Sod, ornamental plants for commercial use, pasture to which milking cows or goats have access	YES	YES	YES	NO
Irrigation of Food Crops				
Spray Irrigation				
All Food Crops	YES	NO	NO	NO
Food crops which undergo physical or chemical processing sufficient to destroy all pathogenic agents	YES	YES	YES	YES
Surface Irrigation				
Crop	YES	YES	NO	NO
Root crops	YES	NO	NO	NO
Orchards and vineyards	YES	YES	YES	YES
Landscape Irrigation				
Restricted access areas (e.g. cemeteries, freeway landscaping)	YES	YES	YES	NO
Open access areas (e.g. golf courses, parks, playgrounds, etc)	YES	NO	NO	NO
Impoundments				
Landscape impoundments	YES	YES	YES	NO
Restricted recreational impoundments	YES	YES	NO	NO
Non-restricted recreational impoundments	YES	NO	NO	NO
Fish Hatchery Basins	YES	YES	NO	NO
Decorative Fountains	YES	YES	NO	NO
Other Uses				
Flushing of Sanitary Sewers	YES	YES	YES	YES

Table SS 8-2 Allowable Uses of Reclaimed Water

Use	Class of Reclaimed Water Required			
	Class A	Class B	Class C	Class D
Street Cleaning				
Street sweeping, brush dampening	YES	YES	YES	NO
Street washing, spray	YES	NO	NO	NO
Washing of Corporation Yards, Lots, and Sidewalks	YES	YES	NO	NO
Dust Control (Dampening Unpaved Roads, other surfaces	YES	YES	YES	NO
Dampening of Solid for Compaction (Construction, Landfills, etc)	YES	YES	YES	NO
Water Jetting for consolidation of Backfill around reclaimed water, sewage, storm drainage, gas, electrical pipelines	YES	YES	YES	NO
Fire Fighting Protection				
Dumping from aircraft	YES	YES	YES	NO
Hydrants or sprinkler systems in buildings	YES	NO	NO	NO
Toilet and Urinal Flushing	YES	NO	NO	NO
Ship Ballast	YES	YES	YES	NO
Washing Aggregate and Making Concrete	YES	YES	YES	NO
Industrial Boiler Feed	YES	YES	YES	NO
Industrial Cooling				
Aerosols or other mist not created	YES	YES	YES	NO
Aerosols or other mist created (e.g. cooling towers, spraying)	YES	NO	NO	NO
Industrial Process				
Without exposure to workers	YES	YES	YES	NO
With exposure of workers	YES	NO	NO	NO

8.1.5 Use Area Requirements

The WRR standards establish criteria for siting and identifying water reclamation projects and their facilities. Water reclamation storage facilities, valves, and piping must be clearly labeled and no cross connections between potable water and reclaimed water lines are allowed. A key area requirement for a water reclamation project is setback distance. Table SS 8-3 summarizes setback requirements for water reclamation facilities.

Table SS 8-3 Setback Distances for Reclaimed Water in the State of Washington

Reclaimed Water Use/Facility	Minimum Distance to Potable Water Well			
	Class A	Class B	Class C	Class D
Spray or surface irrigation	50	50	100	300
Unlined storage pond or impoundment	500	500	500	1000
Lined storage pond or impoundment	100	100	100	200
Pipeline	50	100	100	300
Minimum distance between irrigation area and public areas	0	50	50	100

8.1.6 Operational and Reliability Requirements

Under the reuse standards there are a number of operational and reliability requirements for a water reclamation facility. Some key requirements are summarized below:

1. Minimum Class III Operator
2. Critical equipment and process failures must be signaled by an alarm
3. Emergency storage/disposal in event of facility failure
4. Operating records provided to DOH, as well as Ecology
5. No bypass reuse areas of untreated or partially treated water
6. A standby power supply or long term disposal or storage facilities

8.2 Potential for Reuse in the City of Monroe

8.2.1 Upland Water Reuse

The Skykomish River reach near the City's effluent discharge meets all the applicable water quality standards. Ecology has determined that the City's effluent discharge does not have a reasonable potential to cause exceedances of water quality standards in the Skykomish River, except for mercury and acute toxicity. The City does not expect the water-quality based limitations on mercury and acute toxicity placed in their NPDES permit to limit effluent discharge. Therefore, the City does not have a need to implement water reuse in order to reduce discharge into the Skykomish River based on the current NPDES permit and water quality standards.

8.2.2 Offsets to Existing Water Rights

The City of Monroe purchases potable water from the City of Everett. Per the City of Monroe *2015 Water System Plan as part of the 2015 Utility System Plans*, the City of Everett has projected that they have sufficient water rights to meet 2050 projections. The City of Monroe's water supply from Everett is not limited except by the physical size of the interconnection, which is sufficient for the 20-year forecasted water demand. Therefore the City of Monroe does not anticipate a water rights shortage within the planning period, and water reclamation would not be needed to provide a water rights benefit.

8.2.3 Substitution of Potable Water Uses

Potable water in the City of Monroe is used for residential, commercial, industrial, municipal and irrigation uses. Substitution of potable water with reclaimed water for uses not requiring potable water quality reduces the demand on potable water, and allows the City to serve additional customers without increasing potable water purchases from the City of Everett.

The most visible water application in the City that does not require potable quality water is landscape irrigation of City parks, schools and other facilities. Landscape irrigation of sites with public access requires Class A reclaimed water. Reclaimed water has not to date in Washington State been supplied for irrigation of residential lawns due to maintenance and cross-connection control concerns.

Another potential use for reclaimed water in Monroe is sanitary sewer flushing. Reclaimed water used for flushing sanitary sewers must at least meet Class D standards.

Use of reclaimed water for landscape irrigation of public facilities and sanitary sewer flushing is further evaluated below.

Landscape Irrigation

Potential uses of reclaimed water include irrigation of City parks, school grounds and other public facilities. Centennial Park, adjacent to the WWTP, is currently irrigated with City potable water. Its proximity to the WWTP would result in minimal water distribution costs and it would therefore be an ideal initial reclaimed water project. According to the WRR standards, Class A reclaimed water is required for irrigation of public areas with reclaimed water. The reclaimed water irrigation system could be later expanded to include other parks or schools.

Irrigation water usage at Centennial Park is monitored by a separate irrigation meter. Table SS 8-4 provides the projected irrigation demand based on irrigation meter data from 1998 to 2007.

Table SS 8-4 Centennial Park Landscape Irrigation Demand(1)

Parameter	Irrigation Water Demand(1)
Maximum Annual Demand (gal/year)	4,500,000
Maximum Day Demand (gal/day)	70,000
Typical Irrigation Season Length (months)	3.5

Notes:
1) Irrigation water demand based on irrigation water meter records from 1998 to 2007.

Sanitary Sewer Flushing

Water jet cleaning of sanitary sewers requires about 4,000-gallons per 1,000 feet of sewer pipe. As further described in Chapter SS 9, Operations and Maintenance Program, it is recommended that gravity sewers be cleaned by flushing at a frequency of once every four years. The City of Monroe has approximately 228,000 linear feet of gravity sewers, and about 57,000 linear feet should be flushed each year, resulting in a water demand of 228,000 gallons per year.

The sewer flushing water demand is much lower than the landscape irrigation demand. It will be most cost-effective to operate the water reclamation treatment processes only during the irrigation season. If the flushing program is continuous throughout the year, about 17,000 linear feet would be flushed during the 3.5 month irrigation season. Therefore, 66,000 gallons per year of reclaimed water could be used for sewer flushing. The maximum daily water demand for sewer flushing would be 24,000 gpd based on truck pumping rates.

Recommended Uses

Landscape irrigation of Centennial Park and sanitary sewer flushing are the recommended uses of reclaimed water in the City of Monroe. Class A reclaimed water is required for irrigation of public areas with reclaimed water. The annual reclaimed water demand would be 4,566,000 gallons, during the 3.5-month irrigation season. The maximum day reclaimed water demand would be 94,000 gpd.

8.3 Conceptual Design

8.3.1 Production of Reclaimed Water

The existing WWTP provides secondary wastewater treatment for discharge to the Skykomish River through an NPDES permit. The maximum day reclaimed water demand represents a small proportion of the WWTP capacity. As production of reclaimed water is more expensive than secondary effluent, it is recommended that a sidestream Class A water reclamation process be developed. A portion of the secondary effluent would be diverted from the treatment process into a new process stream containing a coagulation system, filter, and UV disinfection system. The Class A reclamation sidestream would be operated during the irrigation season. At other times, and in case Class A reclamation standards are not met, the sidestream would shut down and the main facility would process and discharge all of the flow. Park irrigation would not be a critical water use, so irrigation could be temporarily halted in case of treatment process upset. Because the District has a NPDES permit for surface water discharge (alternate disposal system), reclaimed water system storage or bypass storage is not required.

The reclaimed water sidestream will be sized to provide the maximum day reclaimed water demand, with a capacity of 65 gpm (94,000 gpd).

Oxidation

The continuous oxidation requirement for reclaimed water will be met with the existing aeration basins and blowers at the WWTP. The oxidation process meets the reclaimed water reliability requirements by having an alarms and standby equipment (backup blower).

Coagulation

Reclaimed water feed pumps will draw WWTP secondary effluent from between the secondary clarifiers and the UV disinfection system, and pump it to the new sidestream reclamation process. The reclamation processes would be located in the area of Aerobic Digester No. 3, which will be abandoned if the anaerobic digestion system is installed.

The continuous coagulation requirement for Class A reclaimed water will be met with a rapid-mix coagulation basin and a slow-mix flocculation basin, to agglomerate fine particles prior to filtration. Redundant emulsion polymer storage tanks and feeders will be provided. The polymer solution will be injected to the filter feed in the rapid-mix basin. The reliability requirements for the coagulation process will be met with standby chemical feed equipment and automatically-actuated long-term disposal provisions (sidestream shutdown with NPDES effluent discharge).

Filtration

The continuous filtration requirement will be met with a fabric disc filter manufactured by Aqua-Aerobics, or by a sand filter. The disc filter utilizes a series of rotating disks that can be continuously backwashed while the filter continues to operate. A 1-disk filter will be provided (each disk = 350 gpm capacity). The reliability requirement will be met with automatically-actuated long-term disposal provisions (sidestream shutdown with NPDES effluent discharge).

UV Disinfection

The UV disinfection system will be designed to disinfect the reclaimed water maximum day flow. The system must be capable of disinfecting filtered secondary effluent (maximum TSS concentration of 15 mg/L) to produce an effluent with less than 2.2 total coliform/100 mL (monthly median). The National Water Research Institute has developed guidelines for UV disinfection, which recommend a design UV dose of 100 mJ/cm2 for production of reclaimed water from filtered effluent, with an assumed UV transmittance of 55 percent.

The reclaimed water UV disinfection system will be an open channel, low-pressure, low-intensity UV system, with one redundant bank to provide treatment capacity during maintenance or cleaning. With the design conditions listed above, these UV lamps are capable of disinfecting 5 gpm per lamp, per Trojan Technologies. Based on this, 28 lamps will be provided, 14 lamps per reactor.

Alarms and Telemetry

The use of reclaimed water for irrigation in open access areas demands a higher level of quality control than normal WWTP operations. An alarm system will be installed to notify staff if the coagulation, filtration, or disinfection systems fail, or if the reclaimed water quality falls below an acceptable level. At this point, the reclaimed water production will cease and effluent will be recycled to the WWTP headworks.

8.3.2 Water Reuse System

Irrigation of public access areas, such as parks, should be performed at the time when risk of public contact is least (nighttime). Assuming a six hour irrigation period (11 p.m. to 5 a.m.), the peak irrigation demand is 194 gpm (70,000 gpd/6 hr). Reclaimed water storage will be provided to equalize production and demand of reclaimed water throughout the day, as reclaimed water demand will be highest when wastewater production is the lowest.

Due to long-term alternate disposal (the Skykomish River) the system storage volume may be reduced from three days to approximately one day of storage. The existing Aerobic Digester No. 1 (volume 90,000 gal) could be modified to become a reclaimed water storage tank if the anaerobic digestion option is implemented. Reclaimed water from the sidestream UV disinfection system would flow by gravity to the storage tank.

A reclaimed water pumping station would convey reclaimed water from the storage tank to the use areas. The reclaimed water pumps (one duty, one standby) will be rated at 194 gpm at 60 psi total dynamic head. The motor horsepower will be approximately 25 hp.

A tanker truck filling station will be located at the WWTP to fill sewer flushing trucks with reclaimed water. Reclaimed water will also be pumped to the Centennial Park irrigation system. The existing potable water connection to the irrigation system would be equipped with an acceptable backflow prevention device, and retained to provide backup irrigation water to the park.

8.3.3 Operation and Maintenance Costs

The estimated annual operation and maintenance cost for the reclaimed water system is $30,000 per year. The cost is the O&M cost for operating the sidestream processes 3.5 months per year, and includes the reclaimed water pumps and storage tank. Park irrigation labor or maintenance is not included.

8.4 Estimate of Probable Project Costs

Table SS 8-5 provides a summary of the estimate of probable project costs for the Class A water reclamation process, distribution, and operation and maintenance.

Table SS 8-5 Centennial Park Landscape Irrigation Demand(1)

Item	Opinion of Probable Project Cost Opinion(1)
Reclaimed Water Sidestream Process	$2,300,000
Storage and Distribution System	$1,200,000
Annual O&M Costs(2)	$30,000

Notes:
1) Assumes 30 percent contingency, 40 percent for engineering, and 8.9 percent sales tax.
2) No costs are included for financing, easements, right-of-way, or property acquisition.
3) Assumes operation 3.5 months per year. Does not include part irrigation labor and maintenance.

8.5 Economic Feasibility of Reuse

Production of reclaimed water is financially feasible to the sewer utility if the cost of producing and distributing reclaimed water is less than the revenue received from selling reclaimed water and/or the cost of using potable water. Production of reclaimed water may also be financially feasible if it delays or eliminates capital expenses related to developing new water sources or meeting stricter standards for effluent discharge to surface water.

In the case of the City of Monroe, the Sewer Fund would pay for debt service and O&M on the water reuse system. These costs would be offset by revenue to the Sewer Fund from selling reclaimed water to the Parks Department or other users in the future. The Water Fund would potentially have a loss of revenue (from selling less irrigation water to the Parks Department), but would be able sell that water to other customers without increasing water purchase from Everett.

At the time when water reclamation and reuse is determined to be necessary, it is recommended that a financial analysis to determine the cost impacts to the existing water and sewer utilities, compared to the costs and revenue of producing and selling reclaimed water is performed.

Chapter SS 9 Operations and Maintenance Program

9.1 Introduction

This Chapter summarizes the operation and maintenance activities performed by the City to ensure performance and reliability of the wastewater collection system. City personnel maintain approximately 6 miles of force mains, 43 miles of gravity sewers, 10 pump stations, a secondary wastewater treatment plant, and a Supervisory Control and Data Acquisition (SCADA) telemetry system.

9.2 City Management and Personnel

The City's Public Works & Utilities Department is composed of approximately 29 full time employees (FTE) that comprise a combined crew for water, sewer, and stormwater maintenance.

9.2.1 Organization

The City is governed by a City Council and Mayor, and the Public Works Director oversees the Public Works Utilities Department. This department is responsible for the operation and maintenance of the City's water, sewer, and stormwater systems, as well as its WWTP. The organizational flow chart shown in Figure SS 9.1 illustrates the specific personnel positions and respective responsibilities for the City's utility systems.

9.2.2 Certification and Training

The City encourages its employees to obtain certification and training for skills relevant to operating and maintaining the sewer system. All staff must, at a minimum, have the following:

- A high school diploma or GED.
- A driver's license.

In addition, the City provides employees with opportunities for training and certification relative to their position function. Operator training is an important component in maintaining a safe and reliable wastewater collection system. At a minimum, all personnel performing wastewater system related duties should receive training in the following areas:

- Traffic flagging
- Trenching and shoring
- Confined space
- First Aid
- Electrical hazards
- Asbestos cement pipe safety
- Occupational Safety and health Administration (OSHA) Plus program
- Capacity Management, Operation and Maintenance (CMOM) programs

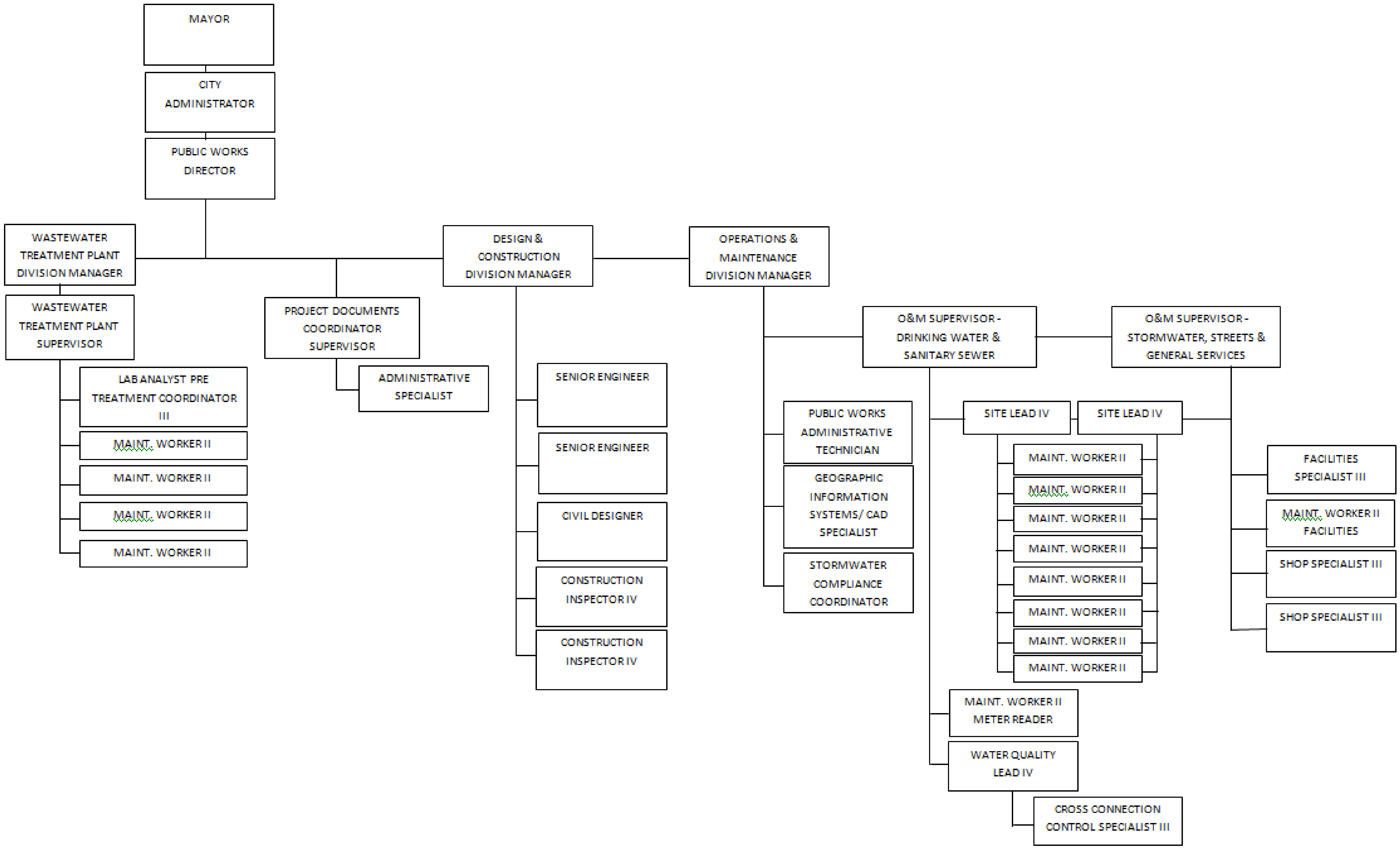

Figure SS 9.1 Utility System Organization Chart

9.3 Operations and Maintenance Activities

This section presents the operations and maintenance activities, including preventive and corrective routines.

9.3.1 Collection System Maintenance

Pump Stations

The frequency of pump station maintenance is related to the size of the pump station. City staff should visit and inspect each pump station on a weekly basis. The stations should be cleaned once a month, or as needed for smaller stations. The wet wells should be pumped out bi-annually or as needed.

Force Mains

City staff should operate all force main valves on an annual basis.

Gravity Sewers and Manholes

Preventive maintenance for gravity sewer lines includes programs for inspection and cleaning. Inspections should include visual observation of manholes and a program of closed-circuit television (CCTV) inspection of sewer pipes. Gravity lines should be cleaned by flushing or jetting at least every four years. The cleaning and inspection programs should identify the majority of problems so that they may be repaired in the maintenance or capital improvement programs, instead of resulting in a failure or overflow.

Summary

A summary of the sewer collection system recommended maintenance standards is provided as Table SS 9-1.

Table SS 9-1 Recommended Collection System Maintenance Standards

Maintenance Task	Quantity or Length of Component	Recommended Standard
Pump Station Inspections	10	0.3 FTE per station per year(1)
Gravity Sewer CCTV Inspections	223,600 LF	22,000 LF per year(2)
Gravity Sewer Cleaning	223,600 LF	57,000 LF per year(3)
Force Main Flushing	30,712 LF	Annual inspection; flushing if force main pressure increases(4)

Notes:
1) FTE is full time equivalent and is equal to 1,768 hours per year (85 percent of a full year).
2) Approximately 10 percent of the system per year.
3) Recommendation based on Figures 8-17 and 8-18, WEF Manual of Practice 7, *Wastewater Collections System Management.*
4) Recommendation based on EPA 832-F-00-071, *Wastewater Technology Fact Sheet, Sewers, Force Main,* September 2000.

9.3.2 WWTP Operations and Maintenance

The program maintenance protocol currently being used at the WWTPs consists of a system that tracks historical preventative maintenance measures for each piece of equipment. This system is the backbone of scheduling all preventative maintenance. All routine preventative maintenance like oil changes, lubrication and exercising of infrequently used equipment and corrective maintenance performed are chronicled on this record.

The plant staff does most of the repairs and rebuilds with in-house personnel. More complex tasks such as motor rewinding, electrical or instrumentation modifications are out sourced to a third party.

Critical equipment that could affect effluent quality has redundant and backup equipment 'on-the-shelf'. This redundancy allows the City to respond to equipment failures without effluent violations. With the backup equipment available, the City currently does not routinely replace old equipment until the maintenance efforts become burdensome and replacement is the prudent decision.

9.4 Staffing Needs

The City sewer utility employs 12.95 FTE's, of which 7 are assigned to the WWTP Division of Public Works. The remaining 5.95 are split out as follows: 5.08 are assigned to the Public Works Department Maintenance and Operations Division; 0.42 are assigned to the Public Works Design and Construction Division; 0.44 are assigned to the Finance and Planning and Permitting Departments.

The City employs 7 field people in the wastewater division. Of these 7, 4 are assigned to the Maintenance and Operations and the remaining 3 are comprised of a supervisor, lab analyst, and manager.

The WWTP is staffed 8 hours/day, 5 days/week. On weekends and holidays personnel are assigned to visit the plant and take samples and laboratory work as necessary. These weekend visits are typically 2 to 3 hours.

To compare the City's sewer utility staffing as a function of length of sewer pipe with other sewer utilities in the Puget Sound region, a brief poll was conducted. A summary of the sewer utility staffing for the polled utilities and the City is presented at Table SS 9-2.

Table SS 9-2 Sewer Utility Staffing Comparison

Agency	Total Current Staff	Total Length of Pipe (LF)	Employees per 100,000 LF of Pipe
City of Monroe[(1)]	**4**	**223,600**	**1.8**
City of Bellevue[(2)]	22	2,777,280	1.3
City of Enumclaw[(1)]	2	248,160	1.2
City of Kent[(2)]	9	1,056,000	1.2
City of Kirkland[(2)]	5.5	633,600	1.2
City of Lacey[(2)]	6	897,600	1.5
City of Mercer Island[(2)]	4	707,520	1.8
Lakehaven Water & Sewer District[(1)]	4	1,689,600	4.2
Midway Sewer District[(1)]	25	818,400	3.1
Southwest Suburban Sewer District[(1)]	33	1,811,670	1.8
Valley View Sewer District[(2)]	14.5	688,400	2.1
Average Employee per 100,000 LF of Pipe			**1.9**

Notes:
1) Operate a WWTP(s).
2) No WWTP.

Based on the results of the poll, the City is just below average in the number of employees per 100,000 linear feet of pipe, indicating that the sewer utility is maintained in an efficient manner.

9.5 Recommended Operation and Maintenance Improvements

The City has been proactive in taking steps to solve the most critical maintenance issues. The City has been responsive to these improvements and has incorporated them into the CIP. One feature that the City may want to consider is the addition of a pigging mandrel station for force mains that are prone to solids deposition.

Chapter SS 10 Distribution Facilities Design and Construction Standards

10.1 Project Review Procedures

Sewer system projects are reviewed by the City of Monroe Engineering Department, the City of Monroe Public Works Department, and Monroe Fire District #3.

10.2 Policies and Requirements for Outside Parties

All projects whether internal or proposed by outside parties are required to comply with the design and construction standards discussed here.

10.3 Design Standards

All sewer system improvements are designed in accordance to Monroe Municipal Code Chapters 13.08 and 13.10, Department of Ecology Criteria for Sewage Works Design, and the City of Monroe Public Works Design and Construction Standards.

These requirements are intended to meet or exceed the design standards referenced in WAC 173-240. This material is intended to meet the requirements of the Washington State Department of Ecology and following the approved procedures and standards, the City is provided a waiver from the requirement of the Washington State Department of Ecology approval of individual collection and conveyance system projects.

10.4 Construction Standards

All water system improvements are constructed in accordance to Monroe Municipal Code Chapters 13.08 and 13.10, Department of Ecology Criteria for Sewage Works Design, Section 7-08 through 7-15 of the WSDOT/APWA Standard Specifications, and the City of Monroe Public Works Design and Construction Standards.

These requirements are intended to meet or exceed the construction standards referenced in WAC 173-240. This material is intended to meet the requirements of the Washington State Department of Ecology and following the approved procedures and standards, the city is provided a waiver from the requirement of the Washington State Department of Ecology approval of individual collection and conveyance system projects. Wastewater treatment facilities projects may require an engineering report per WAC 173-240-060.

10.5 Construction Certification and Follow-Up Procedures

All sewer system improvements constructed within the City of Monroe Sewer Service Area for which the City of Monroe will assume responsibility are inspected by the Public Works Department's Utilities Inspector and overseen by a professional engineer licensed in the State of Washington in accordance with Monroe Municipal Code Chapters 13.08 and 13.10, Department of Ecology Criteria for Sewage Works Design, Section 7-08 through 7-15 of the WSDOT/APWA Standard Specifications, and the City of Monroe Public Works Design and Construction Standards. Water quality samples are taken by City of Monroe employees and tested at the City's accredited laboratory. Laboratory accreditation certificate is included in Appendix W-M.

The inspector annotates construction plans as construction progresses. At the completion of construction record drawings are prepared using the marked up plans and field verified. Project records are retained in accordance with State of Washington Archives and Records Management Division Guidelines.

After completion of construction and acceptance of the improvement a Declaration of Construction Completion is completed per WAC 173-240-090.

Chapter SS 11 Capital Improvements Plan

11.1 Introduction

This chapter provides a compilation of specific projects, improvements, and programs the City should implement, providing the tools necessary for long-range project planning and budgeting. These projects are derived primarily from the system analysis and discussions with the City's operations and engineering staff. Other non-project recommendations can be found throughout the preceding chapters. Each project is accompanied by a planning level opinion of probable cost and a schedule identifying when the project is anticipated to begin and end. The City should review the CIP periodically to adjust for significant changes in the priority of each project, its cost, and scope.

Collection facilities improvement projects for the City wastewater system are broken into the following five categories:

- **Capacity:** Improvements classified as insufficient in capacity are determined based on whether or not the infrastructure can effectively convey the incoming flow. Gravity sewer pipes are considered to have insufficient capacity when the depth in the manhole is more than 200 percent or more of the pipe diameter (d/D > 2.0). Force mains are considered to have insufficient capacity when the velocities exceed 8 feet per second. Pump stations are considered to have insufficient capacity when inflow exceeds the flow produced by the pump station with the largest pump out of service. As described in Chapter SS 6, the conveyance system was evaluated using existing flows and flows projected for 2021, 2035, and build-out conditions. The evaluations determined system deficiencies when subjected to these existing and future flow conditions. Following identification of system deficiencies, the computer model was used to evaluate and select system improvements to alleviate the system deficiencies.
- **Obsolescence:** Improvements classified as obsolete are based on the age of the infrastructure. Pump station mechanical and electrical equipment is expected to have a typical usable life of 25 years; wastewater treatment plant mechanical and electrical equipment is expected to have a typical usable life of 15 to 20 years. Structures are expected to have a typical usable life of 50 years. Pipes are expected to have a typical usable life of 100 years.
- **Operations & Maintenance (O&M):** O&M projects will replace facilities identified by the City O&M staff as having unacceptably high maintenance requirements, both in terms of frequency and in magnitude.
- **General:** General improvement projects are those identified by City staff for various reasons that do not fall within any of the remaining four categories. These projects may be needed to simplify system operation, ease O&M efforts and reduce O&M costs, consolidate and/or eliminate redundant facilities, reduce or eliminate non-critical O&M concerns, or to meet ongoing sewer system management needs.
- **Developer:** Projects identified as developer dependent are needed to serve new developments but are not needed to provide continuation of service to existing customers.

When possible, system improvement projects should be coordinated with other utilities to minimize disruption and reduce associated costs such as road and surface restoration.

11.2 Capital Improvement Plan

The Capital Improvement Plan (CIP) is presented for three timeframes:

- 6-Year CIP from 2015 to 2021
- 20-year CIP from 2022 to 2035
- Build-out CIP from 2036 to build-out

The projects recommended for the CIP are summarized in Tables SS 11-1 and SS 11-2, and illustrated for the collection and conveyance system on Figure SS 11.1 and for the WWTP on Figure SS 11.2. Developer improvements are expected to be privately funded by developers and are not listed. The CIP prioritization was developed in a workshop with the City.

Please note that CIP project SS-102 – Fryelands Pump Station and Force Main Upgrades needs to be coordinated with the Lake Tye stormwater improvements project to minimize costs and disruption to the residents.

Table SS 11-1 6-Year Capital Improvement Plan (2015 – 2021)

CIP No.	Project	Capacity	Obsolescence	O&M	General	Developer	Project Description
Collection and Conveyance							
SS-1	Gravity Sewer Replacement from the Department of Corrections (DOC) to the Park Place Pump Station	☑					▪ Replace approximately 1,100 linear feet of 10-inch diameter gravity sewer that conveys sewage from the DOC lagoon effluent along 177th Ave SE and West Main St to the Park Place Pump Station with 18-inch diameter sewer pipe
SS-2	Cate's Pump Station Upgrades		☑				▪ Pump station reaches the end of its useful design life in the 6-year planning horizon. ▪ Upgrades include new pumps, piping, electrical, instrumentation, and controls. It is assumed that the structures are in sufficient condition and do not need to be upgraded. ▪ A condition assessment of the wet well should be performed during project design.
SS-3	West Main Pump Station Upgrades		☑				▪ Pump station reaches the end of its useful design life in the 6-year planning horizon. ▪ Upgrades include new pumps, piping, electrical, instrumentation, and controls. It is assumed that the structures are in sufficient condition and do not need to be upgraded. ▪ A condition assessment of the wet well should be performed during project design.
SS-4	$500,000 per year Pipe Replacement Program		☑	☑			▪ Replace up to $500,000 of failing equipment and leaking or damaged pipes annually.
Wastewater Treatment Plant							
SS-5	WWTP Rerating Study	☑					▪ In depth unit and facility wide treatment process evaluation. ▪ Compare WWTP capacity findings for BOD and TSS loads to NPDES permit limits.
SS-6	Biosolids Management Study			☑			▪ Evaluate current biosolids management to determine preferred or necessary alternative implementations for solids handling over the next 20 years.
SS-7	Primary Clarifier Mechanism Replacement		☑				▪ Primary Clarifier equipment, drives, chain and flight collector, and scum skimmer replacement.
SS-8	WWTP Engineering Report	☑	☑	☑			▪ Analyze potential liquid and solids process unit improvements for operations, capacity, and life cycle costs.
SS-9	Mechanical Sludge Thickener	☑		☑			▪ Install mechanical equipment to thicken waste activated sludge. ▪ Increase secondary clarification capacity.
SS-10	Belt Filter Press Hood			☑			▪ Install 304 stainless steel ventilation hood over existing belt filter press. ▪ Tie new 20" aluminum duct, fittings, and fan into existing odor control system.
SS-11	Operations and Dewatering Building Metal Roof Replacement		☑				▪ Replace the existing roofing systems with new painted steel panels, trim, and gutters.
SS-12	$100,000 per year WWTP Maintenance		☑	☑			▪ Up to $100,000 will be spent annually on maintenance upgrades at the WWTP.
SS-13	CEPT Implementation(2) (or Third Primary Clarifier)	☑					▪ Pilot and Implement a wet weather chemically enhanced primary treatment (CEPT) process. ▪ Increase peak hour flow capacity.

Table SS 11-1 6-Year Capital Improvement Plan (2015 – 2021)							
CIP No.	**Project**	**Capacity**	**Obsolescence**	**O&M**	**General**	**Developer**	**Project Description**
SS-14	Digester Blower Replacement	☑	☑				▪ Replace the four (4) existing digester blowers with two new duty blowers and a shared standby blower.
SS-15	42-ft Secondary Clarifier Mechanism Replacement		☑				▪ Replace 42-ft secondary clarifier collection mechanism at the end of mechanical life.

Notes:
1) Opinions of probable project costs are included Table SS 11-2.

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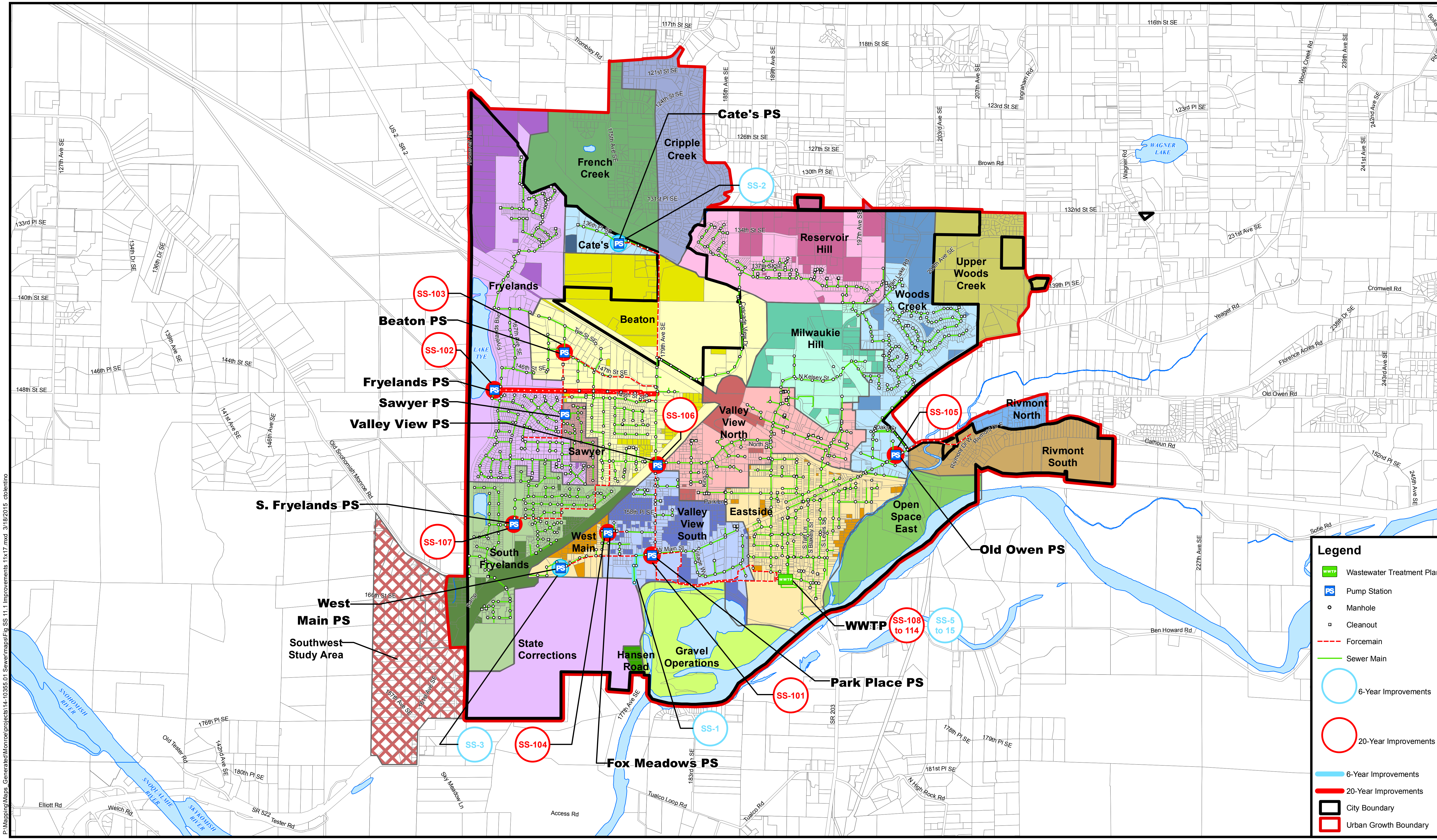
Table SS 11-2 20-Year Capital Improvement Plan (2022 – 2035)

CIP No.	Project	Capacity	Obsolescence	O&M	General	Developer	Project Description[1]
Collection and Conveyance							
SS-101	Park Place Pump Station Upgrades		☑				▪ Pump station reaches the end of its useful design life in the 20-year planning horizon. ▪ Upgrades include new pumps, piping, electrical, instrumentation, and controls. It is assumed that the structures are in sufficient condition and do not need to be upgraded. ▪ Increase the capacity of the pump station from 1700 gpm to 2100 gpm. ▪ A condition assessment of the wet well and dry well to be performed during project design.
SS-102	Fryelands Pump Station and Force Main Upgrades	☑	☑				▪ Pump station and force main reach their design capacity and the end of useful design life in the 20-year planning horizon. ▪ Upgrades include new pumps, piping, electrical, instrumentation, and controls. It is assumed that the structures are in sufficient condition and do not need to be upgraded. ▪ Increase the capacity of the pump station from 750 gpm to 1050 gpm. ▪ A condition assessment of the enclosure and sub-structures to be performed during project design. ▪ Project to be coordinated with Lake Tye stormwater project.
SS-103	Beaton Pump Station Upgrades		☑				▪ Pump station reaches the end of its useful design life in the 20-year planning horizon. ▪ Upgrades include new pumps, piping, electrical, instrumentation, and controls. It is assumed that the structures are in sufficient condition and do not need to be upgraded. ▪ A condition assessment of the enclosure and sub-structures to be performed during project design.
SS-104	Fox Meadows Pump Station Upgrades		☑				▪ Pump station reaches its design capacity and the end of its useful design life in the 20-year planning horizon. ▪ Upgrades include new pumps, piping, electrical, instrumentation, and controls. It is assumed that the structures are in sufficient condition and do not need to be upgraded. ▪ A condition assessment of the enclosure and sub-structures to be performed during project design.
SS-105	Old Owen Pump Station Upgrades		☑				▪ Pump station reaches its design capacity and the end of its useful design life in the 20-year planning horizon. ▪ Upgrades include new pumps, piping, electrical, instrumentation, and controls. It is assumed that the structures are in sufficient condition and do not need to be upgraded. ▪ A condition assessment of the enclosure and sub-structures to be performed during project design.
SS-106	Valley View Pump Station	☑	☑				▪ Pump station reaches its design capacity and the end of its useful design life in the 6-year planning horizon. ▪ Upgrades include new pumps, piping, electrical, instrumentation, and controls. It is assumed that the structures are in sufficient condition and do not need to be upgraded. ▪ Increase the capacity of the pump station from 1650 gpm to 3000 gpm. ▪ A condition assessment of the wet well and dry well to be performed during project design.

Table SS 11-2 20-Year Capital Improvement Plan (2022 – 2035)

CIP No.	Project	Capacity	Obsolescence	O&M	General	Developer	Project Description[1]
SS-107	South Fryelands Pump Station Upgrades	☑	☑				▪ Pump station reaches its design capacity and the end of its useful design life in the 6-year planning horizon. ▪ Upgrades include new pumps, piping, electrical, instrumentation, and controls. It is assumed that the structures are in sufficient condition and do not need to be upgraded. ▪ Increase the capacity of the pump station from 450 gpm to 550 gpm. ▪ A condition assessment of the wet well and dry well to be performed during project design.
Wastewater Treatment Plant							
SS-108	New Dewatering Unit[2]		☑				▪ Replacement (or standby) of belt filter press with a fully enclosed dewatering unit ▪ Produce higher total solids content cake.
SS-109	Turbine Blower[2]	☑	☑				▪ Replace the two (2) existing redundant centrifugal aeration blowers with one (1) turbine blower.
SS-110	Plant-wide SCADA and Control Upgrades[2]		☑				▪ Replace obsolete SCADA system and upgrade controls.
SS-111	Sludge Dryer[2] (or Anaerobic Digester)		☑				▪ Install sludge dryer to produce Class A biosolids. ▪ Relieve current sludge handling costs and off-site dependencies.
SS-112	64-ft Secondary Clarifier Mechanism Replacement[2]		☑				▪ Replace 64-ft secondary clarifier collection mechanism at the end of mechanical life.
SS-113	RAS/WAS Pump Replacement[2]		☑				▪ Replace activated sludge pumps at the end of mechanical life.
SS-114	Effluent Pump Station Mechanical Replacement[2]		☑				▪ Replace effluent pumps and auxiliary equipment at end of mechanical life.

Notes:
1) Opinions of probable project costs are included Table SS 11-3.
2) Items to be confirmed at the Engineering Report level (see CIP SS-8).



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Sewer System: City of Monroe 2014
Snohomish County base data 2014
Data sources supplied may not reflect current or actual conditions. This map is a geographic representation based on information available. It does not represent survey data. No warranty is made concerning the accuracy, currency, or completeness of data depicted on this map.
BHC Consultants LLC., assumes no responsibility for the validity of any information presented herein, nor any responsibility for the use or misuse of the data.

NORTH

0 2,500 5,000 Feet

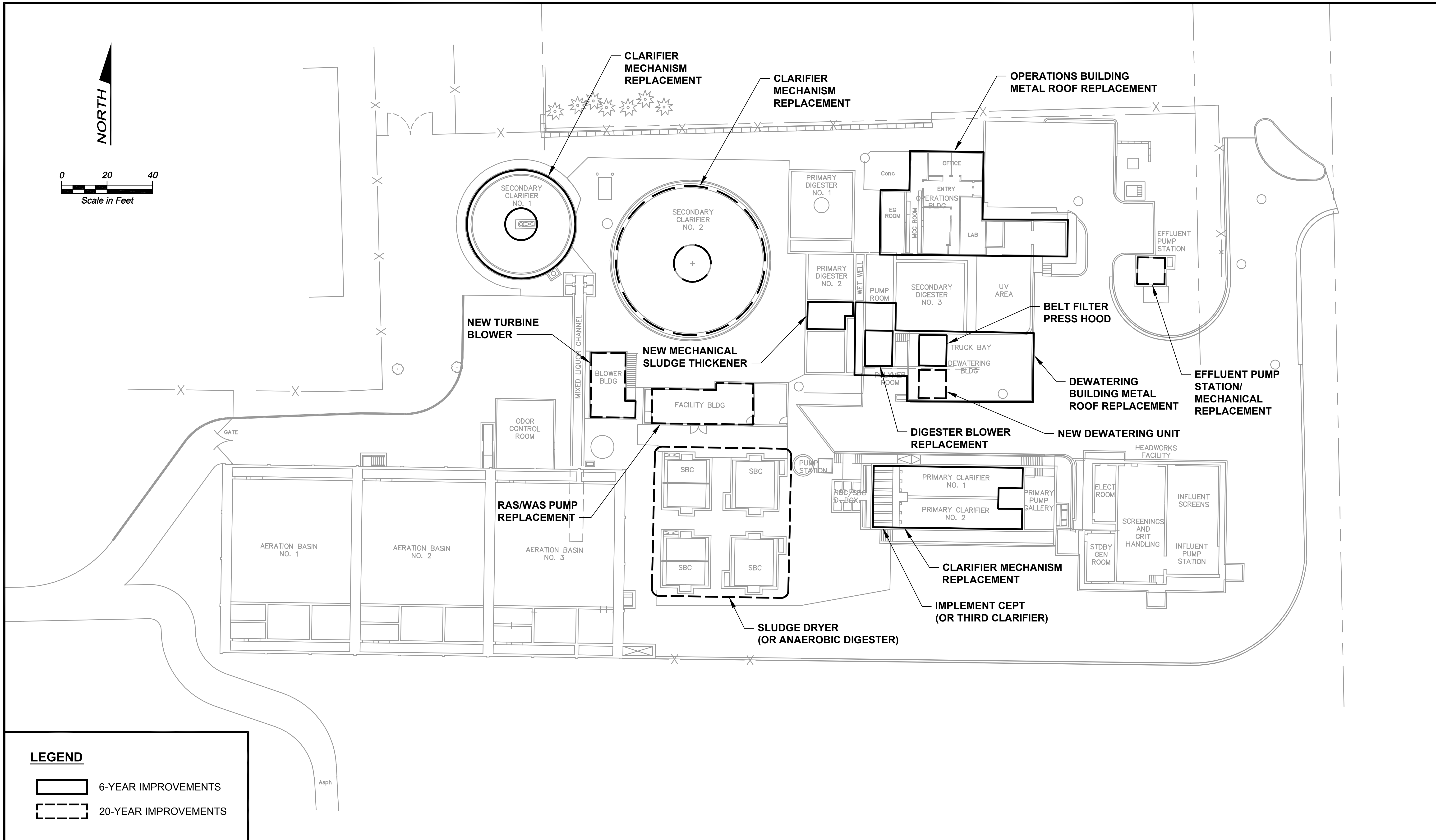
MONROE WASHINGTON

Recommended 6-Year & 20-Year Capital Improvements

Utility Systems Plan - Sewer
City of Monroe, Washington
March 2015

Figure

SS 11.1



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MONROE WASHINGTON

Recommended WWTP 6-Year & 20-year Capital Improvements

Monroe Comprehensive Sewer Plan

March 2015

Figure

SS 11.2

11.3 Basis for CIP Opinions of Probable Project Cost Estimates

Opinions of probable project costs for the 6-year and 20-year CIP are listed in Tables SS 11-2 and SS 11-3, respectively. These projects have been defined only to a preliminary level of design with approximate dimensions. All projects will require further definition and design refinement as part of the design process. The detailed opinions of probable project costs are included as Appendix SS-F.

Construction costs were estimated from bid results for similar projects in the Puget Sound area, RS Means cost data for 2014, and equipment vendor quotes. The opinion of probable construction cost includes the costs to build the various components and sales tax. Opinions of probable costs for City labor and direct costs, planning, surveying, engineering services, permitting, bid advertisement, contract award, and services during construction were calculated as a percentage of the opinion of probable construction costs. No costs are included for financing, easements, right-of-way, or property acquisition unless specifically noted.

Table SS 11-3 6-Year (2015 – 2021) CIP Opinion of Probable Project Costs								
CIP No.	**Project Description**	**Capacity**	**Obsolescence**	**O&M**	**General**	**Developer**	**Opinion of Probable Project Cost(1)(2)**	**Trigger(3)**
Collection and Conveyance								
SS-1	Gravity Sewer Replacement from the Department of Corrections (DOC) to the Park Place Pump Station	☑					$550,000	Existing Deficiency
SS-2	Cate's Pump Station Upgrades		☑				$450,000	(4)
SS-3	West Main Pump Station Upgrades		☑				$450,000	(4)
SS-4	$500,000 per year Pipe Replacement Program		☑	☑			$3,000,000	2015 - 2021
Wastewater Treatment Plant								
SS-5	WWTP Rerating Study	☑					$30,000	(5)
SS-6	Biosolids Management Study			☑			$50,000	(5)
SS-7	Primary Clarifier Mechanism Replacement		☑				$920,000	(5)
SS-8	WWTP Engineering Report	☑	☑	☑			$100,000	(5)
SS-9	Mechanical Sludge Thickener	☑		☑			$1,350,000	(5)
SS-10	Belt Filter Press Hood			☑			$180,000	(5)
SS-11	Operations and Dewatering Building Metal Roof Replacement		☑				$190,000	(5)
SS-12	$100,000 per year WWTP Maintenance		☑	☑			$600,000	2015-2021
SS-13	CEPT Implementation (or 3rd Primary Clarifier)(1)	☑					$280,000	(5)
SS-14	Digester Blower Replacement	☑	☑				$1,100,000	(5)
SS-15	42-ft Secondary Clarifier Mechanism Replacement		☑				$580,000	(5)
Total 6-year CIP Cost Opinion							**$8,400,000**	

Table SS 11-3 6-Year (2015 – 2021) CIP Opinion of Probable Project Costs								
CIP No.	**Project Description**	**Capacity**	**Obsolescence**	**O&M**	**General**	**Developer**	**Opinion of Probable Project Cost(1)(2)**	**Trigger(3)**

Notes:

1) Estimated project costs include the estimated construction costs plus surveying, engineering services, permits, bid advertisement, contract award, and engineering services during construction. Detailed estimates are included as Appendix SS-F.
2) No costs are included for financing, easements, right-of-way, or property acquisition unless specifically noted.
3) Trigger event or threshold to initiate project.
4) Mechanical/electrical components at or approaching expected life.
5) Items not considered critical to operation of the plant but which should be initiated in the next six years.

Table SS 11-4 20-Year (2022 – 2035) CIP Opinion of Probable Project Costs							
CIP No.	**Project**	**Capacity**	**Obsolescence**	**O&M**	**General**	**Developer**	**Opinion of Probable Project Cost(1)(2)**
Collection and Conveyance							
SS-101	Park Place Pump Station Upgrades		☑				$950,000
SS-102	Fryelands Pump Station and Force Main Upgrades	☑	☑				$2,900,000
SS-103	Beaton Pump Station Upgrades		☑				$450,000
SS-104	Fox Meadows Pump Station Upgrades		☑				$450,000
SS-105	Old Owen Pump Station Upgrades		☑				$450,000
SS-106	Valley View Pump Station	☑	☑				$1,492,000
SS-107	South Fryelands Pump Station Upgrades	☑	☑				$860,000
Wastewater Treatment Plant							
SS-108	New Dewatering Unit(1)		☑				$1,600,000
SS-109	Turbine Blower(1)	☑	☑				$500,000
SS-110	Plant-wide SCADA and Control Upgrades(1)		☑				$550,000
SS-111	Sludge Dryer (or Anaerobic Digester)(1)		☑				$8,300,000
SS-112	64-ft Secondary Clarifier Mechanism Replacement(1)		☑				$810,000
SS-113	RAS/WAS Pump Replacement(1)		☑				$700,000
SS-114	Effluent Pump Station Mechanical Replacement(1)		☑				$550,000
Total 20-year CIP Cost Opinion							**$21,322,000**

Notes:
1) Estimated project costs include the estimated construction costs plus surveying, engineering services, permits, bid advertisement, contract award, and engineering services during construction. Detailed estimates are included as Appendix SS-F.
2) No costs are included for financing, easements, right-of-way, or property acquisition unless specifically noted.

Chapter W 4 Description of Water System

4.1 Ownership and Management

The Monroe Water System is owned and operated by the City of Monroe, a municipal corporation. The public water system identification number is 558201. Ultimate decision-making authority rests with the Mayor and City Council. Day to day operation of the water system is under the general direction of the City's Public Works Operations & Maintenance Division Manager who serves as the water system manager and reports to the Public Works Director. The Public Works Director coordinates system analysis and design work, develops policies and goals for the water system and then forwards them to the City Council for consideration and adoption.

A copy of the 2014 Water Facilities Inventory is included on the following pages.

The location of the Monroe water system is shown in Figure W 4.1, Vicinity Map.

4.2 System History and Background

The City of Monroe was incorporated December 28, 1902 with a population of 350. Prior to incorporation, water from a "spring on the hill back of Fern Bluff" was provided by J. E. Dolloff of the Spring Water Company by franchise issued by the Snohomish County Commissioners[1]. Soon after incorporation the Monroe City Council granted a water service contract to Mr. S. A. Buck using water from wells on Buck Island and filtered water from the Skykomish River[2]. In 1905 Mr. Buck turned his water system over to the Monroe Water and Light Company which used two steam pumps located on Buck Island to provide 750 gallons per minute at 90 pounds per square inch.[3] In January of 1905 there were 118 customers of the water system. After years of legal challenges between Buck and Dolloff, Monroe developed its own gravity water system using Sykes Springs located approximately 8 miles north of town as the supply.[4]

Sometime between 1905 and 1937, Monroe developed a well field on Ingraham Hill. In 1937, "faced with a rapidly depleting reservoir and a highly unsatisfactory condition at the pumping station" [5] Monroe investigated connecting to the Everett pipeline. It appears that this went no farther than investigating as the March 1954, Report of Preliminary Survey of Town of Monroe Domestic Water System states "water for the town of Monroe is obtained by pumping from a well located about two miles from the town".

In 1963, Monroe began purchasing water from Everett from a wood stave pipeline north of Monroe. At this time the use of all other sources was discontinued due to the high levels of iron and manganese in the water. Everett replaced the wooden main in 1969 with a 51 inch steel pipe that is known as Transmission Main No. 5.

[1] Robertson, Nellie E., Monroe:The First Fifty Years 1860-1910, Bill & Nellie Robertson, Fall 1996.
[2] ibid
[3] ibid
[4] ibid
[5] Robertson, Nellie E., Monroe: The Next Thirty Years (1911-1940), Nellie E. Robertson, August 2002.

Monroe grew with an average rate of 2.2 percent per year from its incorporation in 1902 until 1988 when the population was 3,350. During this time timber and dairy farming dominated the area's economy. System improvements during this time included:

- Ingraham Hill Reservoir – an open in-ground 1.15 million gallon reservoir built in 1920
- Wagner Road Transmission Main – 14,000 feet of 12 inch main installed in 1963 when the city connected to the Everett system

WATER FACILITIES INVENTORY (WFI) FORM

Washington State Department of Health
Division of Environmental Health
Office of Drinking Water

ONE FORM PER SYSTEM

Quarter: 1
Updated: 01/06/2014
Printed: 01/06/2014
WFI Printed For: On-demand
Submission Reason: Pop/Connect Update

RETURN TO: Northwest Regional Office, 20425 72nd Ave S STE 310, Kent, WA, 98032

1. SYSTEM ID NO.	2. SYSTEM NAME	3. COUNTY	4. GROUP	5. TYPE
55820 1	MONROE WATER SYSTEM	SNOHOMISH	A	Comm

6. PRIMARY CONTACT NAME & MAILING ADDRESS

JAKEH N. ROBERTS [PW MANAGER]
806 W MAIN ST
MONROE, WA 98272-2198

STREET ADDRESS IF DIFFERENT FROM ABOVE
ATTN
ADDRESS
CITY STATE ZIP

7. OWNER NAME & MAILING ADDRESS **8. Owner Number** 003861

MONROE, CITY OF
JAKEH ROBERTS TITLE: PW MANAGER
806 W MAIN ST
MONROE, WA 98272

STREET ADDRESS IF DIFFERENT FROM ABOVE
ATTN
ADDRESS
CITY STATE ZIP

9. 24 HOUR PRIMARY CONTACT INFORMATION

Primary Contact Daytime Phone:	(360) 863-4502
Primary Contact Mobile/Cell Phone:	(425) 754-3752
Primary Contact Evening Phone:	(425) 239-0189
Fax:	E-mail: jroberts@monroewa.gov

10. OWNER CONTACT INFORMATION

Owner Daytime Phone:	(360) 863-4502
Owner Mobile/Cell Phone:	(425) 754-3752
Owner Evening Phone:	(425) 239-0189
Fax: (360) 863-4601	E-mail: jroberts@monroewa.gov

WAC 246-290-420(9) requires that water systems provide 24-hour contact information for emergencies.

11. SATELLITE MANAGEMENT AGENCY - SMA (check only one)

- [X] Not applicable (Skip to #12)
- [ ] Owned and Managed
- [ ] Managed Only
- [ ] Owned Only

SMA NAME: ______ SMA Number: ______

12. WATER SYSTEM CHARACTERISTICS (mark ALL that apply)

- [X] Agricultural
- [X] Commercial / Business
- [X] Day Care
- [X] Food Service/Food Permit
- [X] 1,000 or more person event for 2 or more days per year
- [X] Hospital/Clinic
- [X] Industrial
- [X] Licensed Residential Facility
- [X] Lodging
- [X] Recreational / RV Park
- [X] Residential
- [X] School
- [ ] Temporary Farm Worker
- [X] Other (church, fire station, etc.): ______

13. WATER SYSTEM OWNERSHIP (mark only one)

- [ ] Association
- [X] City / Town
- [ ] County
- [ ] Federal
- [ ] Investor
- [ ] Private
- [ ] Special District
- [ ] State

14. STORAGE CAPACITY (gallons) 7,547,755

15 Source Number	16 SOURCE NAME — LIST UTILITY'S NAME FOR SOURCE AND WELL TAG ID NUMBER. Example: WELL #1 XYZ456. IF SOURCE IS PURCHASED OR INTERTIED, LIST SELLER'S NAME Example: SEATTLE	17 INTERTIE — INTERTIE SYSTEM ID NUMBER	18 SOURCE CATEGORY: WELL	WELL FIELD	WELL IN A WELL FIELD	SPRING	SPRING FIELD	SPRING IN SPRINGFIELD	SEA WATER	SURFACE WATER	RANNEY / INF. GALLERY	OTHER	19 USE: PERMANENT	SEASONAL	EMERGENCY	20 SOURCE METERED	21 TREATMENT: NONE	CHLORINATION	FILTRATION	FLUORIDATION	IRRADIATION (UV)	OTHER	22 DEPTH — DEPTH TO FIRST OPEN INTERVAL IN FEET	23 CAPACITY (GALLONS PER MINUTE)	24 SOURCE LOCATION: 1/4, 1/4 SECTION	SECTION NUMBER	TOWNSHIP	RANGE
S01	EVERETT	24050 L											X			Y	X							2080	SW NE	20	28N	07E
S02	Everett	24050 L											X			Y	X							2880	NW NE	24	28N	06E
S03	Everett	24050 L											X			Y	X							2000	NE NW	19	28N	07E

WATER FACILITIES INVENTORY (WFI) FORM - Continued

1. SYSTEM ID NO.	2. SYSTEM NAME	3. COUNTY	4. GROUP	5. TYPE
55820 1	MONROE WATER SYSTEM	SNOHOMISH	A	Comm

	ACTIVE SERVICE CONNECTIONS	DOH USE ONLY! CALCULATED ACTIVE CONNECTIONS	DOH USE ONLY! APPROVED
25. SINGLE FAMILY RESIDENCES (How many of the following do you have?)	0	6216	Unspecified
A. Full Time Single Family Residences (Occupied 180 days or *more* per year)	4907		
B. Part Time Single Family Residences (Occupied *less than* 180 days per year)	0		
26. MULTI-FAMILY RESIDENTIAL BUILDINGS (How many of the following do you have?)			
A. Apartment Buildings, condos, duplexes, barracks, dorms	248		
B. Full Time Residential Units in the Apartments, Condos, Duplexes, Dorms that are occupied *more than* 180 days/year	1309		
C. Part Time Residential Units in the Apartments, Condos, Duplexes, Dorms that are occupied *less than* 180 days/year	0		
27. NON-RESIDENTIAL CONNECTIONS (How many of the following do you have?)			
A. Recreational Services and/or Transient Accommodations (Campsites, RV sites, hotel/motel/overnight units)	0	0	
B. Institutional, Commercial/Business, School, Day Care, Industrial Services, etc.	481	481	
28. TOTAL SERVICE CONNECTIONS		6697	

29. FULL-TIME RESIDENTIAL POPULATION

A. How many residents are served by this system 180 or *more* days per year? 18513

30. PART-TIME RESIDENTIAL POPULATION	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
A. How many part-time residents are present each month?												
B. How many days per month are they present?												

31. TEMPORARY & TRANSIENT USERS	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
A. How many total visitors, attendees, travelers, campers, patients or customers have access to the water system each month?	8000	8000	8000	8000	8000	8000	8000	50000	50000	8000	8000	8000
B. How many days per month is water accessible to the public?	31	28	31	30	31	30	31	31	30	31	30	31

32. REGULAR NON-RESIDENTIAL USERS	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
A. If you have schools, daycares, or businesses connected to your water system, how many students daycare children and/or employees are present each month?	2000	2000	2000	2000	2000	1500	1000	1000	2000	2000	2000	2000
B. How many days per month are they present?	31	28	31	30	31	30	31	31	30	31	30	31

33. ROUTINE COLIFORM SCHEDULE	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
	20	20	20	20	20	20	20	20	25	20	20	20

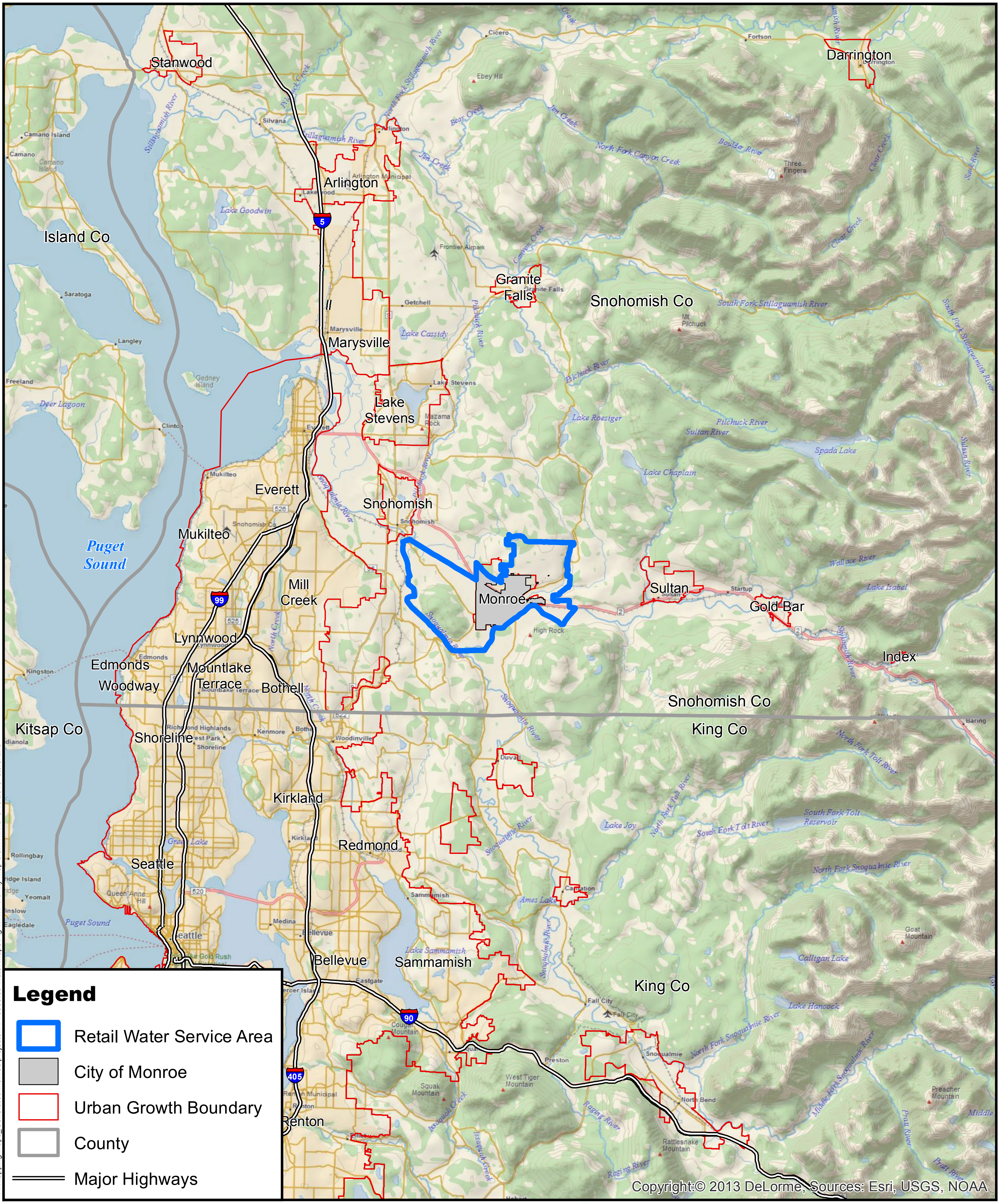
35. Reason for Submitting WFI:

☐ Update - Change ☐ Update - No Change ☐ Inactivate ☐ Re-Activate ☐ Name Change ☐ New System ☐ Other ____________

36. I certify that the information stated on this WFI form is correct to the best of my knowledge.

SIGNATURE: ______________________ **DATE:** ______________

PRINT NAME: ______________________ **TITLE:** ______________



P:\Mapping\Maps_Generated\Monroe\projects\14-10355.00 Water\maps\Fig W 4.1 Vicinity Map 8.5x11.mxd 3/18/2015 ctolentino

This map is a geographic representation based on available information . No warranty is made concerning the accuracy, currency, or completeness of data depicted on this map.

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Miles
0 3 6

NORTH

MONROE WASHINGTON

Vicinity Map

Utility Systems Plan - Water
City of Monroe, Washington
March 2015

Figure
W 4.1

- 179th Avenue Distribution Main – constructed in 1974 from SR 2 to Main Street to serve the developing west side of Monroe
- Chain Lake Road Transmission Main – 21,000 feet of 12 and 16 inch main installed in 1977 to connect the west side of Monroe to the Everett supply
- Trombley Hill Reservoir – a 2.0 million gallon steel reservoir constructed in 1984
- Brown Road Transmission Main – 5,500 feet of 16 inch main installed in 1984 to connect the Wagner Road and Chain Lake transmission mains

Monroe began to grow rapidly, as the timber and farm industries declined, in part due to the easy access provided by the three state highways. Between 1988 and 1996, Monroe's population almost doubled to 6,480. Since then the population within the Monroe city limits has more than doubled to 17,660[6]. This increase came partially from annexation of additional area but the majority was from new development. Monroe has taken on some of the character of a bedroom community. Many of the occupants of the new residential subdivisions commute to work in the Everett/Seattle/Bellevue area. In addition to providing housing, Monroe also has a thriving industrial area and numerous commercial operations, including several grocery stores and new car dealerships. In response to this rapid growth, significant changes have taken place in the water system. The major capital improvements include:

- Ingraham Hill Reservoir – a 2.0 million gallon steel reservoir built in 2001 to replace the original Ingraham Hill reservoir.
- DOC Reservoir – the city acquired a 750,000 gallon reservoir along with a 1,100 gallon per minute booster pump station from the Department of Corrections in 2001; the reservoir was constructed in 1986.
- Tester Road Booster Pump Station – a 1,500 gallon per minute booster pump station to supply the Department of Corrections and the Monroe High School.
- North Hill Reservoir and Booster Pump Station—a 1.15 million gallon reservoir and 1,500 gallon per minute booster pump station to supply the upper pressure zone of the system.
- Wagner Road Transmission Main Replacement Phase I – 8,900 feet of 18 inch main installed in 2005 to replace the northern section of the main installed in 1963.
- Reservoir #5 Trombley Hill Reservoir and Booster Station – a 2.5 million gallon steel reservoir and booster pump station built in 2006 provides storage for the Trombley, Airport, DOC and Downtown pressure zones.

In addition to the major system improvements listed above, the water distribution system has expanded significantly in the west area of the city and along the Chain Lake Road corridor.

As growth has occurred in the water service area, the City has been responsible for the installation of transmission facilities and storage reservoirs. The developers of an area have generally installed distribution mains. The northward expansion of suburban residential development has led to a problem. In 1963 and 1975 the transmission mains were installed in a rural area. The few homes that existed were served by individual wells. Rather than requiring the installation of a distribution main parallel to the transmission mains, direct service connections were allowed. Initially this was not a problem, but as growth has continued the usable capacity of these mains has been reduced by the need to maintain 30 pounds per square inch pressure at the service connection.

[6] Washington State Office of Financial Management April 1, 2014 estimated population

In the future, the City plans to continue the practice of installing the transmission and storage portions of the water system. However, transmission mains will be designated as such and service connections will not be allowed.

In 2013 and 2014, Monroe acquired the Sky Meadow Water Association. With this acquisition, Monroe acquired the following water system facilities:

- Lord Hill A Reservoir – A 25,000 gallon steel reservoir.
- Lord Hill B Reservoir – A 120,000 gallon concrete reservoir.
- Spring Hill A Reservoir – A 50,000 gallon concrete reservoir.
- Spring Hill B Reservoir – A 50,000 gallon concrete reservoir.
- Lord Hill Pump Station – A 235 gpm pump station.
- Spring Hill Pump Station – A 160 gpm pump station.
- Sky Meadow Distribution System – The Sky Meadow distribution system piping, hydrants, valves, and pressure reducing valve stations.

4.3 Inventory of Existing Facilities

The existing major facilities of the City's water system are shown in Figure W 4.2.

4.3.1 Sources of Supply

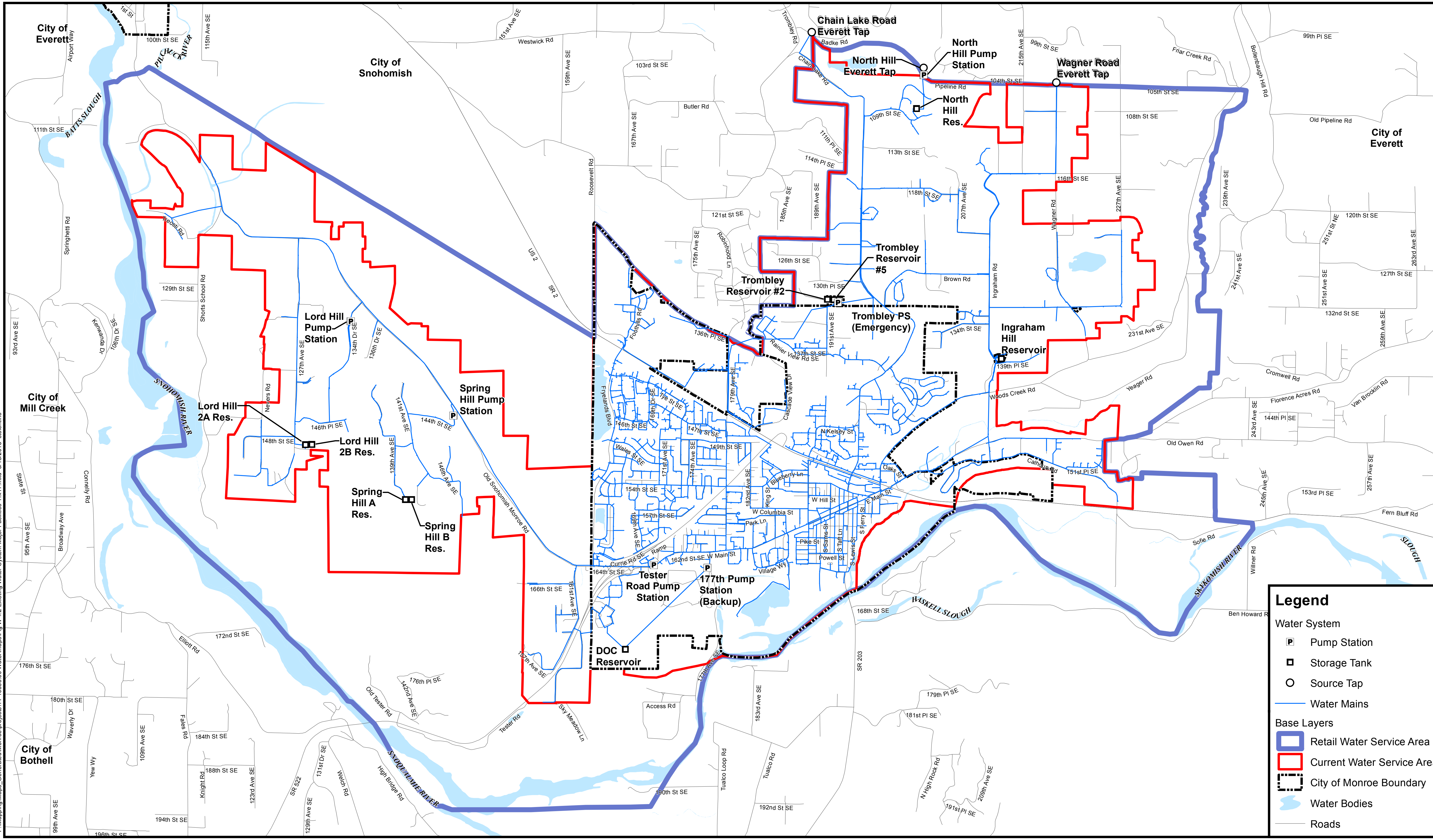
The Monroe Water System currently purchases water from the City of Everett. This water is supplied through three connections to the Everett Transmission Main #5, located approximately three miles north of Monroe. The three connections are summarized in Table W 4-1 and are shown in Figure W 4.2.

Table W 4-1 Sources of Supply

Source No.	Name	Capacity (gpm)	Location
1	Wagner	2,080	SW1/4-NE1/4 Section 20, T28N, R07E
2	Chain Lake	2,880	NW1/4-NE1/4 Section 24, T28N, R06E
3	North Hill	2,000	NE1/4-NW1/4 Section 19, T28N, R07E

The Everett supply system presently consists of Spada Reservoir, an impounding reservoir located at the source of the supply in the Sultan River Basin, a diversion facility located downstream from Spada Reservoir that diverts the flow in the Sultan River to the Lake Chaplain Equalizing Reservoir, and transmission pipelines extending westward. The City of Everett Water Filtration Plant located on Lake Chaplain provides sand filtration and chlorine disinfection of the drinking water.

Monroe signed a water agreement to purchase water in 1963 and it was amended in 1980 to allow Everett to recover the costs of the filtration plant they constructed and operate. The agreement dictates that "Everett agrees to supply all water required by Monroe's Municipal Water System as the same now exists or may be extended, including the requirements of the entire system both within and without Monroe's corporate limits. "This is subject to contracts Everett had in effect at the time the agreement was signed. The City did maintain its wells for some time after the signing of the agreement until certain repairs were made to Everett's



P:\Mapping\Maps_Generated\Monroe\projects\14-10355.00 Water\maps\Fig W 4.2 Existing Water System Major Facilities 11x17.mxd 3/18/2015 ctolentino

BHC CONSULTANTS

Water System: City of Monroe 2014
Snohomish County base data 2014
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NORTH

0 3,500 7,000 Feet

MONROE
WASHINGTON

Existing Water System
Major Facilities
Utility Systems Plan - Water
City of Monroe, Washington
March 2015

Figure
W 4.2

transmission pipeline. This agreement was valid through 1994. Everett continued to honor the conditions of the preexisting agreement through 1996, at which time Monroe was placed under the City of Everett Ordinance Rate. Monroe is now a wholesale water customer of the City of Everett. Everett has indicated they anticipate being able to supply Monroe's municipal water needs until at least 2050.

4.3.2 Storage Facilities

The Monroe Water System existing storage facilities are summarized in Table W 4-2 and are shown in Figure W 4.2.

Table W 4-2 Existing Storage Facilities

Tank No.	Name	Base Elev (ft)	Overflow Elev (ft)	Dia. (ft)	Material	Year of Constr.	Volume (MG)
1	Ingraham Hill	274	298	120	Steel	2001	2.0
2	Trombley #2	417	462	93	Steel	1984	2.0
3	North Hill	545	633	48	Steel	2004	1.15
4	DOC	280	335	50	Steel	1986	0.75
5	Trombley #5	417	462	98	Steel	2006	2.5
6	Lord Hill A	536.5	566.5	12	Steel	Unkn	0.025
7	Lord Hill B	538	568	30	Concrete	Unkn	0.12
8	Spring Hill A	555	568	26	Concrete	Unkn	0.05
9	Spring Hill B	555	568	26	Concrete	Unkn	0.05

4.3.3 Pump Stations

The Monroe Water System existing pump station facilities are summarized in Table W 4-3 and are shown in Figure W 4.2.

Table W 4-3 Existing Pump Station Facilities

Station No.	Name	Year Const.	Pump No.	Manf. & Model No.	Capacity (gpm @ TDH)	Motor HP	Suct. Zone	Disch. Zone
1	Trombley PS	2006	1	Cornell 1.5WH	125 @ 97’	5	Trombley 458	Chain Link 517
			2	Cornell 2WH	250 @ 118’	10		
			3	Cornell 2WH	250 @ 118’	10		
			4	Cornell 8H	3,000 @ 130’	125		
2	Tester Rd PS	1999	1	Peerless 10HXB 5-stage	950 @ 130’	40	Downtown 298	DOC 330
			2	Peerless 10HXB 5-stage	950 @ 130’	40		
3	177th PS (Backup)	1994	1	Floway 10DKH 5-stage	700 @ 135’	50	Downtown 298	DOC 330
			2	Floway 10DKH 5-stage	700 @ 135’	50		
4	North Hill PS	2004	1	Simflo SC12C 2-stage	400 @ 156’	20	Chain Link 517	North Hill 635
			2	Simflo SC12C 2-stage	400 @ 156’	20		
			3	Simflo SV12C 3-stage	1,500 @ 170’	100		
5	Spring Hill PS[1)]	1998	1	Unknown	160 @ 333’	25	Downtown 298	Spring Hill 565
			2	Unknown	160 @ 333’	25		
6	Lord Hill PS[1)]	1998	1	Unknown	235 @ 349’	35	Downtown 298	Lord Hill 565
			2	Unknown	235 @ 349’	35		

Notes:
1) Spring Hill and Lord Hill pump capacities taken from 1998 Sky Meadow computer model. Actual pump and model numbers and actual capacities are unknown.

4.3.4 Pressure Reducing Valves (PRV)

The Monroe PRV stations are summarized in Table W 4-4.

Table W 4-4 Existing PRV Stations

Station No.	Location	Make	Model	Size	Inlet PSI	Outlet PSI	Flowing?
V8012	Woods Creek	Cla-Val	8-100-01	8"	90	74	
V8014	Foothills	Cla-Val	90-01AB	8"	100	85	
V8016	Airport	Cla-Val	10-100-01	10"	175	90	
V8018	Fairgrounds	Cla-Val	6-90-01AB	6"	180	85	
V8022	Chain Lake Kelsey	Cla-Val	6-90-01AB	6"	130	44	
V8024	Chain Lake North	Cla-Val		8"	120	65	
V8026	Trombley	Cla-Val	750-67M	6"	65	14	No
V8028	Farm East	Cla-Val	10-100-01DB	10"	100	50	
V8034	Old Owen	Cla-Val	10-906-01ABC	10"	120	70	
V8038	Airport	Cla-Val	3-100-01	3"	90	105	Relief
V8040	Airport	Cla-Val	2-100-01	2"	175	98	
V8042	Foothills Bypass	Cla-Val		2"	100	75	
V8044	Trombley Bypass	Cla-Val	6-52-03	6"	65	15	Surge Protection
V8054	Old Owen Bypass	Cla-Val	4-906-01ABC	4"	120	75	
V8068	Chain Lake North	Cla-Val	3-100-01	3"	120	70	
V8070	Chain Lake North Bypass	Cla-Val	3-100-01	3"	70	80	Relief
V8072	Calhoun Bypass	Cla-Val	90-01-194A	2"	70	15	
V8074	Calhoun	Cla-Val	6-906-01AB	6"	70	10	
V8076	Local Service	Cla-Val	4-90-01BY	4"	130	65	
V8078	Local Service Bypass	Cla-Val	2-90-01BSY	2"	130	70	
V8080	Fairgrounds Bypass	Cla-Val	2-90-01A5	2"	180	90	
V8082	Chain Lake Kelsey Bypass	Cla-Val	2-90-01A5	2"	130	50	
V8084	Chain Lake Kelsey	Cla-Val	12-90-01AB	12"	130	35	
V8086	Chain Lake Kelsey Bypass	Cla-Val	4-50-01	4"	50	60	Relief
V8088	Farm East	Cla-Val	3-100-01	3"	100	55	
V8090	Farm East	Cla-Val	3-100-01	3"	55	65	Relief
V8092	Ingraham Res. Valve (PSV)	Cla-Val	8-210-03BDHY	8"	130	115	
V8094	Oaks @ Woodscreek	Cla-Val	8-100-01	8"	90	74	Same as V8012

Table W 4-4 Existing PRV Stations

Station No.	Location	Make	Model	Size	Inlet PSI	Outlet PSI	Flowing?
V8096	Oaks @ Woodscreek	Cla-Val	3-100-01	3"	90	81	
V8110	Ingraham (To Tank)	Cla-Val	10-210-01BY	10”	115	To Tank	
V8112	161st Ave SE	Cla-Val	6-90-01BCSY	6”	122	55	
	161st Ave SE (upstream)	Cla-Val	2-50-01	2”	122	130	Relief
	161st Ave SE (downstream)	Cla-Val	2-50-01	2”	55	90	Relief
V8116	127th Ave SE (Sky Meadow)	Cla-Val	4-90-601-ABC	4”	125	30	
	127th Ave SE (Sky Meadow)	Cla-Val	2-50-01	2”	35	45	Relief
	127th Ave SE (Sky Meadow)	Cla-Val	2-916-01AS	2”	125	35	
V8118	134th Dr SE (Sky Meadow)	Cla-Val	2-306-01	2”	65	75	Relief
	134th Dr SE (Sky Meadow)	Cla-Val	3-90-01AS	3”	200	65	
V8124	Sophie Rd			8”		10	
V8128	Sophie Rd			4”		15	

4.3.5 Transmission Mains

Three transmission mains connect the Everett pipeline with the distribution system.

- Wagner Main I: 8,900 feet of 18 inch main (2006) and 5,100 feet of 12 inch main (1963)
- Chain Lake Road: 21,000 feet of 12 and 16 inch main (1978)
- North Hill: 1,700 feet of 12 inch main (2004)

4.3.6 Distribution System

The grid system of the distribution system is primarily 8 and 10 inch pipe with a majority of the pipe looping the system being 4 inch and 6 inch mains. The total lengths of pipe, sizes, and materials are summarized in Table W 4-5.

Table W 4-5 Distribution System Pipe – Size and Material

Size (inches)	Material	Total Length (feet)
1	PVC	3,562
2	AC	384
2	DI	855
2	PVC	4,940
2	Other	1,783
4	AC	36,783
4	DI	3,099
4	PVC	7,229
4	Other	145
6	AC	72,127
6	DI	27,672
6	PVC	15,189
6	Other	31,449
8	AC	11,384
8	DI	130,161
8	PVC	117,696
8	Other	15,397
10	AC	7,145
10	DI	33,100
10	PVC	14,087
10	Other	2,893
12	AC	8,437
12	DI	76,503
12	PVC	18,602
12	Other	1,138
16	AC	5,477
16	DI	15,564
16	PVC	0
16	Other	154
18	DI	5,442
18	Other	3,306
TOTAL		671,756

AC = Asbestos Cement
DI = Ductile Iron
PVC = Polyvinylchloride

4.3.7 Meters

Since 1936[7] the Monroe Water System has metered all service connections. The water meters are read monthly. Monroe currently uses a radio system of drive-by meter reading in most areas. Some of the more urban areas use a touch wand which requires a physical site visit.

4.4 Related Plans

4.4.1 Comprehensive Land Use Plans

The planned land use for an area is important when sizing major system components such as transmission mains and storage reservoirs. Both the City of Monroe and the Snohomish County Comprehensive Land Use Plans were referred to when preparing this plan (see Figure W 5.4).

4.4.2 North Snohomish County Coordinated Water System Plan

This water system plan is consistent with the North Snohomish County Coordinated Water System Plan.

4.4.3 Washington State Department of Corrections Capital Improvements Plan

This plan, prepared in June 2011, outlines the projected water demands and anticipated improvements to the water system at the Monroe Correctional Complex. The plan was used to project future water demand at the Monroe Correctional Complex.

4.5 Existing Service Area Characteristics

The City of Monroe Retail Water Service Area is shown in Figure W 4.3. Figure W 4.3 also shows the Monroe City Limits and the Snohomish County Urban Growth Area.

4.5.1 Adjacent Water Purveyors

The Monroe Water Service Area and applicable adjacent water purveyors are shown in Figure W 4.4.

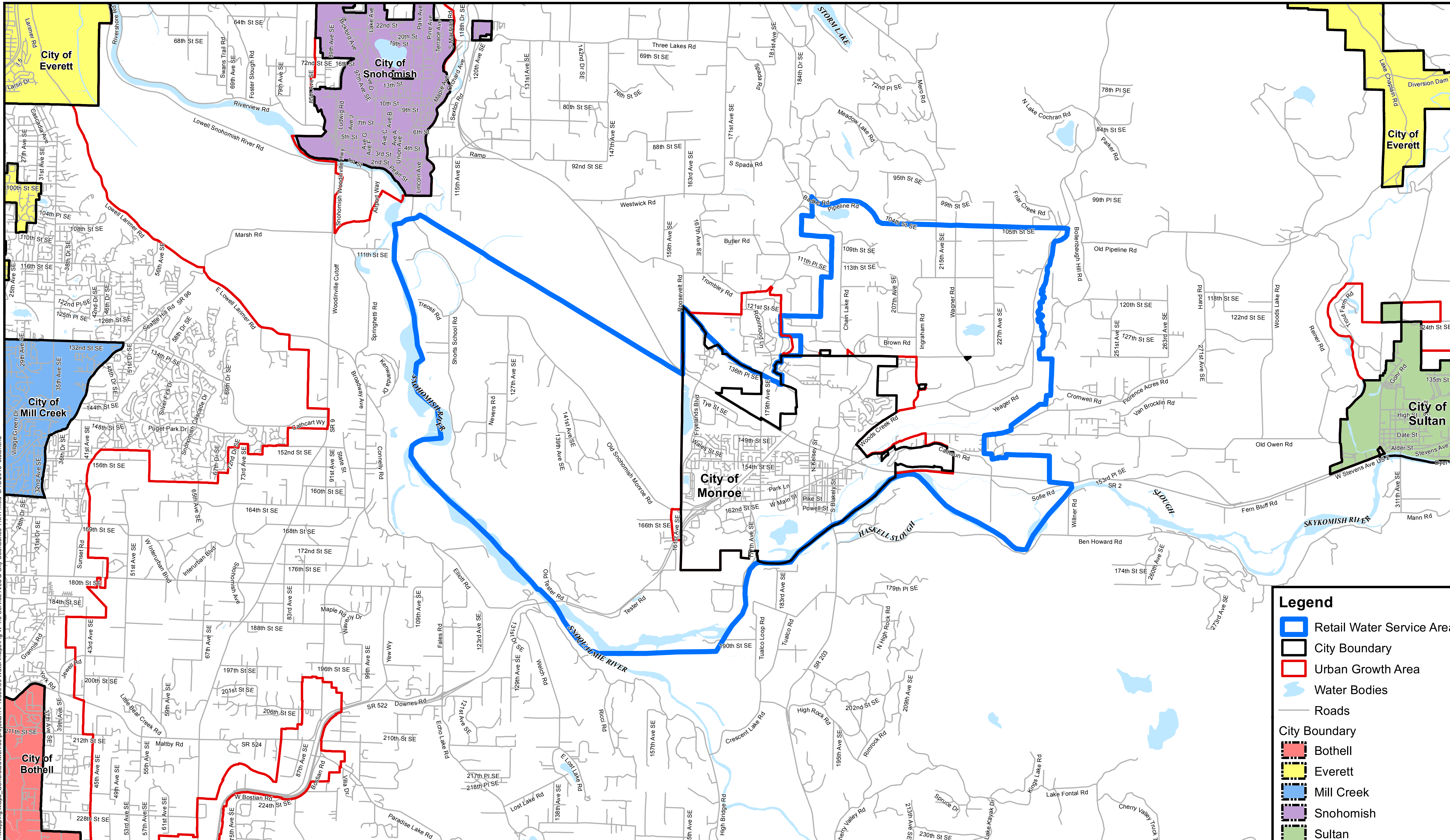
The water service area boundaries for the Monroe water system are consistent with the Snohomish County Coordinated Water System Plan and have been established in working with the county and adjacent water purveyors. The following is a brief description of each of those adjacent water purveyors and how they relate to the Monroe water system.

City of Everett

Monroe purchases its water from Everett. Monroe has three connections to Everett's Transmission Line No. 5, supplied from Lake Chaplain. This transmission line has a capacity of 50 million gallons per day and, since its construction in 1969, has proven to be a reliable source of supply for the City of Monroe.

[7] Robertson, Nellie E., Monroe: The Next Thirty Years (1911-1940), Nellie E. Robertson, August 2002.

At the present time the Everett Water System uses Lake Chaplain as a supply reservoir and provides treatment, including filtration, through a facility that was completed in 1984. Since 1984 the treatment facility has undergone ongoing improvements, based on increasing demands of municipal and industrial water supply and water quality issues set forth through the Safe Drinking Water Act. Monroe entered into an agreement to purchase water from Everett on April 18, 1963. Currently Everett has eliminated water supply contracts and Monroe now purchases water at their wholesale rate. Everett's comprehensive water plan indicates they plan on meeting Monroe's future water demands.



P:\Mapping\Maps_Generated\Monroe\projects\14-10355.00 Water\maps\Fig W 4.3 Service Area & City Boundaries 11x17.mxd 3/18/2015 ctolentino

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Snohomish County base data 2014
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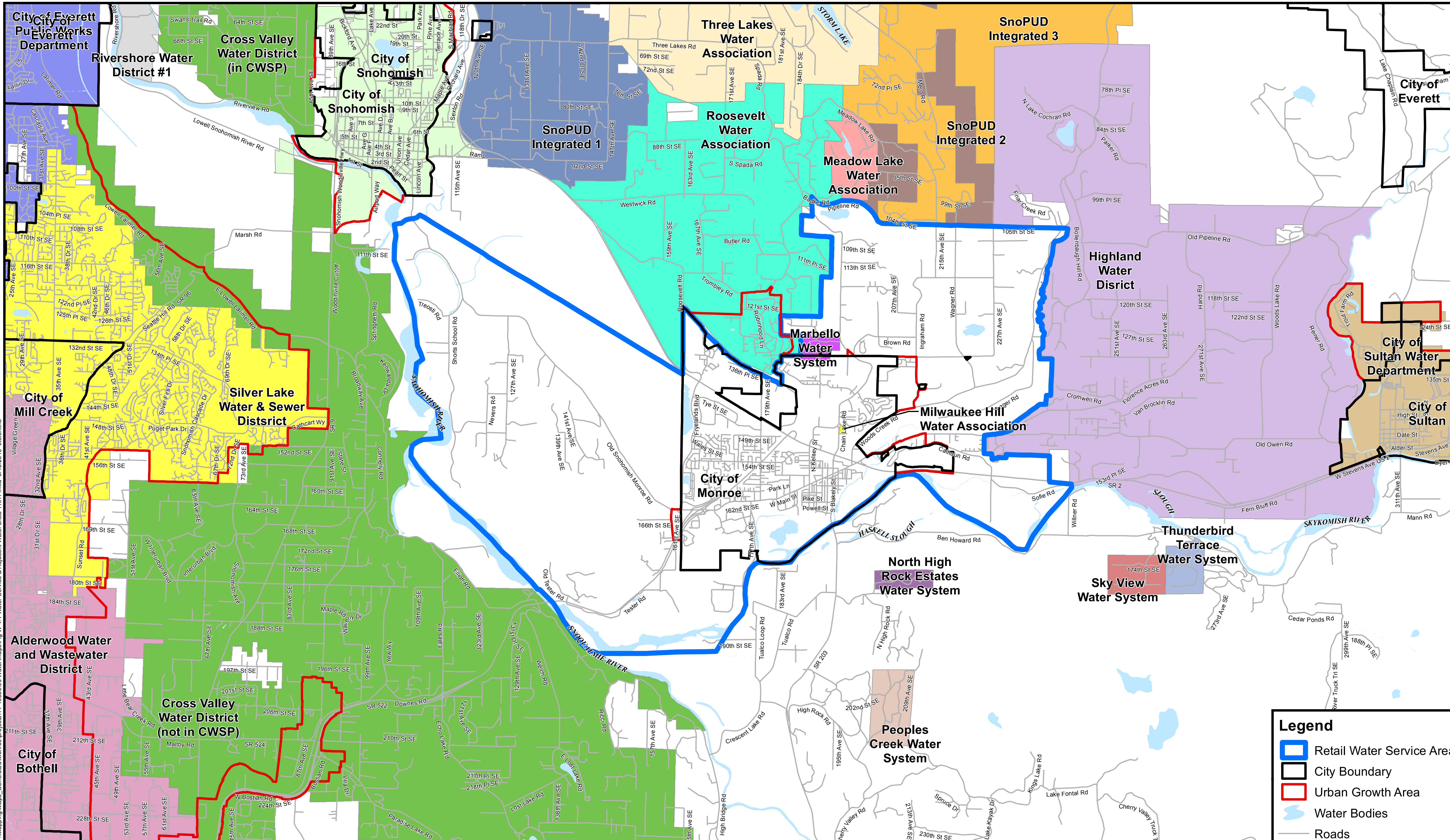
NORTH

0 3,000 6,000 12,000 Feet

MONROE
WASHINGTON

Service Area &
City Boundaries
Utility Systems Plan - Water
City of Monroe, Washington
March 2015

Figure
W 4.3



P:\Mapping\Maps_Generated\Monroe\projects\14-10355.00 Water\maps\Fig W 4.4 Water Service & Adjacent Water Dists 11x17.mxd 3/18/2015 ctolentino

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Snohomish County base data 2014
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NORTH

0 3,000 6,000 12,000 Feet

MONROE WASHINGTON

Water Service Area & Adjacent Water Districts

Utility Systems Plan - Water
City of Monroe, Washington
March 2015

Figure
W 4.4

Roosevelt Water Association

The Roosevelt Water Association is a private water association serving the area northwest of Monroe. It presently has approximately 994 customers serving an area of approximately 2,500 acres. The area is served for the most part by 6-inch waterlines, and is almost entirely residential. The Roosevelt Water Association also purchases its water from Everett. Emergency interties have been informally discussed several times in the past. Current discussions are underway to add an intertie near the Chain Lake transmission main. A portion of the Monroe Urban Growth Area is within the Roosevelt Water Association water service area. This area is expected to develop to urban densities with the need for sanitary sewer service. Monroe currently requires sanitary sewer customers to also have the City as their water service provider. This requirement is the subject of ongoing discussions with the water association and the City Council.

Highland Water District

The Highland Water District serves the area northeast of Monroe, east of Wagner Lake and north of Old Owen Road. The Highland Water District has approximately 1,200 services. Both an intertie and joint use reservoir have been informally discussed in the past, but due to pressure differences and water main sizing issues this is no longer anticipated.

Marbello Water Association

The Marbello Water Association serves approximately 100 customers and is located near the intersection of Chain Lake Road and Brown Road. This association purchases water from the Monroe Water System at out of city residential rates. The 2013 overall demand was 7,208,000 gallons for an average daily demand of 18,249 gallons per day. Monroe is also required to provide standby storage for this water system.

4.6 Future Service Area

The Monroe Water System future service area was developed in 1991 as part of the North Snohomish County Critical Water Supply Service Area planning process and was approved by the Snohomish County Boundary Review Board on September 17, 1990. The future service area is also shown in the North Snohomish County Coordinated Water System Plan.

Monroe modified its future service area in 2002 ceding a portion along Old Owen Road to the Highland Water District. This is shown as an exception to the service area legal description included in Appendix W-A.

In 2014, Monroe acquired the adjacent Sky Meadow Water Association. This increased Monroe’s Water Service Area by about 80 percent. The legal description for this area is included in the Water System Plan Addendum entitled, “Service Area Expansion, October, 2013.” The expanded service area is shown in Figure W 4.3.
As a general rule the Monroe Water System does not proactively extend distribution mains into unserved areas. Monroe works with developers to bring water service to newly developing areas. If it is not economically feasible to extend water service, individual wells are usually installed.

4.7 Service Area Agreements

The Monroe Water System is located within the North Snohomish County Critical Water Supply Service Area and is a party to the North Snohomish Coordinated Water System Plan. Monroe has one water service agreement, with the Department of Corrections. A copy of the agreement is included in Appendix W-B.

Monroe does not have any other area agreements but continues to negotiate with Roosevelt Water Association in the interest of establishing an agreement with the association.

4.8 Service Area Policies

It is the adopted policy of Monroe to provide water service to any property within the water service area boundary. Prior to granting such service the applicant must meet all water department requirements and meet conditions of service. These requirements include line extensions if required, hydrant installation, and payment of front footage charges if due.

4.8.1 Wholesaling Water

The City currently has a wholesale water rate that was established during a 2004 rate study completed by Financial Consulting Solutions Group, Inc. In 2008 Financial Consulting Solutions Group, Inc. updated this rate study. At the present time, the City does not intend to wholesale water to any customers.

4.8.2 Wheeling Water

The City of Monroe does not wheel water to any other purveyor.

4.8.3 Annexation

The City of Monroe does not require the water service applicant to annex to the City prior to providing water service nor does the City require the applicant to sign an agreement to annex or waiver of opposition to annexation.

4.8.4 Direct Connection and Satellite/Remote Systems

All new development must connect directly to the existing water system to be served by the Monroe Water System. Satellite or remote systems are not allowed.

4.8.5 Design and Performance Standards

Chapter 13.04 of the Monroe Municipal Code governs the Monroe Water System. Design and construction standards are included in the City of Monroe Public Works Design and Construction Standards, which have been adopted by resolution of the City Council. A copy of the Design and Construction Standards are included in Appendix W-C.

4.8.6 Surcharge for Outside Customers

The water rates for customers outside of the corporate limits of Monroe are 150 percent of the In-City rate.

4.8.7 Formation of Local Improvement Districts

Monroe has formed local improvement districts to finance the installation of water system improvements in the past. This financing option is available as provided for in the Revised Code of Washington and authorized by the City Council.

4.8.8 Urban Growth Areas

A portion of the water service area is within the Monroe Urban Growth Area. In addition, a portion of the Monroe Urban Growth Area are not within the Monroe Water Service Area. Since the Monroe Municipal Code requires connection to the Monroe Water System as a condition of sanitary sewer service, City staff continue to work with the adjacent purveyors and the City Council to determine how to resolve these conflicts.

The North Snohomish County Coordinated Water System Plan requires Monroe, at its own cost, to upgrade water mains in areas currently served to provide the required water supply for urban levels of service. These additional improvements have been reflected in Monroe's capital improvement fees.

4.8.9 Utility Reimbursement Agreements

The City of Monroe allows utility reimbursement agreements in accordance with Monroe Municipal Code Chapter 13.20.

4.8.10 Oversizing

The minimum main size in the Monroe Water System is 8 inches. Larger sizes are required in some areas as outlined in the capital improvement section of this plan. Developers are required to install the size main shown in this plan. If Monroe requires a main to be installed that is larger than that needed by the development and not shown in this plan, Monroe may reimburse the developer for the cost of oversizing as determined by the City Engineer.

4.8.11 Cross-Connection Control Program

The purpose of Monroe Cross Connection Control Program is to protect and maintain the bacteriological and chemical quality of the municipal potable water supply by the elimination and prevention of cross connections between Monroe potable water distribution system and any water piping arrangement that might threaten the quality of the potable water distribution system. Chapter 13.06 of the Monroe Municipal Code provides the authority for the system's program and is included in Appendix W-D.

4.8.12 Extension

As a general rule the Monroe Water System does not proactively extend distribution mains into unserved areas. Monroe works with developers to bring water service to newly developing areas.

4.9 Satellite Management

The Monroe Water System does not wish to become a Washington State Department of Health approved satellite management agency.

4.10 Conditions of Service

The Monroe Water System conditions of service are set forth in Chapter 13.04 of the Monroe Municipal Code and are shown in Appendix W-E.

4.11 Complaints

The Public Works Department receives citizen concerns regarding water quality or distribution via telephone, e-mail or mail. After receipt and logging of the complaint, a work order is generated and sent to the appropriate party for response.

Complaints are typically addressed based on the severity and nature of the complaint. Public health concerns are addressed immediately, while other less severe concerns are handled in conjunction with the complainant. The City documents the corrective action taken, if any, and the date and time of the complaint. The complaint information is placed into a Compliant Log for future reference. In addition, there is an after-hours emergency number that can be utilized by City of Monroe customers. If a customer calls the after-hours number, a representative from the City will assist them within one-half hour.

A summary of complaints received in 2011 through 2014 are summarized in Table W 4-6.

Table W 4-6 Summary of Customer Complaints 2011-2014

Description	No. of Complaints	Number Resolved
Low Pressure	1	1
Dirty Water	23	23
White Water	1	1
Stale Water	1	1
Chlorine Smell	1	1
TOTAL	**27**	**27**

Chapter W 5 Existing & Future Population, Employment, and Demand Projections

5.1 Historical and Current Population, Service Connections, Water Use, and ERUs

Historical and current population and water demands are necessary to adequately plan for and accommodate future water system needs. The City of Monroe Retail Water Service Area includes the City, portions of the Monroe Urban Growth Area, and unincorporated Snohomish County lands. Not all parcels within the Retail Water Service Area currently receive water service. The parcels that currently receive water service are referred to herein as the Current Water Service Area. The Current Water Service Area as well as the Retail Water Service Area are shown in Figure W 5.1.

5.1.1 Historical and Current Population

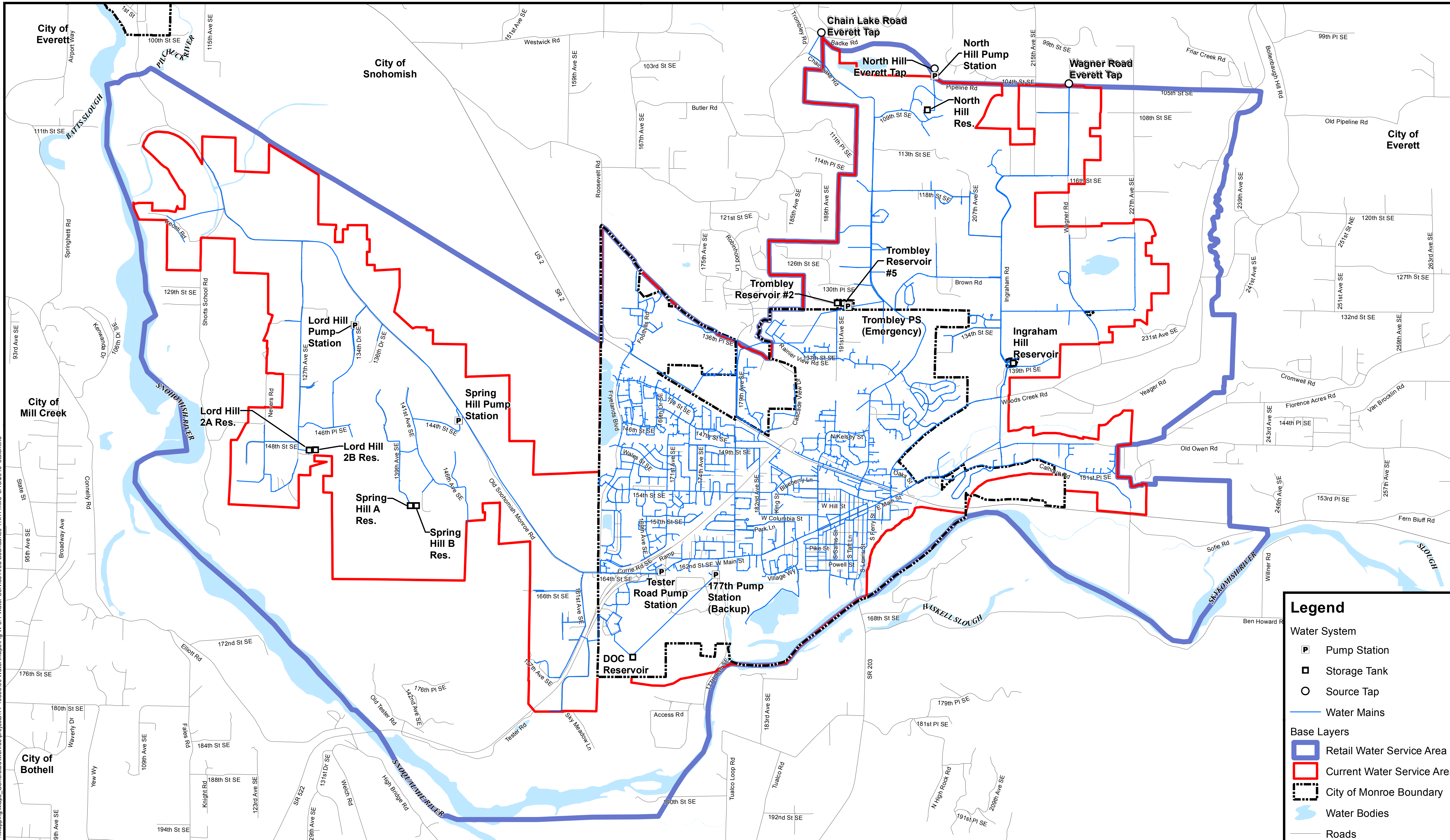
Year 2013 is the most recent full year for which water demand data is available. As a result, Year 2013 is used for calculating unit water demands for the various demand classifications. Year 2013 population and employment within the Current Water Service Area are summarized in Table W 5-1.

Table W 5-1 2013 Population and Employment

Description	Current Water Service Area	Retail Water Service Area
Population	21,753	22,907
Employment	9,314	9,411

Baseline residential population estimates were calculated using 2010 Census data. Census block population data was distributed to parcels based on population density and residential acreage, and aggregated by pressure zone. Year 2013 residential population estimates were calculated by interpolating between the 2010 baseline data and the Snohomish County 2035 Population Growth Targets for the Monroe UGA (refer to Appendix W-F). The current population receiving water service is 21,753 persons. See Appendix W-F for a detailed population methodology.

Current employment estimates per pressure zone were calculated using 2013 Covered Employment estimates and 2012 American Community Survey (ACS) self-employment estimates. Covered employment refers to positions covered by the WA Unemployment Insurance Act, and accounts for approximately 90-95% of all employment. The Act exempts self-employed individuals, therefore this analysis accounts for this exemption by increasing the covered employment value by an additional 8.634% (ACS estimated percentage of Monroe residents “with self-employment income”). The current employment receiving water service is 9,314 persons.



P:\Mapping\Maps_Generated\Monroe\projects\14-10355.00 Water\maps\Fig W 5.1 Water Service Area Boundaries 11x17.mxd 3/18/2015 ctolentino

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Water System: City of Monroe 2014
Snohomish County base data 2014
Data sources supplied may not reflect current or actual conditions. This map is a geographic representation based on information available. It does not represent survey data. No warranty is made concerning the accuracy, currency, or completeness of data depicted on this map.
BHC Consultants LLC., assumes no responsibility for the validity of any information presented herein, nor any responsibility for the use or misuse of the data.

NORTH

0 3,500 7,000 Feet

MONROE WASHINGTON

Water Service Area Boundaries

Utility Systems Plan - Water
City of Monroe, Washington
March 2015

Figure

W 5.1

The Department of Corrections facilities contain both residents (inmates) and employees. In 2013, there were 2,548 inmates and 1,210 employees. With these numbers, the general population is 21,753 minus 2,548, or 19,205 and the general employment is 9,314 minus 1,210, or 8,104.

5.1.2 Service Connections

The 2014 Water Facilities Inventory (WFI) dated January 2014 (included in Chapter W 4), indicates the Monroe water system served a total of 5,636 connections at the end of 2013, as summarized in Table W 5-2.

Table W 5-2 Number of Service Connections

Year	2013
Single Family Residential Connections	4,907
Multi-Family Residential Connections	248
Non-Residential Connections	481
Total Connections	5,636

The 2014 WFI indicates the total number of multiple family units is 1,309, with an average of 5.3 units per connection. The WFI also lists the total number of calculated connections based on the number of multiple family units. This total number of calculated connections is 6,697.

5.1.3 Water Use

Monroe purchases all of their water from Everett as a wholesale customer. Annual water purchases and overall metered demands for the past seven years are shown in Table W 5-3.

Table W 5-3 Annual Water Demands

Year	Annual Total Purchased From Everett (gallons)	Average Daily Demand (gpd)	City Meter Totals (gpd)	Hydrants, Documented Leaks, & Flushing (gpd)	Water Loss (gpd)	Water Loss (%)
2007	828,572,316	2,270,061	1,984,735	25,441	259,885	11.4 %
2008	775,422,428	2,118,641	2,022,798	14,790	81,053	3.8 %
2009	703,911,384	1,928,524	1,985,895	36,916	(94,287)	(4.9 %)
2010	765,211,480	2,096,470	1,812,068	39,631	244,771	11.7 %
2011	726,482,284	1,990,362	1,714,547	26,701	249,115	12.5 %
2012	726,798,688	1,985,789	1,756,192	23,577	206,020	10.4 %
2013	718,061,801	1,967,293	1,758,960	34,281	174,052	8.8 %

Average Daily Demands (ADD) and Maximum Daily Demands (MDD) over the past five years are summarized in Table W 5-4.

Table W 5-4 Average and Maximum Daily Demands			
Year	**ADD (gpd)**	**MDD (gpd)**	**MDD/ADD Factor**
2009	1,928,524	4,942,784	2.56
2010	2,096,470	3,895,584	1.86
2011	1,990,362	3,344,308	1.68
2012	1,985,789	2,968,812	1.50
2013	1,967,293	3,003,968	1.53

Table W 5-4 indicates there has been a general downward trend in MDD/ADD peaking factor over the past five years. This trend appears to be a result of water use efficiency efforts by the City. It is unknown if this trend will continue or if the lower peaking factors will remain long term. As a result, it is prudent to use a peaking factor that is conservative. Based on the information in Table W 5-4, an MDD/ADD factor of 2.0 will be used. This peaking factor is conservative in relation to the past four years.

Maximum Daily Demand typically occurs during the summer months. Three typical summer days were selected to determine the Peak Hour Demand peaking factors. The three days selected are: June 18, 2013; July 16, 2013; and, August 20, 2013. The Peak Hour Demand peaking factors are shown in Table W 5-5. Based on the information in Table W 5-5, a PHD/MDD peaking factor of 1.77 will be used.

Table W 5-5 Peak Hour Demand Factors			
Date	**Daily Demand**	**Peak Hour Demand**	**Peak Hour Demand Factor**
June 18, 2013	2.39 mgd	3.97 mgd	1.66
July 16, 2013	2.37 mgd	4.24 mgd	1.79
August 20, 2013	2.44 mgd	4.54 mgd	1.86
Average			1.77

The 2013 Average Day Demand (ADD) was subdivided into several categories using the summary of water meter records for 2013. Using this distribution, the 1,758,960 gpd is subdivided into 963,285 gpd for residential customers and 795,675 gpd for non-residential customers. These water demands are further subdivided as described below.

Residential Water Demands:

The City billing records do not permit direct determination of which connections are single family residential and which connections are multi-family residential. Two billing codes (06 – ¾" In City Residential, and 25 – ¾" Out of City Residential) are assumed to be solely single family residential since multi-family services typically uses meters larger than ¾". These two billing codes represent about 92 percent of the single family connections. Therefore, these two billing codes will be used as the basis for calculating the water demand per single family unit.

For the year 2013, total water demand for Billing Codes 06 and 25 was 734,901 gallons per day. The total number of connections in the two billing codes is 4,515. These numbers result in a water demand of 163 gpd per single family connection.

Total annual average residential water demand for 2013 is 963,285 gpd (from the City's water meter records summary). Since there are 4,907 single family connections, the water demand for single family residential connections is 799,841 gpd. The remaining residential water demand is multi-family residential water demand, 163,444 gpd. At 1,309 multi-family residential units, this equates to 124.9 gpd/unit.

Non-Residential Water Demands:

The City of Monroe only has one large water user. A large water user is defined as an average daily demand larger than 20,000 gpd. The one large water user is the Department of Corrections (DOC). The ADD for the DOC is 395,403 gpd, based on actual water meter records for January through December of 2013.

The total non-residential water demand, per the City's water meter records summary, is 795,675 gpd. The non-residential water demand, excluding the DOC, is therefore 400,272 gpd.

Unit water demands for the various demand classifications are summarized in Table W 5-6. The unit water demands in Table W 5-6 are based on the 2013 Average Day Demands. The unit water demands in Table W 5-6 will be used for development of the future water demands.

Table W 5-6 Unit Water Demands

Description	2013 ADD (gpd)	Unit	No. of Units In 2013	ADD per Unit (gpd/unit)
Residential	963,285	Person	19,261	50.0
Non-Residential	400,272	Employee	8,104	49.4
Dept. of Corrections	395,403	Inmate	2,548	155.2
Hydrants, Documented Leaks, and Flushing	34,281	Percentage[1]	1	1.95 %
Water Loss	174,052	Percentage[1]	1	9.90 %
TOTAL	**1,967,293**			

Note:
1) Percentage of total water demand from: residential, commercial/industrial/government, schools, and large water users.
2) Excludes DOC employees

5.1.4 Equivalent Residential Units (ERUs)

Water demand per equivalent residential unit (ERU) is the amount of water consumed on a daily basis in a single family dwelling. The demand per ERU is calculated above at 163 gallons per day per ERU. For 2013, water consumption, number of connections, and equivalent residential units per consumption category are shown in Table W 5-7. Water demand of 163 gpd/connection divided by 50.0 gpd/person results in 3.3 persons per single family residential unit. Water demand of 163,444 gpd for 1,309 multi-family units results in 124.9 gpd per unit, or

2.5 persons per unit. This is approximately 76 percent of the density for single family units, which is consistent with standard industry ranges.

Table W 5-7 2013 Water Consumption and ERUs

Consumption Category	ADD (gpd)	Number of Connections	Average Gallons per Day per Connection	ERUs per Connection	TOTAL ERUs
Single Family Residential	799,841	4,907	163	1.0	4,907
Multi-Family Residential	163,444	248	659	4.0	1,003
Non-Residential	795,675	481	1,654	10.1	4,881
Hydrants, Documented Leaks, & Flushing	34,281	N/A	N/A	N/A	210
Water Loss	174,052	N/A	N/A	N/A	1,068
TOTAL	1,967,293	5,636	N/A	N/A	12,069

The Monroe Municipal Code, Section 13.04.025, defines an equivalent residential unit as a consumption of 1,000 cubic feet per month. This equates to approximately 250 gallons per day. Table W 5-8 summarizes data included in the previous Water System Plan and new information calculated for this plan. A review of the information in Table W 5-8 indicates that actual average use by single family residences to be considerably lower than the 250 gallons per day. A plot of average water use per ERU indicates a general trend of a decreasing amount of water used per single family residence, as shown in Figure W 5.2.

Table W 5-8 Water Demand per ERU

Year	Water Demand (gpd per ERU)
1994	275
1995	225
1996	259
1997	218
1998	229
1999	199
2000	214
2001	199
2002	182
2003	200
2004	188
2005	168
2006	186

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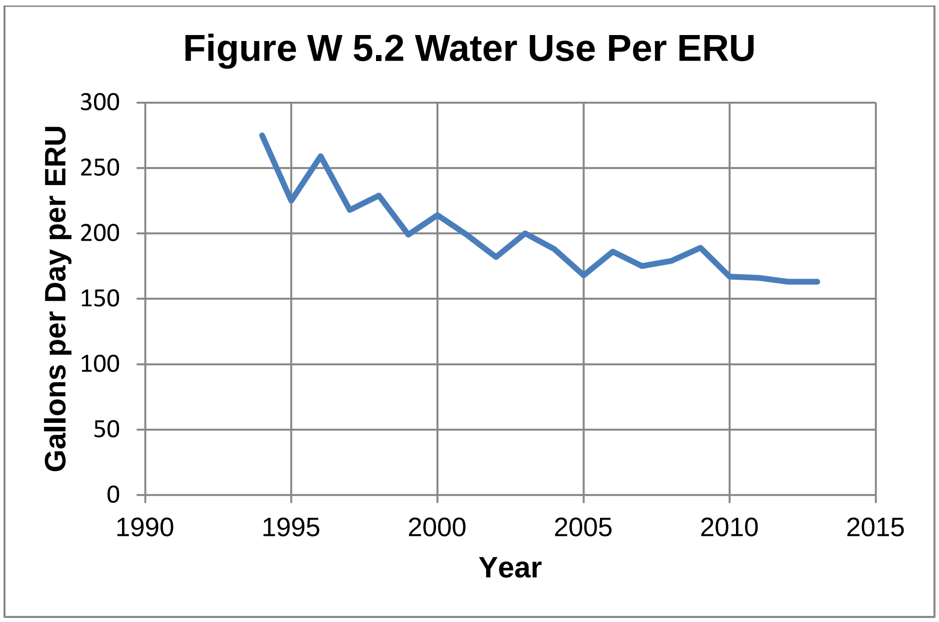
Table W 5-8 Water Demand per ERU

Year	Water Demand (gpd per ERU)
2007	175
2008	179
2009	189
2010	167
2011	166
2012	163
2013	163



5.2 Future Land Use, Projected Populations, and Water Demand

5.2.1 Future Land Use

The City of Monroe Retail Water Service Area encompasses most of the Monroe UGA and extends into unincorporated Snohomish County. This Water System Plan Update is being developed concurrently with the City of Monroe Comprehensive Plan Update (developed by Studio Cascade). BHC has worked closely with Studio Cascade to ensure future land use changes are accounted for. This included a potential UGA expansion (zone R3-5) off the southwest corner of the Monroe UGA and up-zoning several residential zones in the northern portion of the Monroe UGA to R5-7. Figure 3.1 depicts land use within the Retail Water Service Area. Significant land use change is not anticipated for the unincorporated Snohomish County rural lands.

5.2.2 Projected Populations

Residential and employment population projections were developed for the City's Retail Water Service Area for the first 10 years (2015 through 2024) and 2035. The hydraulic analysis years are 2021 (6-years) and 2035 (20-years). The existing populations and forecasts for 2021 and 2035 are shown in Table W 5-9.

Expansion of the current water service area to unserved customers in the full Retail Water Service Area will occur over time as development occurs and as residents request water service. The vast majority of the unserved area is outside the Monroe Urban Growth Area (UGA). Since Snohomish County is unlikely to change the rural zoning and it is currently uneconomical to serve customers at the current densities, expansion into the unserved area over the next 20 years is anticipated to be minimal. Only one water main loop in the northeast portion of the Retail Water Service Area is likely to be constructed in the next 20 years (on 227th Ave SE and 116th St SE). It is assumed this water main extension will add a population of 20 and an employment of 5 over the next 20 years.

Table W 5-9 Projected Populations

Description	2013	2021	2035
Total Residential Population	**21,753**	**24,278**	**27,610**
Dept. of Corrections (Inmates)	2,548	2,601	2,838
General Population	19,205	21,677	24,772
Total Employment	**9,314**	**10,668**	**12,911**
Dept. of Corrections (Employees)	1,210	1,235	1,348
General Employment	8,104	9,433	11,563

Projected Residential Population:

For the Monroe UGA, Countywide Planning Policies for Snohomish County adopted a 2035 Population Growth Target of 24,754. This adopted target was distributed throughout the Monroe UGA based on development capacity. Residential populations were interpolated for 2013 and 2021 between 2010 Census data (taken as baseline residential population) and 2035 Population Growth Targets.

The residential population analysis utilizes Snohomish County 2012 Buildable Lands Report (BLR) data to establish the development capacity per parcel. BLR data was obtained for the Monroe UGA. The BLR identifies parcels as vacant, partially used, or re-developable given a 2025 planning horizon. The BLR provides the additional housing unit (HU) capacity per parcel. The development capacity is calculated for each parcel as its additional capacity divided by the total Monroe UGA capacity, resulting in the percentage of residential population growth captured per parcel.

Beyond the Monroe UGA, the residential population analysis utilizes Snohomish County micro analysis zone (MAZ) data which forecasts 2035 population growth on rural unincorporated lands. This growth was distributed to vacant residential lands.

The 2013 residential population for the Monroe current and retail water service areas, as well as projections for the years 2021 and 2035, are shown in Table W 5-10. While the 2010 residential population is the baseline, the interpolated 2013 population is shown in Table W 5-10 to be evenly compared to the employment and student baseline populations.

Table W 5-10 Residential Population Projections

Year	Current Water Service Area	Future Water Service Area	Retail Water Service Area
2013	21,753	n/a	22,907
2014	21,959	n/a	23,115
2015	22,246	n/a	23,405
2016	22,533	n/a	23,694
2017	23,001	n/a	24,165
2018	23,320	n/a	24,487
2019	23,640	n/a	24,810
2020	23,960	n/a	25,132
2021 (6-years)	24,278	24,298	25,453
2022	24,599	24,619	25,777
2023	24,919	24,939	26,099
2024	25,239	25,259	26,421
2035 (20-years)	27,610	27,630	28,822

Projected Employment Population:

For the Monroe UGA, Countywide Planning Policies for Snohomish County adopted a 2035 Employment Growth Target of 11,781. This adopted target was distributed throughout the Monroe UGA based on development capacity. Employment populations were interpolated for 2021 between 2013 Baseline data and 2035 Population Growth Targets.

The population analysis utilizes Snohomish County 2012 Buildable Lands Report (BLR) data to establish the development capacity per parcel. BLR data was obtained for the Monroe UGA. The BLR identifies parcels as vacant, partially used, or re-developable given a 2025 planning horizon. The BLR provides the additional employment capacity per parcel. The development capacity is calculated for each parcel as its additional capacity divided the total Monroe UGA capacity, resulting in the percentage of employment population growth captured per parcel.

Beyond the Monroe UGA, the rural employment population analysis utilizes Land Use Baseline data by Traffic Analysis Zone (TAZ) from the Puget Sound Regional Council (PSRC) which forecasts employment growth for 2020, 2030, and 2040. A value for 2035 employment growth was interpolated and distributed to vacant parcels.

The baseline employment populations for the Monroe current and retail water service areas, as well as projections for the years 2021 and 2035, are shown in Table W 5-11.

Table W 5-11 Employment Population Projections			
Year	**Current Water Service Area**	**Future Water Service Area**	**Retail Water Service Area**
Baseline (2013)	9,314	n/a	9,411
2014	9,478	n/a	9,598
2015	9,641	n/a	9,785
2016	9,805	n/a	9,972
2017	9,984	n/a	10,175
2018	10,155	n/a	10,370
2019	10,326	n/a	10,564
2020	10,497	n/a	10,759
2021 (6-years)	10,668	10,673	10,953
2022	10,838	10,843	11,147
2023	11,009	11,014	11,342
2024	11,180	11,185	11,536
2035 (20-years)	12,911	12,916	13,527

Department of Corrections Projections:

Monthly Average Daily Population (ADP) values are posted on the DOC's website for the fiscal years 2009-2013. The December 2013 ADP (2,548) was used as the basis for calculating the unit water demands shown in Table W 5-7.

It is assumed the 2015 ADP will be 2,500, which is the capacity of Monroe facility. Section 3 of the DOC's 2011 Capital Improvements Plan addresses ADP projections and estimates a 20-year growth of 13.5 percent. This results in a 2035 ADP of 2,838. It is assumed the DOC population will grow at a linear rate over the next 20 years, or at a rate of 16.9 inmates per year. At this growth rate, the 2021 ADP will be 2,601.

The 2013 number of employees at DOC was 1,210, or an employee to inmate ratio of 0.475. It is assumed this ration will remain the same throughout the planning period. Based on this ratio, the number of employees in 2021 will be 1,235 and the number of employees in 2035 will be 1,348.

5.2.3 Projected Water Demand Without Water Use Efficiency

Per capita water demands were determined by dividing the 2013 ADD by the appropriate unit, as shown in Table W 5-6. The unit water demands shown in this table were then used in conjunction with the projections shown above to project future water demands. As noted above, expansion of the Current Water Service Area is anticipated to be minimal over the next 20 years. The projected water demands are shown in Table W 5-13 and assume only minimal expansion of the water system. The projections in Table W 5-13 are without water use efficiency.

Using the same methodology described above, water demand projections were developed for each year through 2024. These annual ADD projections are shown in Table W 5-12.

Table W 5-12 Annual Water Demand Projections	
Year	**ADD (gpd)**
2014	1,981,976
2015	2,008,656
2016	2,035,319
2017	2,073,019
2018	2,101,934
2019	2,130,850
2020	2,159,766
2021	2,189,990
2022	2,218,936
2023	2,247,852
2024	2,276,768

Table W 5-13 Water Demand Projections – Without Water Use Efficiency

Description	Unit	ADD per Unit (gpd/unit)	2013		2021		2035	
			No. of Units	ADD (gpd)	No. of Units	ADD (gpd)	No. of Units	ADD (gpd)
Residential	Person	50.2	19,205	963,285	21,697	1,088,278	24,792	1,243,507
Non-Residential	Employee	49.4	8,104	400,272	9,438	466,168	11,568	571,387
Dept. of Corrections	Inmate	155.2	2,548	395,403	2,601	403,628	2,838	440,406
Hydrants, Documented Leaks, and Flushing	Percentage(1)	1.95%	1	34,281	1	38,161	1	43,954
Water Loss	Percentage(1)	9.90%	1	174,052	1	193,755	1	223,166
TOTAL WATER DEMAND				**1,967,293**		**2,189,990**		**2,522,419**

Note:
1) Percentage of total water demand from: residential, non-residential, and DOC.

5.2.4 Projected Water Demand With Water Use Efficiency

The City maintains an ongoing water use efficiency program in recognition of the significant demands that population growth is placing on the Puget Sound regional water supply. Efficient use of the existing supply is a central component of sustaining the City's needs. The goal of the water use efficiency program is to eliminate waste and encourage the City's customers to use water wisely, thereby reducing per capita use on a long-term basis.

Table W 5-3 indicates overall water use has generally decreased between 2007 and 2013. Further, Table W 5-10 indicates water use per ERU has decreased between 1998 and 2013. The reduction from 1998 to 2013 was about 28.8 percent. It is believed this reduction is, in part, due to water use efficiency measures and serves as documentation that the City's water use efficiency efforts are successful.

The City buys City of Everett water directly from the Everett Pipeline No. 5. Monroe participates in the Everett Water Utility Regional Conservation Program and thus shares in the system-wide water use efficiency goal, which is to reduce demand by 1.86 MGD by 2018. The Monroe Water Use Efficiency goals and water use efficiency program are shown in Appendix W-G. In addition, the Monroe Water Loss Action Plan to reduce Water Loss is included in Appendix W-G. The Everett Conservation Plan is currently being updated and Monroe intends to continue their participation in the program.

As water use efficiency methods are implemented (including water use efficiency water pricing, education, indoor and outdoor water use efficiency kits, toilet and washer rebates), a decrease in water use efficiency will be noticed. Estimating out to year 2035, and assuming a continual decline in water use demand, this water system plan assumes annual water use efficiency beginning in 2015 at 1.2 percent and reducing to 0.5 percent in 2035, based on the trend the City of Everett shows in their 2007 Plan. This is equivalent to a 7.9 percent reduction by 2021 and a 19.5 percent reduction by 2035. It is possible that more or less savings will be realized within the Monroe service area. Future water system plans will adjust these projections based on actual demand reductions. With this water use efficiency goal, the water demand forecast has been adjusted. The projected demands with water use efficiency are summarized in Table W 5-14.

Table W 5-14 Water Demand Projections – With Water Use Efficiency

Description	Unit	ADD per Unit (gpd/unit)	2013		2021		2035	
			No. of Units	ADD (gpd)	No. of Units	ADD (gpd)	No. of Units	ADD (gpd)
Residential	Person	50.2	19,205	963,285	21,697	1,002,073	24,792	1,001,688
Non-Residential	Employee	49.4	8,104	400,272	9,438	429,241	11,568	460,271
Dept. of Corrections	Inmate	155.2	2,548	395,403	2,601	371,655	2,838	354,762
Hydrants, Documented Leaks, and Flushing	Percentage[(1)]	1.95%	1	34,281	1	35,139	1	35,407
Water Loss	Percentage[(1)]	9.90%	1	174,052	1	178,407	1	179,767
TOTAL WATER DEMAND				**1,967,293**		**2,016,515**		**2,031,895**

Note:
1) Percentage of total water demand from: residential, non-residential, and DOC.

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5.2.5 Water Rates

The Monroe City Council sets water rates by periodic resolution. The current rates set by Resolution No. 027/2014 are shown in Table W 5-15.

Table W 5-15 Current Water Rates

Monthly Water Charges per Unit	In City per Month (includes first 400 cubic feet)	Out of City per Month (includes first 400 cubic feet)
3/4"x5/8" Metered Service	$22.92	$34.38
1" Metered Service	30.43	45.65
1-1/2" Metered Service	34.99	52.49
2" Metered Service	42.66	63.99
3" Metered Service	51.82	77.73
4" Metered Service	60.74	91.11
6" Metered Service	250.80	376.20
8" Metered Service	326.82	490.23
Over 400cf	$2.75 per 100 cf	$4.13 per 100 cf

Unit is defined as follows:

- Each single family residence
- Each unit in multiple residential buildings
- Each residential unit in a commercial building
- Each mobile home in a mobile home park
- Each occupied travel trailer or motor home

Chapter W 6 System Analysis

6.1 System Design Standards

A variety of laws, rules, regulations and standards apply to the management, evaluation, and design of water system components for the Monroe Water System. Among these are the following:

- Washington State Department of Health Water System Design Manual
- Washington Administrative Code Chapter 246-290
- North Snohomish County Coordinated Water System Plan
- Uniform Fire Code
- Monroe Municipal Code Chapter 13.04
- Monroe Public Works Design and Construction Standards
- Water Quality Parameters – Safe Drinking Water Act and DOH Standards

System design standards applicable to the Monroe water system facilities are summarized in Table W 6-1

6.1.1 Standard Construction Plans

Standard construction plans set forth the materials and construction standards that contractors, developers, and the City must follow when constructing water system facility improvements. Standard construction plans for the City are included in Appendix W-H.

6.1.2 Water Quality Parameters

The City is classified as a Group A public water system and is required to comply with applicable DOH requirements. The DOH defines maximum contaminant levels (MCL's) for water systems. Constituents that require monitoring and the MCL's are listed in WAC 246-290-300 and 246-290-310.

The City of Everett is responsible for testing and treating the water that is purchased by the City. The City of Monroe is responsible for the distribution system monitoring that is outlined in WAC 246-290-300, that includes coliform sampling, disinfection by-product sampling, residual disinfectant sampling, and lead and copper monitoring. Those tests and recent results are described below.

6.1.3 Fire Flows

The City has established required fire flows for each of the zoning classifications within the Retail Water Service Area. There also exist individual properties/structures that require fire flows that are higher than those determined by the zoning classifications. These are input individually to the computer model for hydraulic analysis.

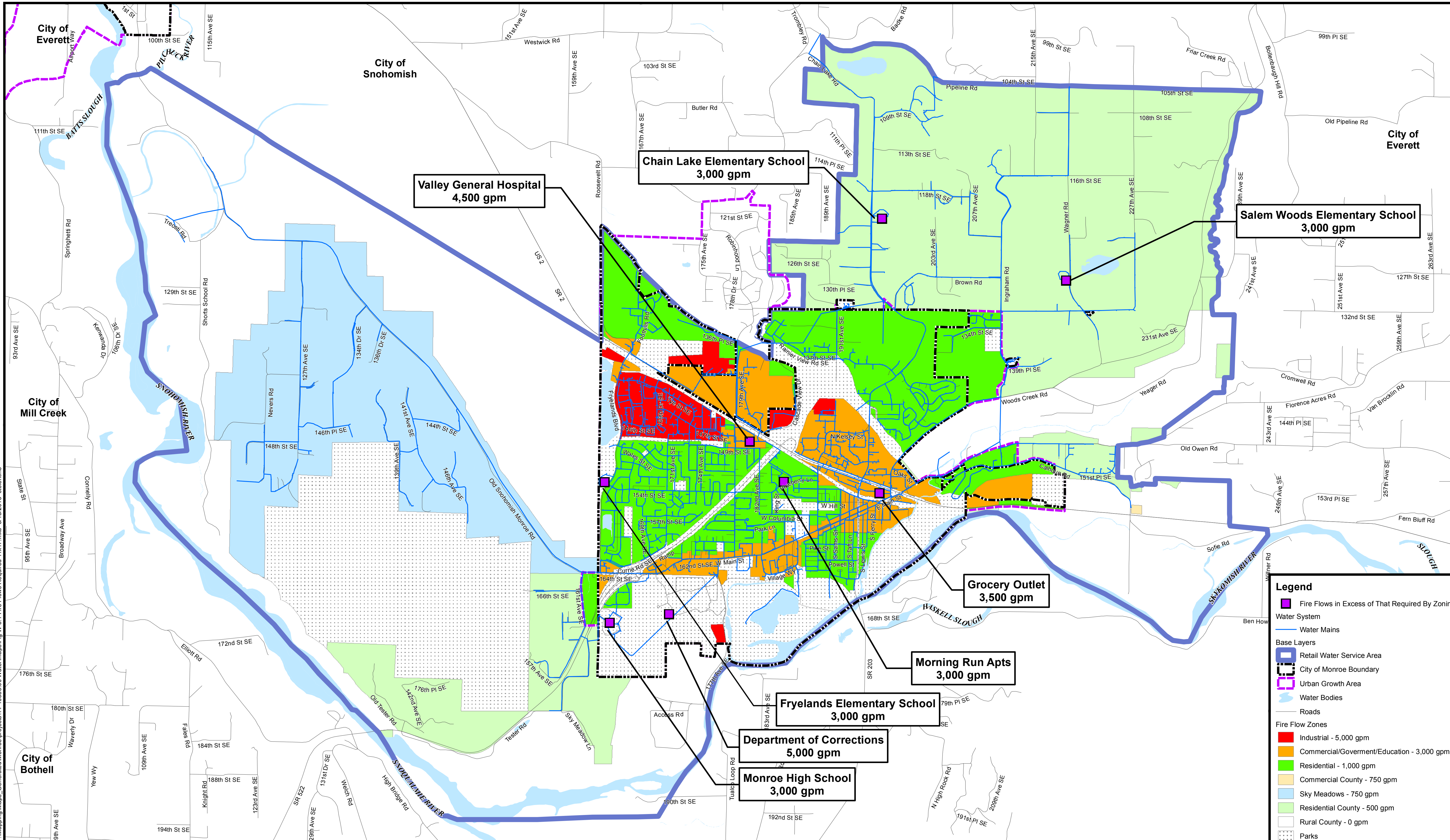
Both the fire flows based on zoning classifications and the individual properties/structures that require higher fire flows are shown in Figure W 6.1

Table W 6-1 General Facility Design Standards

Standard	DOH Water System Design Manual Criteria (Dec. 2009)	City of Monroe Standard
Average Day Demand & Maximum Day Demand	Average Day Demand (ADD) should be determined from metered water use data. Maximum Day Demand (MDD) is estimated at approximately 2.0 times the average day demand if metered data is not available. *Chapter 5*	ADD = metered purchased water (163 gpd/ERU) MDD = metered maximum day purchased water (326 gpd/ERU)
Peak Hour Demand	Peak hour demand is determined using the following equation: PHD = (MDD/1440)[(C)(N) + F] + 18 C = Coefficient from DOH Table 5-1 N = Number of connections, ERUs F = Factor of range from DOH Table 5-1 *Chapter 5*	PHD = metered peak hour purchased water averaged from three typical days (557 gpd/ERU, 4,672 gpm)
Reliability Recommendations	• Sources capable of supplying MDD within an 18-hour period • Sources meet ADD with largest source out of service • Back-up power equipment for pump stations unless there are two independent public power sources • Provision of multiple storage tanks • Standby storage equivalent to ADD x 2, with a minimum of 200 gpd/ERU • Low and high level storage alarms • Looping of distribution mains when feasible • Pipeline velocities not greater than 10 fps at PHD • Flushing velocities of 2.5 fps for all pipelines *Chapter 5*	Same as DOH Water System Design Manual
Source	Capacity must be sufficient to meet MDD and replenish fire suppression storage in 72 hours. *Chapter 7*	Same as DOH Water System Design Manual
Minimum System Pressure	The system should be designed to maintain a minimum of 30 psi in the distribution system under PHD and 20 psi under MDD plus fire flow conditions. *Chapter 8*	Same as DOH Water System Design Manual

Table W 6-1 General Facility Design Standards

Standard	DOH Water System Design Manual Criteria (Dec. 2009)	City of Monroe Standard
Fire Flow Standard	The minimum fire flow shall be determined by the local fire authority or WAC 246-293/246-290 for systems within a Critical Water Supply Service Area (CWSSA), whichever is greater. *Chapter 8*	The City's fire flow requirements are based on the International Fire Code (IFC) Guidelines
Minimum Pipe Sizes	The diameter of a transmission line shall be determined by hydraulic analysis. The minimum size distribution system line shall not be less than 6-inches in diameter. *Chapter 8*	Same as DOH Water System Design Manual
Valve and Hydrant Spacing	Sufficient valving should be placed to keep a minimum of customers out of service when water is turned off for maintenance or repair. Fire hydrants should be provided with their own auxiliary gate valve. *Chapter 8*	Same as DOH Water System Design Manual
Storage	The sum of: ***Operational Storage (OS)*** Volume sufficient to prevent pump cycling ***Equalizing Storage (ES)*** $V_{ES} = (Q_{PH} – Q_S) * 150$ ***Standby Storage (SB)*** $V_{SB} = 2 ((ADD * N) – t_m * (Q_S – Q_L))$ ***Fire Suppression Storage (FSS)*** $V_{FSS} = NFF * T$ and ***Dead Storage*** Where: ADD = average day demand, gpd/ERU N = number of ERU's Q_{PH} = peak hour demand, gpm Q_S = capacity of all sources, excluding emergency sources, gpm Q_L = capacity of largest source, gpm t_m = daily pump source run time, min (1440) NFF = needed fire flow, gpm T = fire flow duration, min *Chapter 9*	Same as DOH Water System Design Manual



Water System: City of Monroe 2014
Snohomish County base data 2014
Data sources supplied may not reflect current or actual conditions. This map is a geographic representation based on information available. It does not represent survey data. No warranty is made concerning the accuracy, currency, or completeness of data depicted on this map.
BHC Consultants LLC., assumes no responsibility for the validity of any information presented herein, nor any responsibility for the use or misuse of the data.

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NORTH

0 3,500 7,000 Feet

MONROE WASHINGTON

Fire Flows Required
Utility Systems Plan - Water
City of Monroe, Washington
March 2015

Figure
W 6.1

6.2 Water Quality Analysis

This section summarizes an evaluation of the City's efforts to comply with the required water quality regulations and testing requirements. Specific details on water quality sampling are included in Chapter W 9, Operations and Maintenance Program. The City provides a Consumer Confidence Report to its customers annually. A copy of the City's 2013 Consumer Confidence Report (year 2012 data) is located in Appendix W-I.

The Monroe Water System purchases water from the City of Everett. The source of the water is Spada Lake located in the Sultan Basin. The City of Everett Water Filtration Plant located on Lake Chaplain provides sand filtration and chlorine disinfection of the drinking water. The finished water is continuously monitored by the City of Everett. The City of Monroe conducts additional testing on the water system.

6.2.1 Bacteriological

The City takes coliform samples in accordance with the Coliform Monitoring Plan, which is included in Appendix W-J. The City currently takes 21 coliform samples each month in the distribution system and eight samples each month at reservoirs and pump stations. The City had zero positive coliform samples in 2013.

6.2.2 Residual Disinfectant

The City monitors for residual disinfectant daily at the Wastewater Treatment Plant. In addition, chlorine residual is monitored weekly at all reservoirs. In the past six years, the City has never had a sample where chlorine residual was not detected. The City has recorded residual disinfectant concentrations since the 1980's. Residual disinfectant sampling data is summarized in Table W 6-2.

6.2.3 Disinfectants/Disinfection By-Products Rule (DBPR)

Disinfection by-products (DBP) result from the reaction of disinfectants such as chlorine and chloramines with traces of organic compounds in the drinking water. Some common DBP are chloroform, dichloromethane, halogenated acetic acids, and other halogenated organic compounds. The risks that are posed by DBP range from increased risk of cancer to neurological damage and damage to major organ systems.

The City tests for DBP four times each quarter. The results are also summarized in Table W 6-2.

6.2.4 Water Quality Sampling Results

Table W 6-2 summarizes the City's water quality results from the 2013 Consumer Confidence Report.

Table W 6-2 2013 Water Quality Analysis Results						
Parameter	**Units**	**Ideal Level/Goal (MCLG)**	**Maximum Allowable (MCL)**	**Range or Other**	**Average or Highest Result**	**Comply?**
Nitrate	ppm	10	10	0.023-0.105	0.062	Yes
Total Coliform Bacteria	percent positive	0 %	5 % positive per month	none	0 %	Yes
Fluoride	ppm	2	4	0.5-0.9	0.8	Yes
Chlorine	ppm	4.0 (MRDLG)	4.0 (MRDL)	0.2-0.93	0.57	Yes
Haloacetic Acids (5)	ppb	n/a	60	10.9-31.6	21.1	Yes
Total Trihalomethanes (TTHM)	ppb	n/a	80	15.6-46.0	27.7	Yes
Turbidity	NTU	n/a	TT	100 %	0.17	Yes

6.2.5 Lead and Copper

The City participates in the Everett Regional Lead and Copper Rule Monitoring Program. The purpose of the Program is to help fulfill the monitoring, notification, and treatment optimization in accordance with the EPA Lead and Copper Rule. This Program allows data to be collected using similar protocols for the entire City of Everett water service area. A copy of the Lead and Copper Rule Compliance Monitoring Plan is included in Appendix W-K.

The City tests for lead and copper every three years. In 2012, the City took samples at four locations. The results for the City's lead and copper sampling are summarized in Table W 6-3.

Table W 6-3 2013 Lead, Copper, and pH Results					
Parameter	**Units**	**Ideal Level/Goal (MCLG)**	**Action Level (AL)**	**90th % Level**	**Homes Exceeding Action Level**
Lead	ppb	0	15	8.6	None
Copper	ppm	1.3	1.3	0.0894	None
pH	pH	Daily Avg 7.6	Min Daily Avg 7.4	Avg 7.6	Minimum 7.4

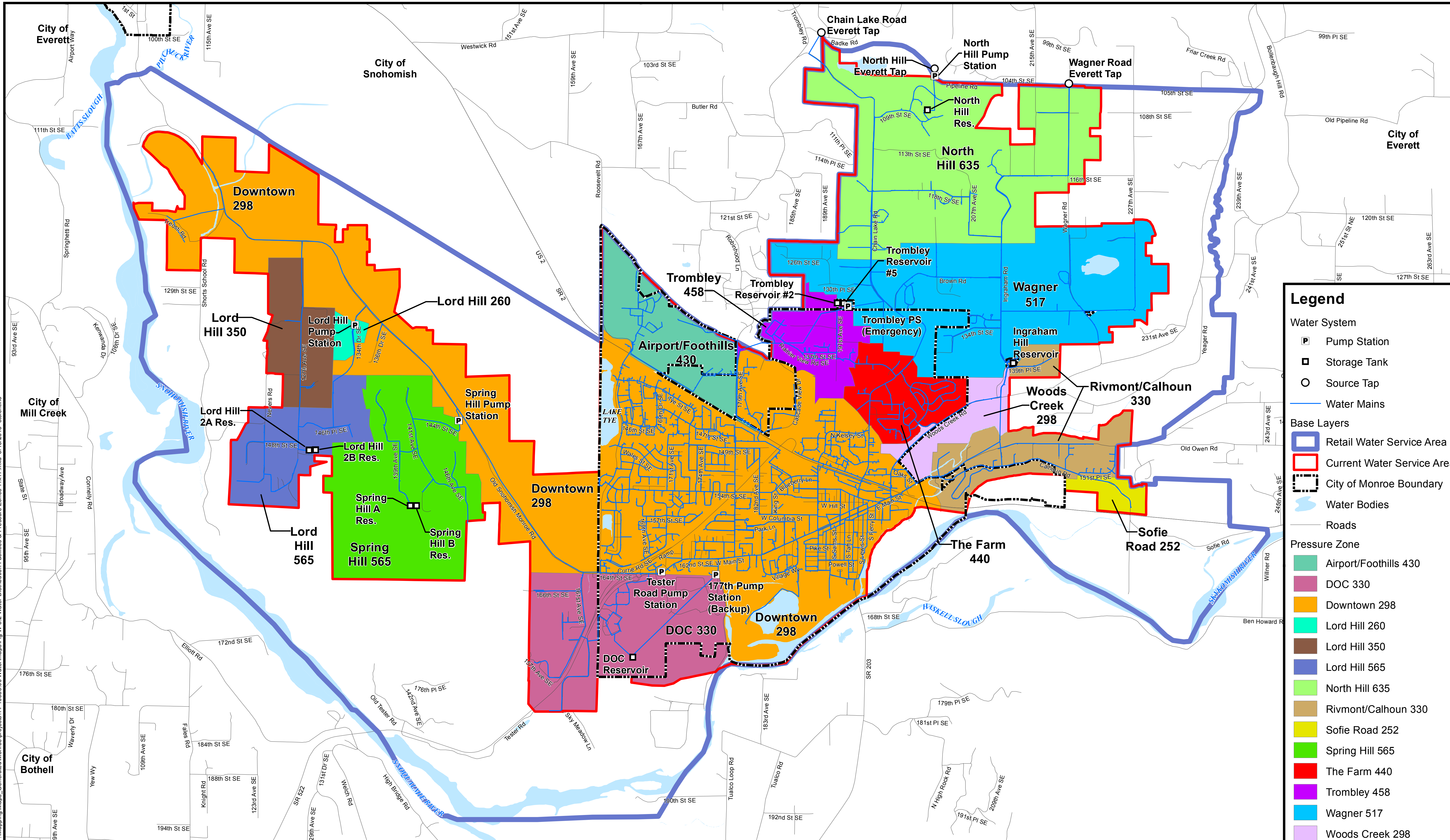
As shown in Table W 6-3, the City's 90th percentile concentration did not exceed the action level for lead or copper in 2013.

6.2.6 City of Everett Water Quality Monitoring Results

A detailed review of the water quality of the City of Everett public drinking water system is provided in the current City of Everett Comprehensive Water Plan.

6.3 System Description and Analysis

The existing water distribution system facilities and pressure zones are shown in Figure W 6.2. A schematic hydraulic profile for the existing water system is shown in Figure W 6.3.



P:\Mapping\Maps_Generated\Monroe\projects\14-10355.00 Water\maps\Fig W 6.2 Water Distribution Facilities & Pressure Zones 11x17.mxd 3/18/2015 ctolentino

Water System: City of Monroe 2014
Snohomish County base data 2014
Data sources supplied may not reflect current or actual conditions. This map is a geographic representation based on information available. It does not represent survey data. No warranty is made concerning the accuracy, currency, or completeness of data depicted on this map.
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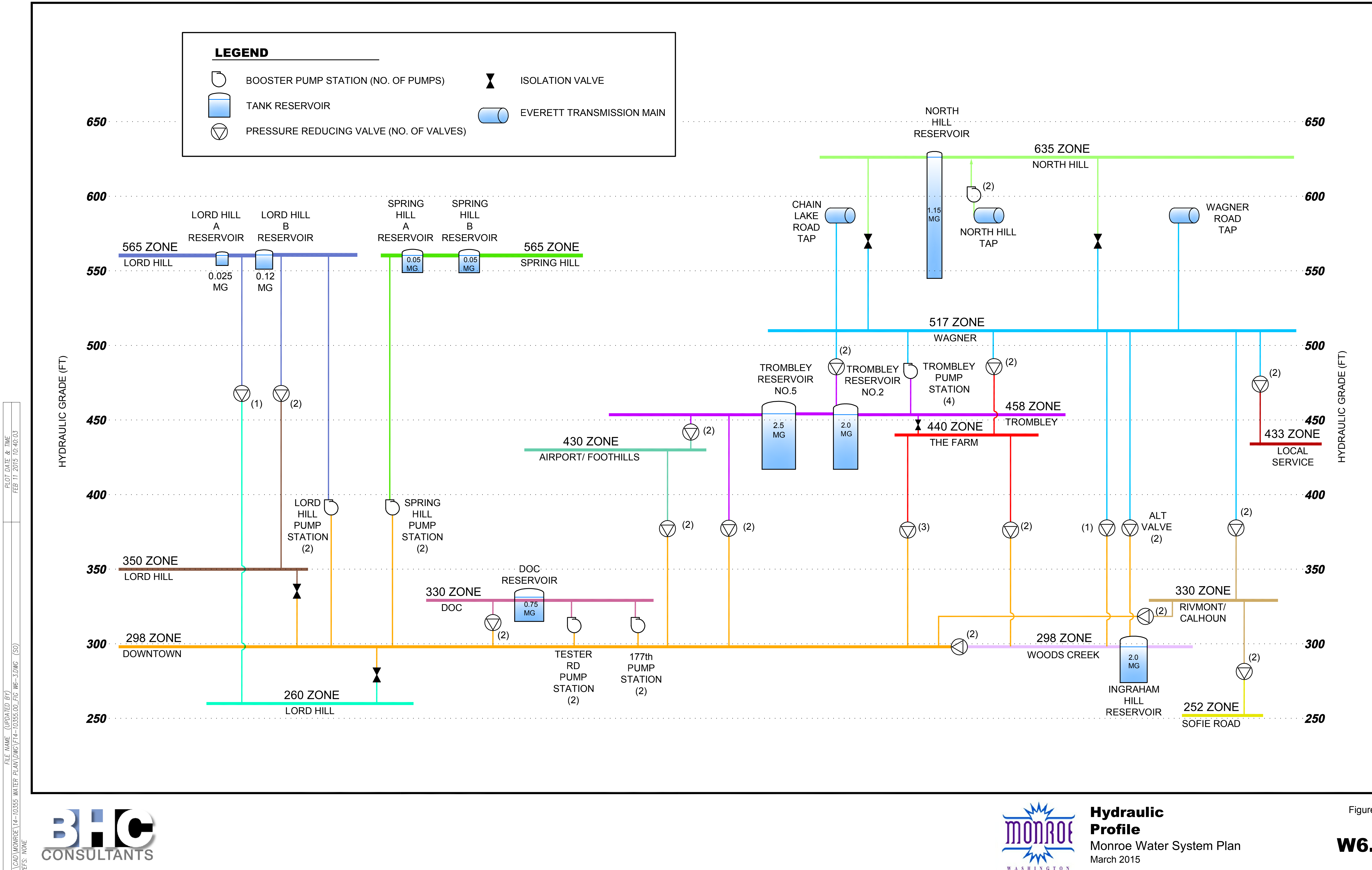
MONROE WASHINGTON

Existing Water Distribution Facilities & Pressure Zones

Utility Systems Plan - Water
City of Monroe, Washington
March 2015

Figure
W 6.2



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MONROE WASHINGTON

Hydraulic Profile

Monroe Water System Plan

March 2015

Figure

W6.3

6.3.1 Source of Supply Analysis

The City of Monroe purchases finished water from the City of Everett. The water is delivered to Monroe from the Everett Transmission Main No. 5, a 51-inch steel pipe with a capacity of 50 million gallons per day (per the City of Everett Comprehensive Water Plan).

Monroe currently has three taps on the Everett Pipeline No. 5. The Chain Lake tap has a capacity of 4.15 mgd, the Wagner tap has a capacity of 3.0 mgd, and the North Hill tap has a capacity of 2.88 mgd. Total capacity from all three taps is 10.0 mgd.

The maximum fire suppression storage (FSS) in Monroe is for a 6,000 gpm fire for 4 hours. This results in a FSS of 1,440,000 gallons. Per the criteria in Table W 6-1, this volume must be replenished within 72 hours (3 days), resulting in a FSS replenishment rate of 0.48 mgd.

The 2035 ADD for Monroe is 2.56 mgd (per Table W 5-13). With a MDD/ADD peaking factor of 2.0, this results in an MDD of 5.12 mgd. Using the criteria in Table W 6-1, the system must be capable of providing this water in 18 hours, resulting in a rate of 6.83 mgd. Coupled with the FSS replenishment rate of 0.48 mgd, results in a total required flow of 7.31 mgd. The available capacity via the existing taps (10.0 mgd) exceeds this requirement, so no source improvements are necessary.

6.3.2 Storage Analysis

The Monroe water system currently has 8.65 million gallons of storage located in 9 storage facilities. Several of these tanks (Trombley Nos. 2 & 5, Spring Hill Nos. A & B, and Lord Hill Nos. A & B) are located at the same site and serve the same pressure zones. As a result, the storage requirements at these sites will consider the sum total volume, not the volume of individual tanks separately.

Three of the tanks (Trombley Nos. 2 & 5 and Ingraham Hill) serve many of the same pressure zones through many pressure reducing valve stations. As a result, the storage requirements for these pressure zones as met by the three tanks will be considered together. It is not possible to separate the storage requirements for these areas due to the interconnectivity of the multiple pressure zones.

The storage analyses for the various tanks are summarized in Tables W 6-4 through W 6-8. Fire suppression storage is for the largest fire flow within the pressure zones served by the tank. For all storage analyses, it is assumed that fire suppression storage and standby storage are nested. That is, the greater of the two is used to calculate the required storage for each tank.

Standby storage is calculated assuming the Everett Pipeline No. 5 is offline. In this instance, all three taps to the Everett No. 5 line cannot provide water. With no supply of water to Monroe, the standby storage is equal to two times the average day demand.

In many cases, pumping capacity to a reservoir with the largest pump out of service exceeds the peak hour demand in the zone(s) being served by the reservoir. In these cases, no equalizing storage is needed. This is denoted in the tables as N/R (not required).

Table W 6-4 Storage Analysis – North Hill Reservoir

Year	2021	2035
Pressure Zones Served	North Hill 635	
ADD (mgd)	0.054	0.062
MDD (mgd)	0.108	0.124
Operational Storage (OS)	0.026	0.026
Equalizing Storage (ES)	N/R	N/R
Fire Suppression Storage (FSS)	0.060	0.060
Standby Storage (SB)	0.108	0.124
Total Required Storage (mg)	0.134	0.150
Existing Storage (mg)	1.150	1.150
Deficit (-) or Surplus (+) Storage (mg)	+1.020	+1.000

Table W 6-5 Storage Analysis – Trombley & Ingraham Reservoirs

Year	2021	2035
Pressure Zones Served	Trombley 458, The Farm 440, Airport/Foothills 430, Rivemont/Calhoun 389, Woods Creek 316, Downtown 298, Sophie Road 310	
ADD (mgd)	1.459	1.699
MDD (mgd)	2.918	3.397
Operational Storage (OS)	0.200	0.200
Equalizing Storage (ES)	0.148	0.236
Fire Suppression Storage (FSS)	1.200	1.200
Standby Storage (SB)	2.918	3.397
Total Required Storage (mg)	3.266	3.833
Existing Storage (mg)	6.500	6.500
Deficit (-) or Surplus (+) Storage (mg)	+3.234	+2.667

Table W 6-6 Storage Analysis – DOC Reservoir		
Year	**2021**	**2035**
Pressure Zones Served	DOC 330	
ADD (mgd)	0.508	0.551
MDD (mgd)	1.016	1.103
Operational Storage (OS)	0.047	0.047
Equalizing Storage (ES)	N/R	N/R
Fire Suppression Storage (FSS)	1.200	1.200
Standby Storage (SB)	1.016	1.103
Total Required Storage (mg)	1.247	1.247
Existing Storage (mg)	0.75	0.75
Deficit (-) or Surplus (+) Storage (mg)	-0.497	-0.497

This reservoir is about 0.5 million gallons deficient. It is recommended that a second tank be constructed, of the same configuration as the existing tank. This will provide operational flexibility due to that same tank sizes as well as provide future capacity for expansion within the DOC 330 Pressure Zone beyond the 20-year planning period.

Table W 6-7 Storage Analysis – Spring Hill Reservoirs		
Year	**2021**	**2035**
Pressure Zones Served	Spring Hill 565	
ADD (mgd)	0.023	0.026
MDD (mgd)	0.047	0.053
Operational Storage (OS)	0.008	0.008
Equalizing Storage (ES)	N/R	N/R
Fire Suppression Storage (FSS)	0.090	0.090
Standby Storage (SB)	0.047	0.053
Total Required Storage (mg)	0.098	0.098
Existing Storage (mg)	0.10	0.10
Deficit (-) or Surplus (+) Storage (mg)	+0.002	+0.002

Table W 6-8 Storage Analysis – Lord Hill Reservoirs

Year	2021	2035
Pressure Zones Served	Lord Hill 565, Lord Hill 350, Lord Hill 260	
ADD (mgd)	0.031	0.034
MDD (mgd)	0.063	0.068
Operational Storage (OS)	0.010	0.010
Equalizing Storage (ES)	N/R	N/R
Fire Suppression Storage (FSS)	0.090	0.090
Standby Storage (SB)	0.063	0.068
Total Required Storage (mg)	0.100	0.100
Existing Storage (mg)	0.145	0.145
Deficit (-) or Surplus (+) Storage (mg)	+0.045	+0.045

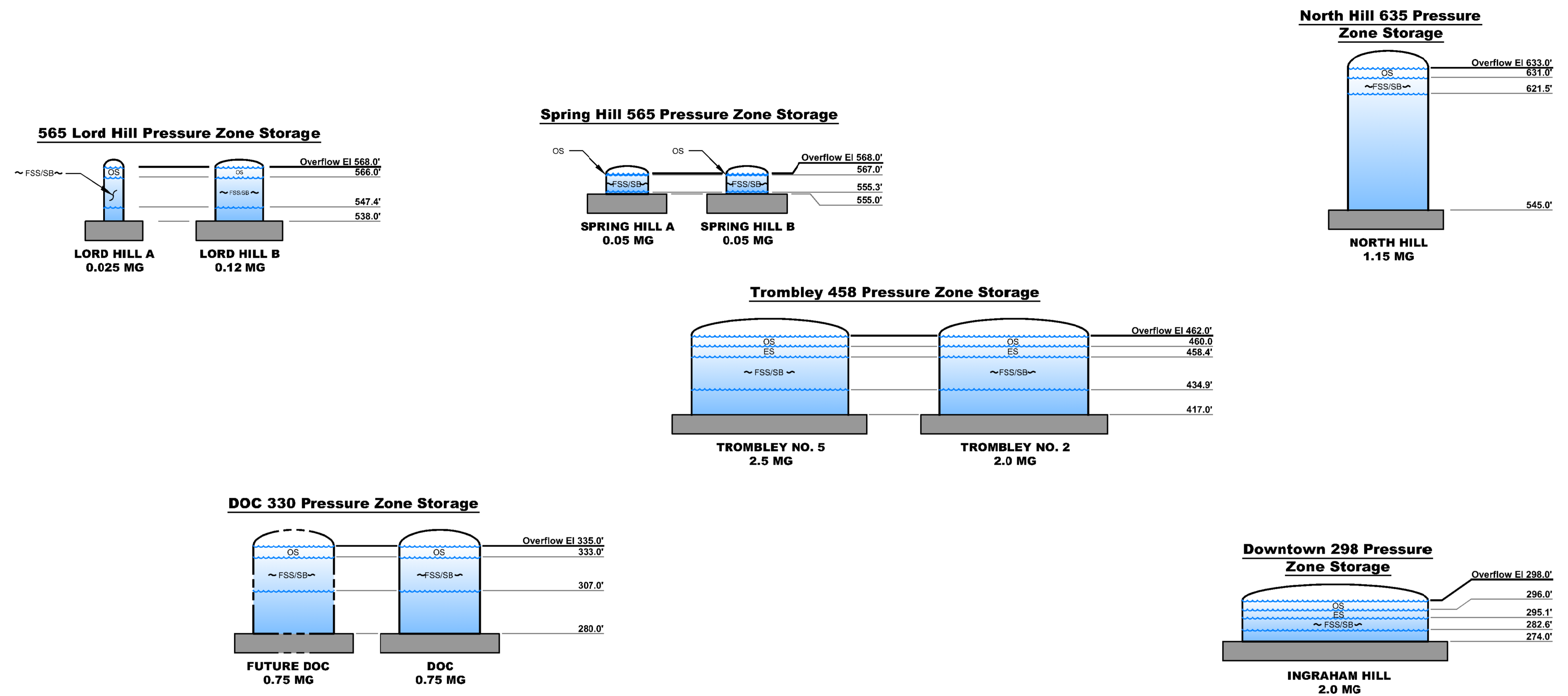
The storage analysis for the entire Monroe water system is shown in Table W 6-9. For the system-wide analysis, it is assumed both a 5,000 gpm fire in the Downtown 298 Zone and a 5,000 gpm fire in the DOC 330 Zone occur simultaneously.

Table W 6-9 Storage Analysis – Entire System

Year	2021	2035
ADD	2.190 mgd	2.522 mgd
MDD	4.380 mgd	5.045 mgd
Operational Storage (OS)	0.291 mg	0.291 mg
Equalizing Storage (ES)	0.148 mg	0.236 mg
Fire Suppression Storage (FSS)	2.400 mg	2.400 mg
Standby Storage (SB)	4.380 mg	5.045 mg
Total Required Storage	4.819 mg	5.572 mg
Existing Storage	8.650 mg	8.650 mg
Deficit (-) or Surplus (+) Storage	+3.831 mg	+3.078 mg

The storage analysis summarized above indicates that all storage facilities are sufficient, with the exception of the DOC reservoir. This deficiency is addressed above.

The storage components within the Monroe tanks are summarized in Figure W 6.4.



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XREFS: NONE

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OS = Operational Storage
ES = Equalizing Storage
FSS = Fire Suppression Storage
SB = Standby Storage

MONROE WASHINGTON

Monroe Water District
Storage Facilities Water
Monroe Water System Plan
March 2015

Figure
W 6.4

6.3.3 Booster Pump Station Analysis

The Monroe water system currently has six booster pump stations serving five pressure zones. The pump station capacities are summarized and evaluated in Tables W 6-10 through W 6-14. Two of these stations serve the same pressure zone (DOC 330). As a result, the booster pump station capacity to the DOC 330 Zone will consider the total pumping capacity at both stations.

Table W 6-10 Pump Station Analysis – North Hill PS

Year	2021	2035
Pressure Zones Served	North Hill 635	
ADD (mgd)	0.054	0.062
MDD (mgd)	0.108	0.124
MDD (gpm)	75 gpm	86 gpm
Fire Suppression Storage (FSS)	0.06 mg	0.06 mg
Replenish FSS in 72 hours	14 gpm	14 gpm
Total Required Capacity	89 gpm	100 gpm
Existing Capacity (with Largest Pump Out of Service)	800 gpm	800 gpm
Deficit (-) or Surplus (+) Capacity	+711 gpm	+700 gpm

The Trombley Pump Station is a backup/emergency station that is only needed if the primary source of supply to the Wagner 517 Zone is unavailable. Since it is a backup station, the capacity of the station is evaluated assuming the largest source of supply to the Wagner 517 Zone is out of service, that is, the Everett Pipeline No. 5 is out of service. As a result, it is assumed all pumps in the pump station are operational.

Table W 6-11 Pump Station Analysis – Trombley PS

Year	2021	2035
Pressure Zones Served	Wagner 517	
ADD (mgd)	0.114	0.150
MDD (mgd)	0.229	0.300
MDD	159 gpm	208 gpm
Maximum Fire Flow	3,000 gpm	3,000 gpm
Total Required Capacity	3,159 gpm	3,208 gpm
Existing Capacity (with Everett Supply Out of Service)	3,625 gpm	3,625 gpm
Deficit (-) or Surplus (+) Capacity	+466 gpm	+417 gpm

Two of the stations (Tester Road & 177th) serve the same pressure zone (DOC 330). As a result, the booster pump station capacity to the DOC 330 Zone will consider the total pumping capacity at both stations.

Table W 6-12 Pump Station Analysis – Tester Rd & 177th PS

Year	2021	2035
Pressure Zones Served	DOC 330	
ADD (mgd)	0.508	0.551
MDD (mgd)	1.016	1.103
MDD	706 gpm	766 gpm
Fire Suppression Storage (FSS)	1.2 mg	1.2 mg
Replenish FSS in 72 hours	278 gpm	278 gpm
Total Required Capacity	984 gpm	1,044 gpm
Existing Capacity with Largest Pump Out of Service	2,350 gpm	2,350 gpm
Deficit (-) or Surplus (+) Capacity	+1,366 gpm	+1,306 gpm

Table W 6-13 Pump Station Analysis – Spring Hill PS

Year	2021	2035
Pressure Zones Served	Spring Hill 565	
ADD (mgd)	0.023	0.026
MDD (mgd)	0.047	0.053
MDD	33 gpm	37 gpm
Fire Suppression Storage (FSS)	0.09 mg	0.09 mg
Replenish FSS in 72 hours	21 gpm	21 gpm
Total Required Capacity	54 gpm	58 gpm
Existing Capacity with Largest Pump Out of Service	160 gpm	160 gpm
Deficit (-) or Surplus (+) Capacity	+108 gpm	+102 gpm

Table W 6-14 Pump Station Analysis – Lord Hill PS		
Year	**2021**	**2035**
Pressure Zones Served	Lord Hill 565, Lord Hill 350, Lord Hill 260	
ADD (mgd)	0.031	0.034
MDD (mgd)	0.063	0.068
MDD	44 gpm	47 gpm
Fire Suppression Storage (FSS)	0.09 mg	0.09 mg
Replenish FSS in 72 hours	21 gpm	21 gpm
Total Required Capacity	65 gpm	68 gpm
Existing Capacity with Largest Pump Out of Service	235 gpm	235 gpm
Deficit (-) or Surplus (+) Capacity	+170 gpm	+167 gpm

The pump station analyses summarized above indicate that all pump stations have sufficient capacity through the end of the 20-year planning period. Pump station pumps, mechanical equipment, and electrical equipment have a design life of about 25 years. Structures can be expected to last about 40-50 years. As a result, mechanical and electrical upgrades will be needed at all of the water pump stations within the planning period. Water pump station upgrades are summarized in Table W 6-15.

Table W 6-15 Recommended Pump Station Upgrades			
Pump Station	**Year Constructed**	**Future Upgrades**	**Year Future Upgrades Needed**
177th Pump Station	1994	Replace mechanical and electrical equipment	2019
Spring Hill Pump Station	1998	Replace mechanical and electrical equipment	2023
Lord Hill Pump Station	1998	Replace mechanical and electrical equipment	2023
Tester Road Pump Station	1999	Replace mechanical and electrical equipment	2024
North Hill Pump Station	2004	Replace mechanical and electrical equipment	2029
Trombley Pump Station	2006	Replace mechanical and electrical equipment	2031

6.3.4 Distribution System Hydraulic Analysis

The water system computer model was updated to use InfoWater, an ArcGIS-based computer model available from Innovyze. Computer Model data and sample results are provided in Appendix W-L.

Existing Peak Hour Demand: The existing peak hour demand was not analyzed with the computer model. The 2021 Peak Hour Demand was analyzed and the analysis is summarized below. The modeling results indicate the existing facilities are adequate to meet the 2021 peak hour water demands and as a result, the existing facilities are also adequate for the existing peak hour water demands.

The 2021 Peak Hour Demand discussion below describes adjustments to several PRV stations. It is recommended that these adjustments be implemented as soon as possible.

Existing MDD plus Fire Flow Analysis: The fire flow demands shown in Figure W 6.1 were modeled in conjunction with the Existing MDD scenario. Upgrades to the existing water system facilities are required to alleviate the deficiencies resulting from the MDD plus fire flow conditions. The improvements described below assume that existing water lines will be replaced with new water lines of the size shown, unless otherwise noted. The system deficiencies identified as a result of the MDD plus fire flow modeling are shown in Table W 6-16.

Table W 6-16 Water System Deficiencies – Existing

Deficient Water System Facility	Cause for Deficiency	CIP No(s).
8-inch pipe along Chain Lake Rd	1,000 gpm fire flow in Farm 440 Zone: velocities too high, pressures too low	W-5
6-inch pipe between Monroe High School and Tester Rd and crossing SR-2	500 gpm fire flow in DOC 330 Zone on 166th St SE: pressures too low	W-6
12-inch pipe from Trombley Reservoirs to 191st Ave SE	5,000 gpm fire flow in Airport 430 Zone at airport: pressures too low	W-7
12-inch pipe from Fairgrounds PRVs adjacent to airport	5,000 gpm fire flow in Airport 430 Zone at airport: pressures too low	W-8
10-inch pipe from Trombley transmission through Fairgrounds PRVs	5,000 gpm fire flow in Airport 430 Zone at airport: pressures too low	W-9
8-inch pipe from SR-2 to Cascade View Dr	5,000 gpm fire flow in Downtown 298 Zone behind movie theaters: pressures too low	W-10/W-11
8-inch pipe along Wagner Rd north of Salem Woods Elementary School	3,000 gpm fire flow at Salem Woods Elementary School: pressures too low	W-12/W-13
Lord Hill 565 Zone conveyance system	750 gpm fire flow in Lord Hill 565 Zone on 127th Ave SE: pressures too low	W-14
6-inch pipe along 141st Dr SE to intersection at 141st Pl SE	750 gpm fire flow in Spring Hill 565 Zone on 141st Dr SE: pressures too low	W-15

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2021 MDD plus Fire Flow Analysis: The fire flow demands shown in Figure W 6.1 were modeled in conjunction with the 2021 MDD scenario. No additional improvements beyond those required for the Existing MDD plus Fire Flow analysis are required.

2023 Peak Hour Demand: The 2023 peak hour demand was not analyzed with the computer model. The 2035 Peak Hour Demand was analyzed and the analysis is summarized below. The modeling results indicate the existing facilities are adequate to meet the 2035 peak hour water demands and as a result, the existing facilities are also adequate for the 2023 peak hour water demands. As noted below, it is assumed the PRV settings shown in Table W 6-15 will be used at the PRV stations through 2035.

2023 MDD plus Fire Flow Analysis: The fire flow demands shown in Figure W 6.1 were modeled in conjunction with the 2023 MDD scenario. No additional improvements beyond those required for the Existing MDD plus Fire Flow analysis are required.

2021 Peak Hour Demand: The forecast average day demands for 2021 shown in Table W 5-13 were multiplied by the peaking factors shown in Section W 5.1.3 and distributed to the nodes in each pressure zone. The distribution to the nodes assumed all nodes within a pressure zone have equal water demand. The percentage of the total demand distributed to each pressure zone was based on population within the zone. These demands constitute the 2021 peak hour modeling scenario.

The modeling results indicate that the existing facilities are adequate to meet peak hour water demands for 2021. The City intends to install a new 8-inch pipe in the North Hill zone to extend water service to residents within the service area that do not currently receive water from the City. This project does not address a system deficiency but will be included as a capital improvement project in Chapter W 11.

The Trombley Reservoirs, Ingraham Reservoir, and Wagner 517 Zone supply eight separate pressure zones either directly by gravity or through several pressure reducing valve (PRV) stations. The flow distribution, system pressures, and pipeline velocities are highly dependent on individual PRV pressure set points. Adjusting PRV set points can dramatically alter the routing of water to the customers and hence impact system pressures and velocities within the pipelines.

Minor adjustments to PRV set points were necessary to maintain velocities and pressures within the criteria defined in Table W 6-1. Table W 6-17 includes a list of PRV stations and recommended set points to result in system pressures and velocities within the design criteria.

Table W 6-17 Recommended PRV Settings – 2021 Peak Hour Demand

PRV Station	Existing Sizes (in)	Existing Outlet Pressures (psi)	Recommended Outlet Pressures (psi)
Airport	10/2	98/90	103/95
Fairgrounds	6/2	85/90	90/95
Farm East	10/3	50/55	43/48
Old Owen	10/4	70/75	75/80

The model indicates the PRVs on Old Owen Road are closed during normal operation. The set point change shown in Table W 6-17 is recommended to meet conveyance standards during a fire flow scenario in the Downtown 298 Zone.

It is recommended that flow control be added to the 12-inch PRV installed at the Farm East PRV station. The flow control should be set to limit flow through the valve to 750 gpm. This flow limitation will reduce velocities and head loss in the existing 8-inch transmission line passing through the Farm 440 Zone to the Downtown 298 Zone.

2035 Peak Hour Demand Analysis: The water system was modeled using the 2035 peak hour demands developed in Chapter W 5.

The modeling results indicate the existing facilities are adequate to meet peak hour water demands for 2035. It is assumed that the PRV settings shown in Table W 6-15 will be used at the PRV stations through 2035.

2035 MDD plus Fire Flow Analysis: The fire flow demands shown in Figure W 6.1 were modeled in conjunction with the 2035 MDD scenario. This modeling scenario resulted in one conveyance deficiency in addition to those listed in Table W 6-16 above. The system deficiencies identified as a result of the MDD plus fire flow modeling are shown in Table W 6-18. Additional modeling indicates that CIP No. W-53 is needed when ADD exceeds approximately 2.52 mgd.

Table W 6-18 Water System Deficiencies – Year 2035

Deficient Water System Facility	Cause for Deficiency	CIP No(s).
6-inch pipe along Old Owen Rd	500 gpm fire flow in Rivemont/Calhoun 330 Zone on Old Owen Rd: pressures too low	W-53

6.4 Summary of System Deficiencies

System deficiencies are summarized as follows:

- DOC 330 Zone storage deficiency noted in Table W 6-6
- Pump Station upgrades noted in Table W 6-15
- Existing piping deficiencies noted in Table W 6-16
- PRV set point revisions noted in Table W 6-17
- 2035 piping deficiencies noted in Table W 6-18

6.5 Identification and Selection of System Improvements

System improvements to alleviate the deficiencies listed in Section W 6.4 are shown in Table W 6-19 and in Chapter W 11.

Table W 6-19 Improvements to System Conveyance

CIP No.	Recommended Improvement	Pipe Length (ft)	New Pipe Diameter (in)	Basis for Improvement	Trigger
W-1	0.75 mg DOC Reservoir	n/a	n/a	Insufficient FSS in the DOC 330 Zone	Existing Deficiency
W-5	Replace 8-inch pipe along Chain Lake Rd	3,972	12	Reduce velocity and increase pressure of fire flow in Farm 440 Zone	Existing Deficiency
W-6	Replace 6-inch pipe between MHS and Tester Rd and crossing Hwy 2	1,815	10	Increase pressure during fire flow in DOC 330 Zone	Existing Deficiency
W-7	Replace 12-inch pipe from Trombley Reservoirs to 191st Ave SE	260	16	Low pressure during fire flow in Airport 430 Zone and in transmission main	Existing Deficiency
W-8	Replace 12-inch pipe from Fairgrounds PRVs adjacent to airport	773	16	Increase pressure in Airport 430 Zone during fire flow at airport or downtown	Existing Deficiency
W-9	Replace 10-inch pipe from Trombley transmission through Fairgrounds PRVs	335	12	Increase pressure in Airport 430 Zone during fire flow at airport or downtown	Existing Deficiency
W-10	Replace 8-inch pipe from Hwy 2 to Cascade View Dr	1,985	12	Increase pressure in Downtown 298 Zone during fire flow	Existing Deficiency
W-11	Extend new 12-inch line from Cascade View Dr to 8” pipe at west end of movie theaters parking lot	970	12	Increase pressure in Downtown 298 Zone during fire flow	Existing Deficiency

Table W 6-19 Improvements to System Conveyance					
CIP No.	**Recommended Improvement**	**Pipe Length (ft)**	**New Pipe Diameter (in)**	**Basis for Improvement**	**Trigger**
W-12	Replace 8-inch pipe along Wagner Rd north of Salem Woods Elementary School	1,887	12	Increase pressure at school during fire flow	Existing Deficiency
W-13	Extend new 12-inch pipe along Wagner Rd north to Wagner 517 24-inch transmission main	2,285	12	Increase pressure in Wagner 517 Zone during fire flow	Existing Deficiency
W-14	Install 8-inch pipe along 127th Ave SE to connect pipe loop	286	8	Increase pressure during fire flow in Lord Hill 565 Zone	Existing Deficiency
W-15	Replace 6-inch pipe along 141st Dr SE to intersection at 141st Pl SE	3,875	10	Increase pressure during fire flow in Spring Hill 565 Zone	Existing Deficiency
W-53	Replace 6-inch pipe along Old Owen Rd	966	8	Increase pressure during residential county fire flow	Needed when ADD exceeds approximately 2.52 mgd.

Chapter W 7 Water Use Efficiency, Water Right Evaluation, Source Water Protection, System Reliability, and Interties

This chapter outlines the City of Monroe's Water Use Efficiency (WUE) program, which was the subject of a public forum on June 17, 2014. This chapter also summarizes applicable water rights, system reliability, and existing and proposed interties.

7.1 Collection of Production and Consumption Data

Production, consumption and non-metered water loss are tracked monthly as outlined in Section W 5.1 and Table W 5-3.

7.2 WUE Program Development and Implementation

The State Legislature enacted the Water Use Efficiency Rule as part of the Municipal Water Law on January 22, 2007 in recognition of the increasing demands put on the State's water resources for population growth, agriculture, industry, and fish. This conservation effort in turn requires municipal water suppliers to comply with the following elements of the WUE Rule:

- Water Use Efficiency Planning Requirements – As part of a water system plan, municipal water suppliers must collect data, forecast demand, and evaluate leakage. Furthermore, appropriate WUE measures must be implemented to consider rate structures and encourage water use efficiency.

- Distribution System Leakage Standard – Municipal water suppliers must meet a state distribution system leakage standard to minimize water loss; more than 10 percent water loss due to leakage in the distribution system requires action. See Section W 7.1.3 for a description of the City's measures to be taken to achieve this goal.

- WUE Goal-Setting and Performance Reporting – Municipal water suppliers must set quantitative WUE goals using a public process and provide annual reports on performance that are available to their customers, the DOH, and the public.

In addition, municipal water suppliers with more than 15 residential service connections must adhere to an implementation schedule. By January 22, 2017, all new service connections must be metered and all existing service connections must have service meters installed to record data to be included in planning documents and performance reports.

7.2.1 Regional WUE Program

The City of Monroe's WUE Program reflects the cooperation of local businesses and residents alike in an effort to continue as conscientious stewards of the local region's valuable watershed. The City's program is focused on meeting the co-adopted regional goal, which is shared with the City of Everett. This goal is also shared with many of the members of the Everett Water Users Committee (EWUC), an organization in which the City is an active participant. The regional conservation goal is to reduce the regional demand for water by 1.86 mgd by 2018.

7.2.2 City of Monroe WUE Program Outline

The City of Monroe's goal is to reduce the 3-year running average of leakage in the distribution system from 11.9 percent down to below 10 percent prior to the end of 2016. The City's goal to be under 10% leakage will be an important part of contributing to and accomplishing the regional goal.

In an effort to achieve the WUE goals the City has implemented six measures. Each measure was closely evaluated to confirm that it would be a sensible contributor to City's WUE program. The following six measures are intended to be adopted by the City for the 2014 – 2019 program.

1. Develop a conservation minded rate structure
2. Conservation education program developed for 2^{nd} – 12^{th} graders
3. Indoor and outdoor water conservation kits for single and multi-family homes
4. Rainwater harvesting for City water-use vehicles
5. Reclaimed water-use at the City's WWTP
6. Large water users audits performed by contracted professional

Measure No. 1: The City is evaluating a water rate structure that emphasizes water conservation. The goal of developing a new conservation minded rate structure is to have a large portion of the charges be based on the quantity of water the customer consumes. The City's goal is to reward customers who are efficient water users. The City plans to investigate a new water rate structure by 2018.

Measure No. 2: As a member of the Everett Water Utilities Committee (EWUC) the City of Monroe participates in the Committee's Conservation Education Programs offered to grade school students throughout the district. Triangle Associates was hired to develop education programs and support materials that will reach students and families educating them on the impacts of water use behaviors. In 2013 Triangle Associates taught 18 classes at three of the district's elementary schools.

Measure No. 3: Distribution of indoor and outdoor conservation kits to single-family and multi-family dwellings. Indoor kits contain a massage shower-head (2 gallons per minute), faucet aerators (1 gallon per minute), and Teflon tape. Outdoor kits contain a garden hose nozzle and garden hose repair ends. Lawn watering timers and leak detection strips are also available separately. All of these conservation tools are free to City of Monroe water customers and are available at City Hall.

Measure No. 4: Rainwater harvesting for the City's water-use vehicles. Since 2008 the City has been maintaining a rainwater collection system where rainwater is collected from the roof of the City's decant facility and drains into two large containers. With a simple pump system the City's water-use vehicles are able to use rainwater for several City programs and projects.

Measure No. 5: The use of reclaimed water at the City's wastewater treatment facility saves the City approximately 10.5 MG of potable water annually. Reclaimed water is used as wash water for cleaning tanks, seal water for pumps and other equipment, and supply water for polymer make-up processes. The City has also explored using reclaimed water for other large water users. Sky River Park, which is near the wastewater facility, is a 32 acre City park that is a probable candidate for future reclaimed water irrigation use.

Measure No. 6: The EWUC voted to incorporate a conservation effort for large customer audits. The City will select some of its largest water users for the program and determine which one(s) will be chosen for audit. The audits will performed by a contracted professional. The idea is to work with local businesses and determine efficient water use.

7.3 City of Monroe WUE Previously Implemented Measures

The City has previously implemented several measures to improve water use efficiency. These measures are ongoing and it is the City's intent that they be continued indefinitely.

7.3.1 Non-Metered Water Loss

Non-metered water loss is calculated monthly and added to a database which is used for calculation of the rolling three year average, as required by the WUE rule.

The City has a regular and systematic program of finding and repairing leaks. All distribution system valves are exercised yearly, and valves found to be leaking are repaired. Meter readers report leaking meters to the maintenance crew for repair. The City has a meter testing program to check, verify, calibrate and repair the City's meters.

7.3.2 Utility Billing System

The City's utility billing system provides graphs of historical consumption information for the customers on their monthly billing statements. The City currently tracks and maintains a database for water consumption for various commercial and residential customer classes.

7.3.3 High Technology Metering

The City utilizes hand-held and radio meter reading technology that in many cases has already reached, or is expected to reach the end of its useful service life within the next year. These radio semi-automated technologies are being replaced by Automated Metering Infrastructure (AMI) which includes "smart" metering devices. In general "smart meters" are capable of delivering meter reads to the customer and utility billing staff in real time via the internet and "smart" meters can notify of customers and staff regarding leaks and dry pipe alarms when system main failure may occur. Continued replacement of water meters is necessary to replace failed or damaged meters and to replace meters at the end of their useful service life. Annual meter replacement is included in the Capital Improvements Program as improvement W-19 and is expected to cost about $200,000 per year, on an ongoing basis.

7.3.4 Master Source Meters

The City withdraws its water supply from three connections on Transmission Line No. 5 of the City of Everett's water system, all of which are metered by Everett.

7.3.5 Water Distribution System Metering

The City meters 100 percent of its water supply through the City of Everett's source meters prior to distribution.

The City has several fire system taps used to supply both residential and commercial fire sprinkler systems. Many of these taps are not metered. In accordance with standard industry practice, these systems are monitored annually. Calculations of consumption are done as fire incidents occur, and during cross connection control site surveys. Currently the City requires all new fire system taps to be metered, and where prudent the use of a DCDA with bypass meter is allowed as well.

All single-family customers outside of the city limits are required to be metered.

All new construction single-family residences are required to install a meter box and meter-setter for future meter installation.

7.3.6 Lawn Watering

The City encourages customers to participate in a voluntary lawn watering restriction program to reduce peaking flows during July and August. The City will continue to encourage wise water use during the summer months.

7.3.7 Plumbing Code

The City supports state code revisions to require water efficient fixtures for new construction and extensive remodels and actively promotes their use.

7.3.8 Landscape Management and Playfields

The City currently promotes low water use landscaping as a part of the public education program.

7.3.9 Water Wasting

The City has a water wasting ordinance which prohibits the wasting of water for any reason.

7.4 Meriting Consideration

The City of Monroe will continue to evaluate other water conservation measures such as mandatory water restrictions, system pressure reduction, etc. Implementation of such measures will depend on need and cost effectiveness of the proposed actions to be taken.

7.5 Source of Supply Analysis

It is becoming increasingly difficult to obtain new or expanded water rights from the Washington State Department of Ecology, without first demonstrating that the water system has seriously considered other options. The purpose of the source of supply analysis is to evaluate opportunities to obtain new sources and to optimize the use of existing sources already developed. The City of Monroe does not anticipate pursuing water rights within the next 20 years and therefore, this analysis is not required.

7.6 Water Rights Evaluation

7.6.1 Permits, Certificates, Claims, and Applications

The City of Monroe has no current permits, certificates, claims, or applications for water rights. Furthermore, there are no current agreements, court orders, pending legal actions, or other restrictive conditions pertaining to the utilization of water rights to note.

7.7 Water System Reliability Analysis

A water system reliability analysis summarizes efforts being taken to ensure an adequate quantity of water can be provided at all times. When water shortages or interruptions in service occur, public health can be threatened because customers may use other non-potable sources of water inappropriately, or system pressure may be reduced such that basic health needs are not met or other backflow related problems occur.

7.7.1 Source Reliability

All water used by the Monroe Water System is purchased from the City of Everett. The water is delivered by way of three metered connections to Everett's Transmission Line No. 5. The physical capacity is currently 10 million gallons per day (mgd). The projected 2035 maximum day demand is 5.2 mgd (see Chapter W 5). There are no time limits imposed by Everett on the delivery of water.

7.7.2 Water Right Adequacy

The City of Everett, which provides all of the Monroe Water System's water, has water rights for a maximum production rate of 275 mgd and an annual average production volume of 150 mgd.[1] The Everett Public Works 2007 Comprehensive Water Plan shows that the Sultan River and Spada Reservoir have sufficient capacity to meet Everett's water needs through 2050.

7.7.3 Facility Reliability

The improvements necessary to increase the reliability of the Monroe Water System are discussed in Chapter W 6.

7.7.4 Water Shortage Response Plan

A water shortage response plan details actions to be taken during various levels of water shortage. During minor water shortages, only public information and voluntary conservation measures may be necessary to ensure adequate water supply. During extreme shortages, mandatory curtailment and rationing may be required. The City of Monroe Emergency Response Plan is located in Chapter W 9.

7.8 Interties

7.8.1 Existing Interties

The Monroe Water System has five existing interties. Three are metered connections with the City of Everett's Transmission Line No. 5 where the Monroe Water System receives water. None of these connections are intended to provide water to the Everett System. The two additional interties provide water to adjacent purveyors. None of these interties is intended to provide water to the Monroe System.

7.8.2 New Intertie Proposals

Currently there are no new interties proposed. The possibility of interties with Roosevelt Water Association and Highland Water District has been investigated in the past. However, due to pressure differences at the likely locations of interties these are no longer being pursued.

[1] Everett Public Works 2000 Comprehensive Water Plan page xvii

7.8.3 Intertie Agreements

There are no intertie agreements with the City of Monroe water system at this time.

Chapter W 8 Source Water Protection

The City of Monroe purchases all water from the City of Everett and has no other water to protect.

Chapter W 9 Operations and Maintenance Program

9.1 Water System Management and Personnel

The ultimate authority and control of the water system lies with the elected officials. In addition, personnel responsible for the daily management, maintenance, operation and quality control are employed by the City and are listed below:

Administration:
  Brad Feilberg, Public Works Director
    Professional Engineer

Normal Day-to-Day Operations and Preventative Maintenance:
  Jakeh Roberts, O&M Division Manager
    Water Distribution Manager 3, Cross Connection Control Specialist

Water Quality Monitoring;
  Jordan Ottow, Water Quality Lead
    Water Distribution Manager 1, Cross Connection Control Specialist,
    Backflow Assembly Tester

Emergency Response:
  Jim Simon, O&M Division Supervisor
    Water Distribution Manager 2
  Ryan Anderson, O&M Division Supervisor
    Water Distribution Manager 2

Cross-Connection Control
  Scott Barr, Cross Connection Control Specialist
    Water Distribution Manager 2, Cross Connection Control Specialist,
    Backflow Assembly Tester

Implementation of Improvement Program:
  Scott Peterson
    Professional Engineer

Budget Formulation:
  Brad Feilberg, Public Works Director
    Professional Engineer

Response to Complaints:
  Jordan Ottow, Water Quality Lead
    Water Distribution Manager 3, Cross Connection Control Specialist
    Backflow Assembly Tester

Public/Press Contact:
Brad Feilberg, Public Works Director
Professional Engineer

Billing:
Dianne Nelson, Finance Director

9.2 Operator Certification

The water system personnel registered by the State of Washington Water Works Certification Law are listed in Table W 9-1.

Table W 9-1 Water System Personnel Registrations

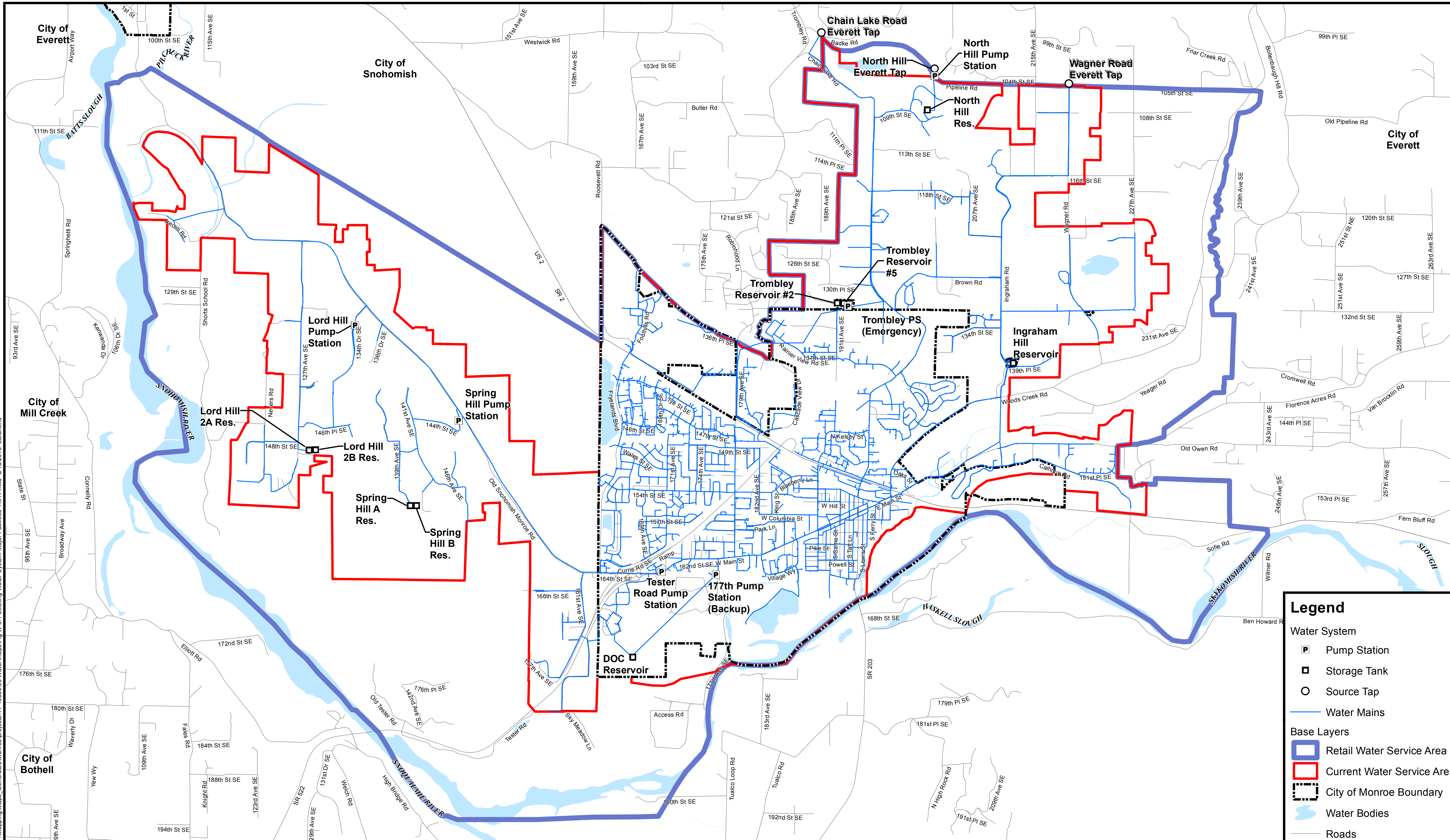
Name	Title	Certification
Brad Feilberg	Public Works Director	Professional Engineer
Jakeh Roberts	O&M Division Manager	Water Distribution Manager 3 Cross Connection Control Specialist
Jim Simon	O&M Division Supervisor	Water Distribution Manager 2
Jordan Ottow	Water Quality Lead	Water Distribution Manager 2 Cross Connection Control Specialist Backflow Assembly Tester
Scott Barr	Cross Connection	Water Distribution Manager 3 Cross Connection Control Specialist Backflow Assembly Tester
Ryan Anderson	O&M Division Supervisor	Water Distribution Manager 2
Andy Koehler	O&M Division Site Lead	Water Distribution Manager 2
Jamie Woolworth	Maintenance Worker II	Water Distribution Manager 1 Backflow Assembly Tester

The Monroe Water System is committed to ensuring that certified operators comply with professional growth requirements. To this end, the City provides funding and time for ongoing training.

9.3 System Operation and Control

9.3.1 Identification of Major System Components

Major system components of the Monroe water system are shown in Figure W 9.1. A hydraulic profile of the major system components, showing the interaction of the various components, is shown in Figure W 9.2.



Water System: City of Monroe 2014
Snohomish County base data 2014
Data sources supplied may not reflect current or actual conditions. This map is a geographic representation based on information available. It does not represent survey data. No warranty is made concerning the accuracy, currency, or completeness of data depicted on this map.
BHC Consultants LLC., assumes no responsibility for the validity of any information presented herein, nor any responsibility for the use or misuse of the data.

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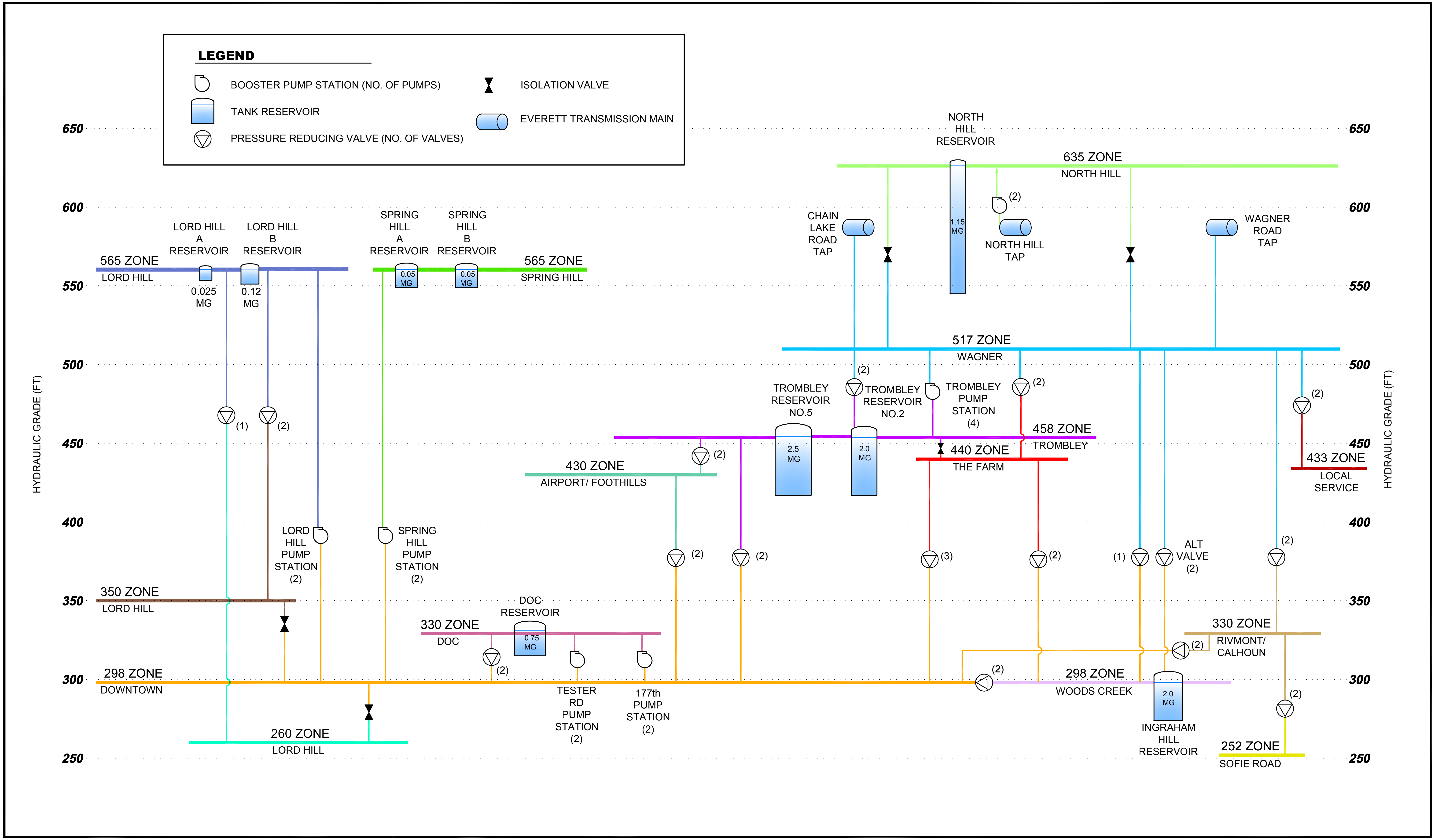
MONROE WASHINGTON

Existing Water System Major Facilities

Utility Systems Plan - Water
City of Monroe, Washington
March 2015

Figure
W 9.1



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XREFS: NONE

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Monroe Washington

Hydraulic Profile

Monroe Water System Plan

March 2015

Figure

W9.2

9.3.2 Routine System Operation

Under normal operating conditions the water system is largely self-regulating. The system's six reservoir locations are normally "on-line" at all times. Reservoir water surface elevations are controlled by an altitude control valve, which allows water into the reservoir when the water surface elevation reaches a predetermined point and shuts off the inflow of water when the reservoir is full, or by booster pump station control. Pumps in pump stations are controlled based on water surface elevations in the discharge reservoirs or system pressure sensors. Normal reservoir and pump station operation are summarized in Tables W 9-2 and W 9-3.

Table W 9-2 Normal Operation – Reservoirs

Reservoir Name	Zone Served	Supply Zone	Supply Facility
Trombley Nos. 2 & 5	Trombley 458	Chain Link 517	PRV/Altitude Valve
North Hill	North Hill 635	North Hill Tap	North Hill PS
Ingraham Hill	Rivemont/Calhoun 330 & Woods Creek 298	Wagner 517	PRV/Altitude Valve
DOC	DOC 330	Downtown 298	Tester Rd PS 177th PS
Lord Hill A & B	Lord Hill 565	Downtown 298	Lord Hill PS
Spring Hill A & B	Spring Hill 565	Downtown 298	Spring Hill PS

Table W 9-3 Normal Operation – Pump Stations

Pump Station Name	Supply Zone	Discharge Zone	Control Facility
Trombley	Trombley 458	Chain Link 517	Pressure in Chain Link 517
North Hill	North Hill Tap	North Hill 635	North Hill Res
Tester Rd	Downtown 298	DOC 330	DOC Res
177th	Downtown 298	DOC 330	DOC Res
Lord Hill	Downtown 298	Lord Hill 565	Lord Hill Res
Spring Hill	Downtown 298	Spring Hill 565	Spring Hill Res

Reservoir levels and booster pump status are remotely monitored using the city's supervisory control and data acquisition (SCADA) system. This system provides emergency notification if problems are detected. In addition to the remote monitoring, each reservoir and booster pump station is inspected daily and flow meter readings recorded.

9.3.3 Monitoring Frequency

All services in the Monroe Water System are metered and read monthly. Other system parameters are monitored as shown in Table W 9-4.

Table W 9-4 System Monitoring Frequency

Task	Frequency
Cross Connection Control	Daily
Cl_2 Residual	Daily
Reservoir Inspection	Weekly
Pump Station Inspection	Weekly
Meter Reading	Monthly
Billing	Monthly
DOH Cl_2 Residual Report	Monthly
DOH Bacteriological Report	Monthly
Leak Detection	Monthly
Water Facilities Inventory Report	Annually

9.3.4 Preventative Maintenance Program

Preventive maintenance is an ongoing program that is designed to reduce component failures and the need for unplanned repairs and/or replacement. A good preventive maintenance program helps to ensure that equipment and appurtenances will be able to perform their intended function both in the course of daily operation and in emergency situations.

Periodic maintenance of all components of the municipal water system is necessary to ensure continuous, uninterrupted service. General maintenance of many items may include: checking set points, checking security, painting exposed surfaces, lubricating moving parts, cleaning, rebuilding, and assessing overall operation for more significant repairs or replacement.

Booster Pump Stations

The City of Monroe operates and maintains six water booster pump stations. Each station is continuously monitored by the SCADA system. City staff physically checks each booster station weekly to inspect for leaks, pump and motor operation, and system pressures and flows. Data is then checked against readings on the SCADA system to verify accuracy. Pump run times, starts and stops are monitored for maintenance purposes. Oil is changed on all motors after 1,000 hours of operation and pump seals are greased weekly.

Reservoirs

In general, reservoir maintenance includes weekly inspection for security purposes. Inspections of interior and exterior surfaces and coatings, integrity of all hatches, ladders, earthquake straps, sight gauges, overflow, air vent, foundation/footings, and screen openings and condition of the interior are done on an annual basis.

Hydrants

All hydrants are inspected annually for proper operation and function. The preventive maintenance consists of the following as a minimum:

- Check for leakage and visual damage.
- Open completely to adequately flush the system and valve.
- Check all nozzle and cap threads, clean and lubricate with light oil.
- Replace lost or damaged gaskets.
- Lubricate the operating nut in accordance with the manufacturer's recommendations.
- Check the hydrant gate valve in accordance with the valve maintenance schedule. Be certain that the auxiliary gate valve is left in the open position.
- Inspect the waste opening in the waste drainage system to be sure the hydrant will be protected in cold weather.
- Record the inspection and date and make note of deficiencies requiring follow-up. Coordinate all activities with the fire department.
- Biannual painting.

Valves

All valves are inspected annually for proper operation and function. The preventive maintenance consists of the following as a minimum:

- Locate the valve boxes and check the accuracy of the tie measurements and the permanence of the landmarks with the valve book (atlas) information.
- Check valve box and cover for damage.
- Insert the wrench and make sure that all debris that would inhibit operation of the valve is removed.
- Operate the valve for a complete cycle (opened and closed) if possible, checking the number of turns required for full operation of the valve.
- Record the inspection and date and list all deficiencies that require follow-up maintenance.
- Raising of the box and cover to street grade.
- Removal of dirt, rocks, and debris.
- Other repair or replacement.

Pressure Control Valves

The City of Monroe currently operates 38 pressure control valves within the distribution system and at the reservoirs. Most of these valves are pressure reducing valves (PRVs) with the remainder being pressure relief and surge control valves.

The purpose of the PRV stations is to effectively reduce the water pressure to a safe usable pressure to the service area. The water department maintains and inventories each station within the system. Each station has a number and detailed inventory. Information included in this inventory consists of size, type of valve, and brand of valve. Inlet and outlet pressure is also tracked as well as maintenance and service records. An inventory of most commonly used repair parts is also maintained for emergency repairs if required. PRV valves are monitored daily by tracking the water system pressure in various zones. All PRV valves are cleaned and exercised annually. Valves are then readjusted and tested before returning to service. All valves are on a 5 year re-build schedule at which time they are disassembled and inspected, any worn parts are replaced, and the valve is reassembled before returning to service. Each station is equipped with upstream and downstream pressure gauges and each valve is equipped with manual sight gauges for visual confirmation of valve status (open or closed).

9.3.5 Equipment, Supplies and Chemical Listing

The Public Works Department maintains reserve maintenance materials and operational supplies. An inventory of pipes of all sizes and types that are in use in the system is stored at the Public Works Yard. Appurtenances such as fittings, valves, and hydrants are also held in stock. These materials are not only available for maintenance of the system in emergency conditions, but all new construction is also done from this rotated supply.

Chemicals for sample monitoring are purchased in bulk. These supplies are rotated as they are used.

9.4 Comprehensive Monitoring (Regulatory Compliance) Plan

9.4.1 Water Quality Monitoring

Monitoring the quality of the water supply delivered to the individual customers is the responsibility of the City of Monroe. The standards of quality that have been specified by rules and regulations are intended to apply throughout the distribution system unless otherwise specified. With the addition of the Sky Meadow area to the Monroe Water System sampling sites have been arranged to include the Sky Meadow area. Samples are tested at selected certified laboratories. The City's monitoring program is shown in Table W 9-5 and is described below. All analyses are performed by the State Public Health Laboratory or laboratories holding a current certificate of approval from the Department. The exception to this is that staff may determine free chlorine residual.

Table W 9-5 Water System Sampling and Testing Frequency Schedule

Sample Type	Frequency of sampling
Bacteriological	Twenty-one distribution system samples per month
Disinfection By-Products	Four samples taken quarterly
Chlorine Residual	Daily
Lead and Copper	Once every three years
Inorganic Chemical and Physical	As directed by DOH
Organic Chemicals	As directed by DOH
Radionuclides	As directed by DOH

Bacteriological

Four routine sites and three reservoir sites within the incorporated Sky Meadow area of the water system are now included in the Coliform Monitoring Plan. A minimum of twenty-one (21) bacteriological samples are collected monthly from representative points in the distribution system along with eight (8) samples from reservoirs and pump stations. This minimum number of samples is increased as the population served increases. The current locations for bacteriological testing are shown in Figure W 9.3.

Disinfectant By-Product Monitoring

The Stage 2 Disinfectants and Disinfection Byproducts Rule (Stage 2 Rule) establishes monitoring requirements for total trihalomethanes (TTHM) and haloacetic acids (HAA5). The U.S. Environmental Protection Agency (EPA) published the Stage 2 Rule in January 2006, and Washington State assumed responsibility for the Stage 2 Rule on January 4, 2010. The Stage 2 Rule applies to all community and nontransient noncommunity (NTNC) Group A water systems that deliver water continuously treated with a primary or residual disinfectant.

Monroe Water System is required to take four disinfection byproducts (DBP) samples quarterly from representative points throughout the system based off previous monitoring compliance programs. With the addition of the Sky Meadow service area one of the sampling locations was moved into the Sky Meadow service area. Samples are tested at selected certified laboratories. A map showing the locations for the DBP sampling is shown in Figure W 9.4.

Free Chlorine Residual

Daily determination is made at representative locations. The samples are collected and analyzed by the City of Monroe staff.

Lead and Copper

An analysis for lead and copper is completed in conjunction with the City of Everett's consolidated water sampling and monitoring plan and is repeated every three years.

Inorganic Chemical and Physical Contaminants

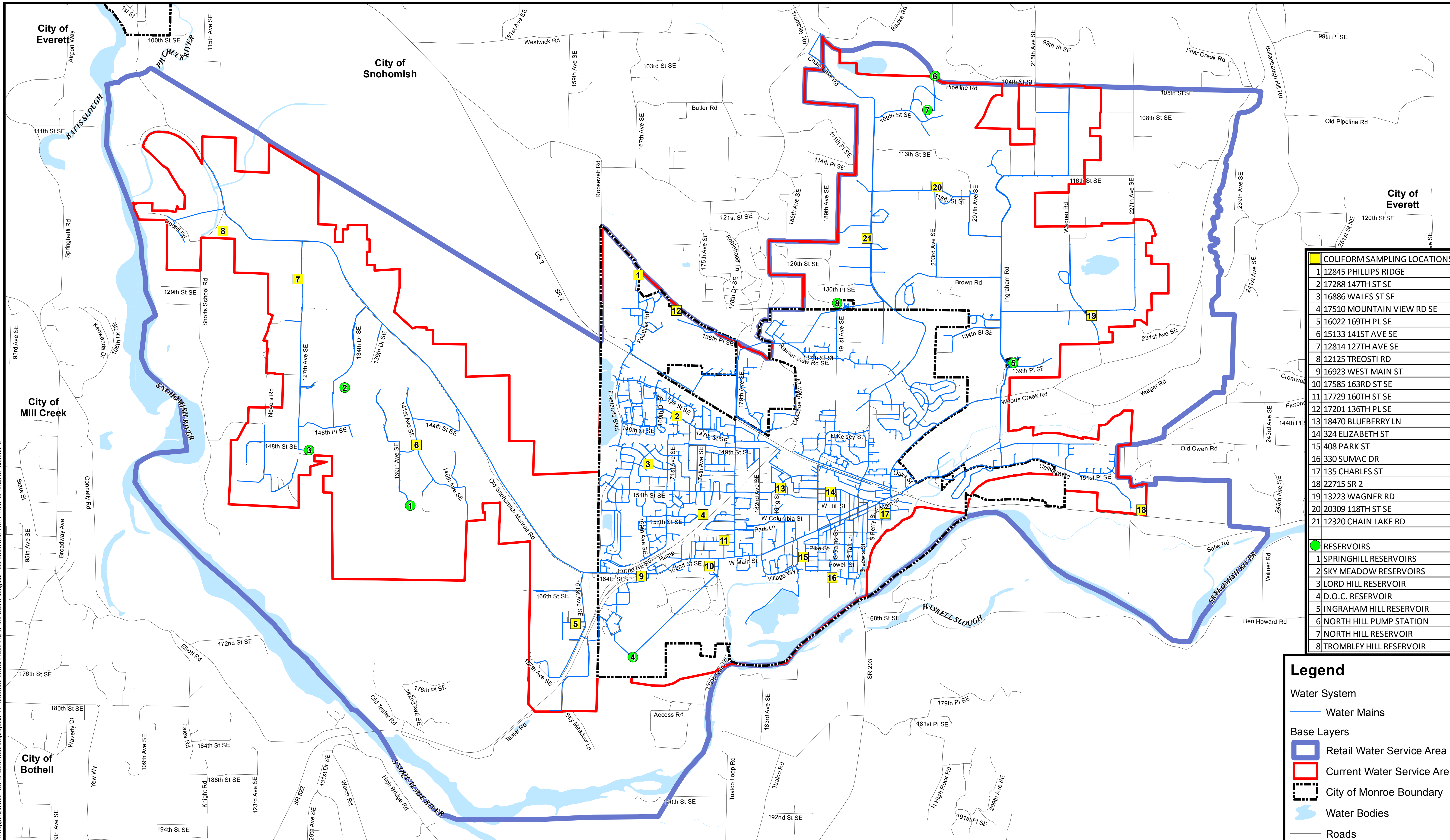
Testing for inorganic chemical and physical contaminants is completed as directed by DOH. Monroe does not have a set schedule for testing of these contaminants.

Organic Chemicals

Testing for organic chemicals is completed as directed by DOH. Monroe does not have a set schedule for testing of these contaminants.

Radionuclides

Testing for radionuclides is completed as directed by DOH. Monroe does not have a set schedule for testing of these contaminants.



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Water System: City of Monroe 2014
Snohomish County base data 2014
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BHC Consultants LLC., assumes no responsibility for the validity of any information presented herein, nor any responsibility for the use or misuse of the data.

NORTH

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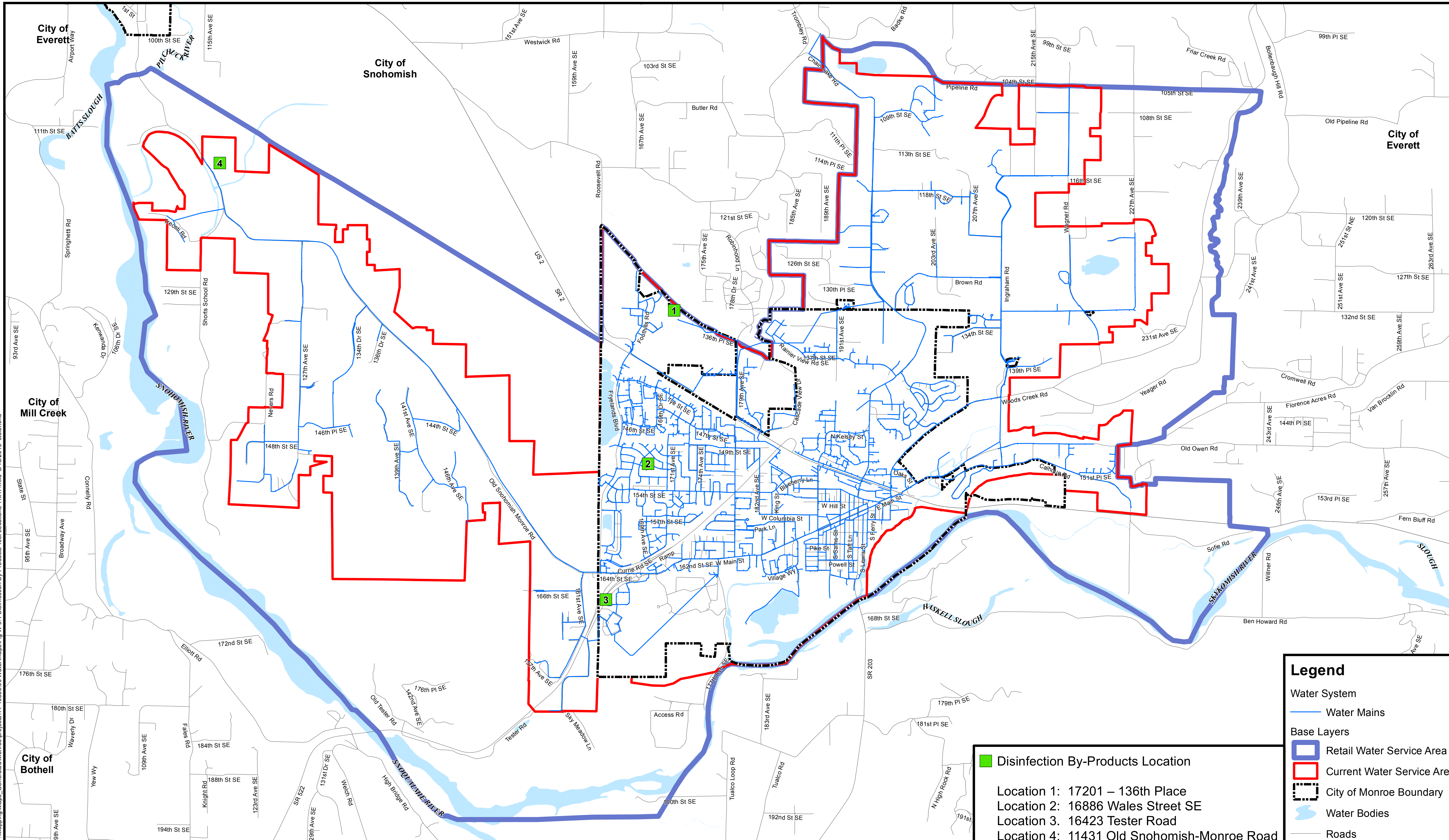
MONROE WASHINGTON

Bacteriological Test Locations
Utility Systems Plan - Water
City of Monroe, Washington
March 2015

Figure
W 9.3



Water System: City of Monroe 2014
Snohomish County base data 2014
Data sources supplied may not reflect current or actual conditions. This map is a geographic representation based on information available. It does not represent survey data. No warranty is made concerning the accuracy, currency, or completeness of data depicted on this map.
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NORTH

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MONROE WASHINGTON

Disinfection By-Products Test Locations

Utility Systems Plan - Water
City of Monroe, Washington
March 2015

Figure
W 9.4

9.5 Emergency Response Program

The Monroe Water System has prepared a water system vulnerability assessment and emergency response plan as required by Section 1433(b) of the Safe Drinking Water Act as amended by the Public Health Security and Bioterrorism Preparedness and Response Act of 2002 (Public Law 107-188, Title IV – Drinking Water Security and Safety). These documents are considered confidential and are exempt from disclosure under RCW Section 42.17.310(1)(ww) of the Public Disclosures Act, RCW 42.17.250 et seq. These documents have been prepared, assembled, or are maintained to prevent, mitigate, or respond to criminal terrorist acts.

9.5.1 Notification Procedures

City personnel must be immediately notified in an emergency. The public may notify the City by calling the main phone number at City Hall anytime during normal business hours. The water system operations personnel on duty will be contacted via telephone or pager.

Between the hours of 5:00 p.m. and 8:00 a.m., emergency calls are directed to (425) 239-0189. This phone number allows for an on-call staff response or for the caller to leave a voice mail message. Response to the City limits is required per policy within 30 minutes of notification of an emergency.

Table W 9-6 Water System Personnel – Emergency Call-Up List

Rank	Job Title	Phone Number
1	O&M Division Manager	(360) 863-4502
2	Public Works Director	(360) 863-4540
3	Water Quality Lead	(360) 863-4546

The City must also be prepared to notify the potentially affected public if an emergency arises. Depending upon the urgency, the affected public may be notified through any one or a combination of methods such as the following:

- Notices mailed with billings.
- Posted notices at publicly visible locations.
- Public notices in newspapers, circulating in the local vicinity.
- Announcements over local radio and television broadcasts.
- Police loudspeaker - roaming system.
- Door-to-Door delivery of announcements and personal contact.
- Mystateusa.com (Emergency Telephone Notification)

All announcements should inform the public regarding: the situation that has occurred; what intermediate measures must be taken by them (i.e. conservation methods, where to go for water, or what to do with their water prior to consumption); and, when they can expect to see the system return to normal operations.

Public Notification Program

The water-using public must be informed of all events that could jeopardize public health. All individual customers must be informed through regular channels, as described above. Mass media notices must also be prepared and issued as soon as problems become evident. The following program generally outlines the requirements for the City of Monroe for fulfilling the needs of public awareness.

The City of Monroe has implemented the Public Notification of Drinking Water Violation, Tier 1-3 in accordance with 40 CFR 141.201 through 208.

The Public notice requirements are divided into three tiers, to take into account the seriousness of the violation or situation and of any potential adverse health effects that may be involved.

- **Immediate Notice (Tier 1):** Any time a situation occurs where there is the potential for human health to be immediately impacted, water suppliers have 24 hours to notify people who may drink the water of the situation. Water suppliers must use media outlets such as television, radio, and newspapers, post their notice in public places, or personally deliver a notice to their customers in these situations.
- **Notice as soon as possible (Tier 2):** Any time a water system provides water with levels of a contaminant that exceed EPA or state standards or that hasn't been treated properly, but that doesn't pose an immediate risk to human health, the water system must notify its customers as soon as possible, but within 30 days of the violation. Notice may be provided via the media, posting, or through the mail.
- **Annual Notice (Tier 3):** When water systems violate a drinking water standard that does not have a direct impact on human health (for example, failing to take a required sample on time) the water supplier has up to a year to provide a notice of this situation to its customers. The extra time gives water suppliers the opportunity to consolidate these notices and send them with annual water quality reports (consumer confidence reports).

Media outlets that may be used for public notification are listed in Table W 9-7.

Table W 9-7 Media Outlets – Public Notification

Name	Address	Phone Number	Fax Number
KRKO	7115 – Larimer Road Everett, WA 98208	(360) 353-1380	(360) 353-5289
KING	333 Dexter Ave N Seattle, WA 98109	(206) 447-5555	
KOMO	100 4th Ave Seattle, WA 98109	(206) 443-4010	
KIRO	2807 – 3rd Ave Seattle, WA 98121	(206) 728-9637	
Monroe Monitor – Valley News	P.O. Box 399 Monroe, WA 98272	(360) 794-7116	(360) 794-6202
The Herald	P.O. Box 930 Everett, WA 98206	(360) 337-3400	(360) 339-3464

9.6 Safety Procedures

The City of Monroe proactively trains all Utilities personnel to follow all safety procedures for the following:

Confined space entry (annually, 34 employees are current)
Energy control (every three years, 24 employees are current)
Traffic control (every three years, 29 employees have current flagger cards)
First aid/CPR (every two years, 32 employees have current cards)
Competent person/trenching and shoring training (annually, 29 employees are current)

The City of Monroe has adopted policies for confined space entry, excavations, respiratory protection, and work zone safety.

All city vehicles are equipped with first aid kits and fire extinguishers.

9.7 Cross-Connection Control Program

The purpose of the City of Monroe Cross Connection Control Program is to protect and maintain the bacteriological and chemical quality of the municipal potable water supply by the elimination and prevention of cross connections between the City of Monroe potable water distribution system and any potable water piping arrangement that might threaten the quality of the potable water distribution system.

To track this, surveillance programs for cross connections and sanitary hazards are in place that require the inspection of all new and existing buildings, structures and grounds. The Building Department and the Public Works Department both review plumbing plans as they pertain to new buildings, structures and grounds; however, it is the Water Department that schedules and inspects existing buildings, structures and grounds based on the degree of hazard that those businesses might impose to the municipal water distribution system.

When a cross connection is found the Water Department works together with the customer to fix the problem, giving them information and advice and also a deadline date by which to have the work done. Once the assembly is in place a certified backflow assembly tester (BAT) employed by the City of Monroe tests the backflow assembly and verifies that the initial installation is correct. When the backflow assembly passes the test the results are then entered into a computer program maintained by the City of Monroe Water Department. Backflow assemblies are tested annually and when their test date is due the following year the Water Department sends a reminder letter to the customer. It is the customer who is responsible to contact a certified BAT to perform the annual test. That BAT then sends in the test results to the City of Monroe Water Department where it is then entered into the database.

The cross connection control program is included in Appendix W-D.

9.8 Customer Complaint Response Program

The Public Works Department receives citizen concerns regarding water quality or distribution via telephone, e-mail or mail. After receipt and logging of the complaint, a work order is generated and sent to the appropriate party for response.

Complaints are typically addressed based on the severity and nature of the complaint. Public health concerns are addressed immediately, while other less severe concerns are handled in conjunction with the complainant. The City documents the corrective action taken, if any, and the date and time of the complaint. The complaint information is placed into a Compliant Log for future reference. In addition, there is an after-hours emergency number that can be utilized by City of Monroe customers. If a customer calls the after-hours number, a representative from the City will assist them within one-half hour.

9.9 Recordkeeping and Reporting

9.9.1 Record Keeping

Monroe Water System maintains records in accordance with the State Department of Health Requires and per WAC 246-290-480.

The following records are in perpetuity and located and reported to DOH as noted below:

- Bacteriological Samples, sampling map updated as needed
  - Monroe Public Works Department, reported monthly
- Chemical Analysis
  - Monroe Public Works Department, reported as required in cooperation with the City of Everett
- Chlorine Residual Samples
  - Monroe Public Works Department, reported monthly
- All water quality and water related citizen concerns
  - Monroe Public Works Department
- Water system flushing/maintenance and hydrant maintenance information
  - Monroe Public Works Department
- Fire hydrant flow tests
  - Monroe Public Works Department
- Water System Flows
  - Monroe Public Works Department
- Water System Construction Completion Reports
  - Monroe Public Works Department
- Water Facility Inventory
  - Monroe Public Works Department, updated/reported annually
- Consumer Confidence Report
  - Monroe Public Works Department, updated/reported annually
- Water System improvements/expansion drawings and inspection reports
  - Monroe Public Works Department

- De-chlorination reports
  - Monroe Public Works Department
- Monroe Water System Annual Report
  - Monroe Public Works Department, updated/reported annually to City of Everett

9.9.2 Reporting

Reporting the results of all tests, measurements, and analyses to DOH on a regular basis is required by the rules and regulations (WAC 246-290). Separate reporting is not required where analytical tests are performed by the State Public Health Laboratory or by a private laboratory that is certified by DOH and those results are reported directly. Following is an outline of all reporting that is required.

Results of all tests and analyses must be reported to DOH within 40 days. As indicated, duplicate reporting is not required where the analysis is made by the State Laboratory or one that is certified by DOH.

Failure of compliance with any of the established maximum containment levels or failure to comply with the monitoring schedule shall be reported to DOH within 48 hours.

Annually, a water facilities inventory and report shall be submitted to DOH no later than July 1. This report shall consist of a summarization of the previous year's operation and shall contain as a minimum the following information:

- Summarize the services of the system
- Total number of services.
- Number of metered services.
- Summarize the water production.
- Average daily demand for the year.
- Peak daily demand
- Outline the range of distribution system pressures within the various pressure levels.
- Include a brief narrative summary of the operation of the major features of the system.
- Outline major system additions or changes made during the year.
- Summarize the water quality information determined during the year.

9.10 Operation & Maintenance Improvements

O&M improvements identified below are planned and will be budgeted in the O&M section of the water utility budget.

- Water system mapping updates in GIS (ongoing)
- Water system maintenance software and records management system (ongoing)
- Leak Detection Program (ongoing)
- Automated mixing and/or sodium hypochlorite dosing equipment at both Spring Hill reservoirs
- Security fencing at both Lord Hill reservoirs
- Automated flushing devices at dead end main locations (12 or more) in the southwest portion of the water system

Chapter W 10 Distribution Facilities Design and Construction Standards

10.1 Project Review Procedures

Water system projects are reviewed by the City of Monroe Engineering Department, the City of Monroe Public Works Department, and Monroe Fire District #3.

10.2 Policies and Requirements for Outside Parties

All water projects whether internal or proposed by outside parties are required to comply with the level of service standards in Chapter W 6 and the design and construction standards discussed here.

10.3 Design Standards

All water system improvements are designed in accordance to Monroe Municipal Code Chapters 13.04 and 13.16 (Appendices W-E and W-C), applicable American Water Works Association specifications, and the City of Monroe Public Works Design and Construction Standards (Appendices W-C and W-H).

These requirements are intended to meet or exceed the design standards referenced in WAC 246-290. This material is intended to meet the requirements of the Washington State Department of Health Submittal Exception Process and following the approved procedures and standards, the City is provided a waiver from the requirement of the Washington State Department of Health approval of individual distribution system projects.

10.4 Construction Standards

All water system improvements are constructed in accordance to Monroe Municipal Code Chapters 13.04 and 13.16 (Appendices W-E and W-C), applicable American Water Works Association specifications, Section 7-08 through 7-15 of the WSDOT/APWA Standard Specifications, and the City of Monroe Public Works Design and Construction Standards (Appendices W-C and W-H).

These requirements are intended to meet or exceed the construction standards referenced in WAC 246-290. This material is intended to meet the requirements of the Washington State Department of Health Submittal Exception Process and following the approved procedures and standards, the city is provided a waiver from the requirement of the Washington State Department of Health approval of individual distribution system projects.

10.5 Construction Certification and Follow-Up Procedures

All water system improvements constructed within the City of Monroe Water Service Area for which the City of Monroe will assume responsibility are inspected by the Public Works Department's Utilities Inspector and overseen by a professional engineer licensed in the State of Washington in accordance with Monroe Municipal Code Chapters 13.04 and 13.16 (Appendices W-E and W-C), applicable American Water Works Association specifications, Section 7-08 through 7-15 of the WSDOT/APWA Standard Specifications, and the City of

Monroe Public Works Design and Construction Standards (Appendices W-C and W-H). All flushing and hydrostatic pressure test operations are witnessed by the City of Monroe. Water quality samples are taken by City of Monroe employees and tested at the City's accredited laboratory. Laboratory accreditation certificate is included in Appendix W-M.

The inspector annotates construction plans as construction progresses. At the completion of construction record drawings are prepared using the marked up plans and field verified. Project records are retained in accordance with State of Washington Archives and Records Management Division Guidelines.

After completion of construction and acceptance of the improvement a Construction Report for Public Water System Projects is completed per WAC 246-290-040.

Chapter 11 Capital Improvement Program

11.1 Introduction

This chapter presents the City of Monroe water system Capital Improvement Programs (CIP). These water system capital improvements have been scheduled and prioritized on the basis of population and subsequent water demand increase, component reliability, regulatory requirements, system benefit, and cost. The CIP is comprised of three primary components: recurring maintenance issues, infrastructure that has known deficiencies or integrity issues, and infrastructure that needs to be upsized resulting from population growth and associated increase in water demands. Typically, isolated reports of minor faults or problems do not warrant a CIP.

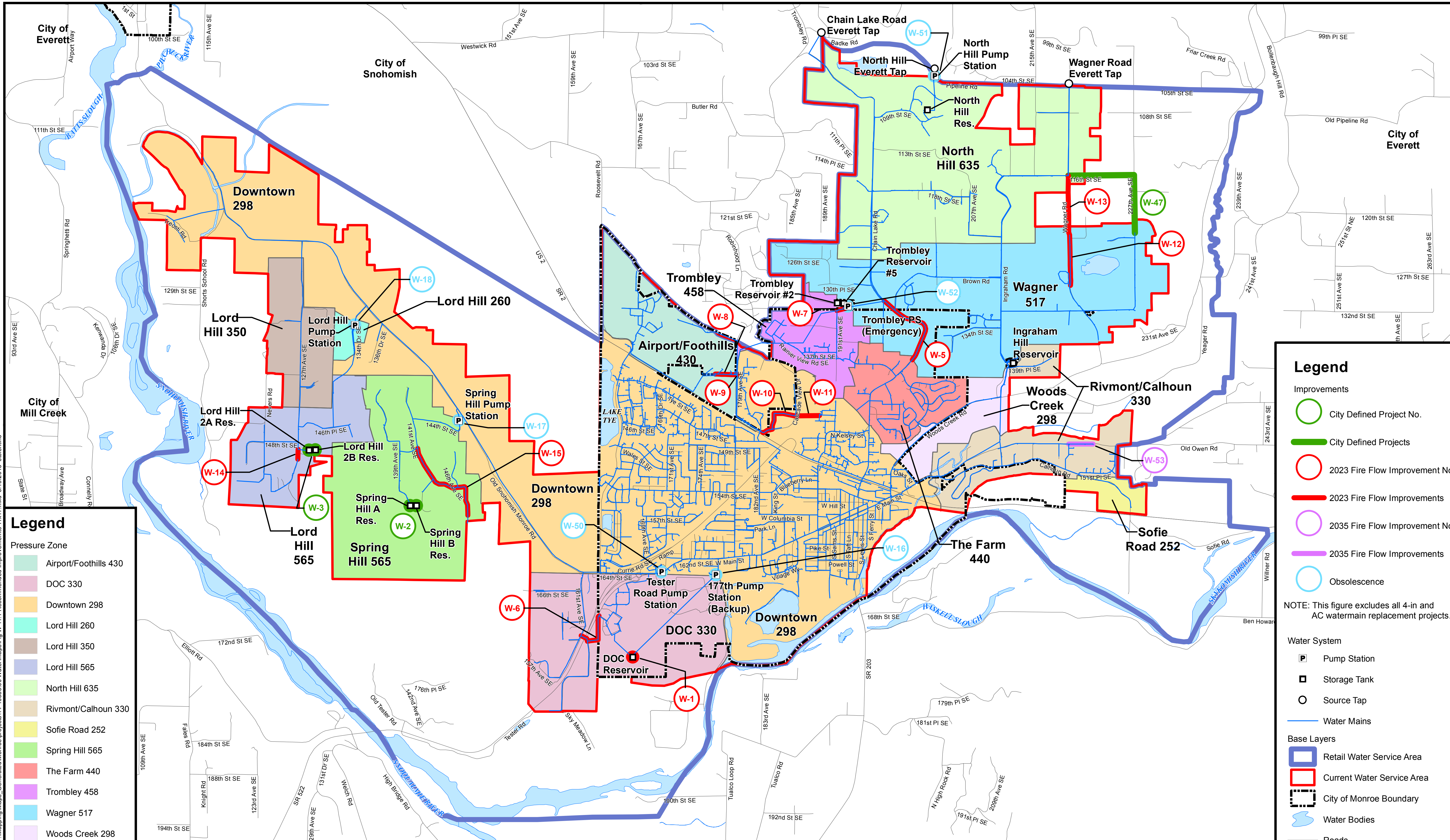
All opinions of probable costs presented herein are in 2015 dollars.

11.2 Capacity Limitations in Existing Lines

Based on the future projected population growth presented in Chapter W 5 and the flow projections and modeling results located in Chapter W 6, specific deficiencies are anticipated in the existing water system. Location maps for the recommended water system improvements are presented in Figure W 11-1. Chapter W 6 provides a brief description of the issues with the infrastructure leading to these improvements as well as what steps should be taken to satisfy each improvement for the City's water system.

Table W 11-1 presents an itemized and prioritized list of all recommended CIP upgrades. These ranked projects total $26,203,700 that is to be distributed over the eight years between 2015 and 2023, or approximately $3,275,500 per year. The City can select and prioritize from this group of projects and can also coordinate with other City projects. The CIPs listed between 2024 and 2035 are based on extended population and flow projections and consequently tend to be less precise. However, they are presented for informative purposes and as an indicator of future potential capacity issues.

Detailed opinions of probable project costs for the CIP items are included in Appendix W-N.



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Water System: City of Monroe 2014
Snohomish County base data 2014
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NORTH

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MONROE WASHINGTON

Recommended Improvements

Utility Systems Plan - Water
City of Monroe, Washington
March 2015

Figure
W 11.1

Table W 11-1 Capital Improvement Program							
CIP No.	Type of Improv.	Description	Configuration		Basis for Improvement	Opinion of Probable Project Cost	Trigger(1)
			Length (ft)	Dia. (in)			
8-Year Capital Improvement Program							
W-1	Storage	Construct second DOC storage reservoir to serve DOC 330 Zone	750,000 gal		Insufficient storage for 5,000 gpm fire flow at DOC	$3,000,000	Existing Deficiency
W-2	Operations / Maintenance	Spring Hill Reservoirs automated mixing and/or sodium hypochlorite dosing equipment	N/A		To maintain sufficient chlorine residual in the reservoirs	$30,000	Existing Deficiency
W-3	Operations / Maintenance	Security fencing at both Lord Hill Reservoirs	N/A		Increased security	$25,000	Existing Deficiency
W-4	Operations / Maintenance	Automated flushing devices at dead end main locations in the southwest portion of the water system	N/A		To remove older water in the system and replace it with new water with sufficient chlorine residual	$10,000	Existing Deficiency
W-5	Fire Flow Conveyance	Replace exist 8" pipe along Chain Lake Rd	3,972	12	Reduce velocity and increase pressure of fire flow in Farm 440 zone	$1,737,000	Existing Deficiency
W-6	Fire Flow Conveyance	Replace exist. 6" pipe between MHS and Tester Rd and crossing Hwy 522	1,815	10	Increase pressure during fire flow in DOC 330 zone	$1,146,000	Existing Deficiency

Table W 11-1 Capital Improvement Program

CIP No.	Type of Improv.	Description	Configuration		Basis for Improvement	Opinion of Probable Project Cost	Trigger[1]
			Length (ft)	Dia. (in)			
W-7	Fire Flow Conveyance	Replace exist. 12" pipe from Trombley Reservoirs to 191st Ave SE	260	16	Increase pressure during fire flow in Airport 430 zone and in transmission main	$199,000	Existing Deficiency
W-8	Fire Flow Conveyance	Replace exist. 12" pipe from Fairgrounds PRVs adjacent to airport	773	16	Increase pressure in Airport 430 zone during fire flow at airport or downtown	$430,000	Existing Deficiency
W-9	Fire Flow Conveyance	Replace 10" pipe and PRV at Fairgrounds PRV station	335	12	Increase pressure in Airport 430 zone during fire flow at airport or downtown	$110,000	Existing Deficiency
W-10	Fire Flow Conveyance	Replace 8" pipe from Hwy 2 to Cascade View Dr	1,985	12	Increase pressure in Downtown 298 zone during fire flow	$839,000	Existing Deficiency
W-11	Fire Flow Conveyance	Extend new 12" line from Cascade View Dr to 8" pipe at west end of movie theaters parking lot	970	12	Increase pressure in Downtown 298 zone during fire flow	$407,000	Existing Deficiency
W-12	Fire Flow Conveyance	Replace 8" pipe along Wagner Rd north of Salem Woods Elementary School	1,887	12	Increase pressure at school during fire flow	$939,000	Existing Deficiency

Table W 11-1 Capital Improvement Program

CIP No.	Type of Improv.	Description	Configuration Length (ft)	Configuration Dia. (in)	Basis for Improvement	Opinion of Probable Project Cost	Trigger[(1)]
W-13	Fire Flow Conveyance	Extend new 12" pipe along Wagner Rd north to Wagner 517 24" transmission main	2,285	12	Increase pressure in Wagner 517 zone during fire flow	$1,119,000	Existing Deficiency
W-14	Fire Flow Conveyance	Install 8" pipe along 127th Ave SE to connect pipe loop	286	8	Increase pressure during fire flow in Lord Hill 565 zone	$160,000	Existing Deficiency
W-15	Fire Flow Conveyance	Replace exist. 6" pipe along 141st Dr SE to intersection at 141st Pl SE	3,875	10	Increase pressure during fire flow in Spring Hill 565 Zone	$1,726,000	Existing Deficiency
W-16	Pump Station Upgrade	177th Pump Station: Replace Mechanical and Electrical Equipment	2-50 HP Pumps and Electrical Controls		Obsolescence	$680,000	End of Useful Life Approx. 2019
W-17	Pump Station Upgrade	Spring Hill Pump Station: Replace Mechanical and Electrical Equipment	2-25 HP Pumps and Electrical Controls		Obsolescence	$520,000	End of Useful Life Approx. 2023
W-18	Pump Station Upgrade	Lord Hill Pump Station: Replace Mechanical and Electrical Equipment	2-35 HP Pumps and Electrical Controls		Obsolescence	$580,000	End of Useful Life Approx. 2023
W-19	Water Meters	Annual Water Meter Replacements	Annual Water Meter Replacements		Obsolescence	$200,000 per year	Ongoing

Table W 11-1 Capital Improvement Program

CIP No.	Type of Improv.	Description	Configuration		Basis for Improvement	Opinion of Probable Project Cost	Trigger[1]
			Length (ft)	Dia. (in)			
W-20	D&C Project	Park to Kelsey Utilities Replacement	480	8	Obsolescence	$84,000	
W-21	D&C Project	182nd and 154th Water Main Replacement	400	8	Obsolescence	$70,000	
W-22	D&C Project	Graden Water Main Replacement	2,375	8	Obsolescence	$415,625	2016[2]
W-23	D&C Project	132nd Water Main Replacement	3,168	8	Obsolescence	$554,400	2016[2]
W-24	D&C Project	Thrive Alley Utilities Replacement	528	8	Obsolescence	$92,400	2016[2]
W-25	D&C Project	Destination Alley	620	8	Obsolescence	$108,500	2016[2]
W-26	D&C Project	Strawberry Lane Water Main Replacement	550	8	Obsolescence	$96,250	

Table W 11-1 Capital Improvement Program

CIP No.	Type of Improv.	Description	Configuration		Basis for Improvement	Opinion of Probable Project Cost	Trigger(1)
			Length (ft)	Dia. (in)			
W-27	D&C Project	Ingraham Hill from Brown Road/Reservoir to SR-2 and Old Owen Road	11,235	12	Obsolescence	$2,800,000	
W-28	D&C Project	Trombley Hill from Reservoir to Airport/179th Avenue SE	6,000	16	Obsolescence	$2.1 million	
W-29	D&C Project	132nd Street SE from Ingraham Road to Wagner Road	3,240	8	Obsolescence	$567,000	
W-30	D&C Project	134th Street SE/133rd Street SE/208th Avenue SE/209th Avenue SE	2,800	8	Obsolescence	$490,000	
W-31	D&C Project	Alley running N/S between Madison and Sams/McDougall and Pike	515	8	Obsolescence	$90,125	
W-32	D&C Project	Alley parallel to Main Street at Ferry East to N. Blakely East to N. Madison	1,140	8	Obsolescence	$199,500	
W-33	D&C Project	Alley parallel to Lewis and Blakely Freemont to McDougall	460	8	Obsolescence	$80,500	

Table W 11-1 Capital Improvement Program

CIP No.	Type of Improv.	Description	Configuration		Basis for Improvement	Opinion of Probable Project Cost	Trigger[1]
			Length (ft)	Dia. (in)			
W-34	D&C Project	Connect Wagner to 116th Street SE to complete loop	2,335	8	Obsolescence	$408,625	
W-35	D&C Project	Park to Kelsey utility abandonment/replacement in Powell Street	490	8	Obsolescence	$85,750	
W-36	Conveyance	Park Street to Pike – Phase II	351	8	A-C Main Replacement	$83,000	2016[2]
W-37	Conveyance	S. Taft Lane	175	8	A-C Main Replacement	$42,000	2014[2]
W-38	Conveyance	182nd Avenue SE and 154th	400	8	A-C Main Replacement	$95,000	2015[2]
W-39	Conveyance	180th Avenue – Phase I	300	8	A-C Main Replacement	$71,000	2014[2]
W-40	Conveyance	180th Avenue – Phase II	300	8	A-C Main Replacement	$71,000	2015[2]

Table W 11-1 Capital Improvement Program

CIP No.	Type of Improv.	Description	Configuration		Basis for Improvement	Opinion of Probable Project Cost	Trigger[1]
			Length (ft)	Dia. (in)			
W-41	Conveyance	181st Avenue	450	8	A-C Main Replacement	$107,000	2016[2]
W-42	Conveyance	Orr to Kelsey Abandon Line Under Houses/Loop to Kelsey	200	8	Loop Mains	$48,000	2017[2]
W-43	Conveyance	Wilson Lane	330	8	A-C Main Replacement	$17,000	2018[2]
W-44	Conveyance	Circle Drive to Sumac	320	8	A-C Main Replacement	$76,000	2020[2]
W-45	Conveyance	Short Columbia	533	8	A-C Main Replacement	$127,000	2021[2]
W-46	Conveyance	127th Avenue SE at 150th Street SE	370	8	Loop Mains	$88,000	2022[2]
W-47	Service	Install 8" North Hill service pipe east along 116th St SE and south along 227th Ave SE; connect to Wagner 517 pipe; install PRVs	4,830	8	Inclusion of additional residents in water service area	$1,879,000	Developer Driven

Table W 11-1 Capital Improvement Program

CIP No.	Type of Improv.	Description	Configuration		Basis for Improvement	Opinion of Probable Project Cost	Trigger[1]
			Length (ft)	Dia. (in)			
20-Year Capital Improvement Program							
W-48	Conveyance	Replace 4” pipe serving fire hydrants[3]	N/A		Excessive velocity during fire flow	$50,000 per year	Beginning 2023
W-49	Conveyance	A-C pipe replacement[3]	N/A		Renewing material useful life	$100,000 per year	Beginning 2023
W-50	Pump Station Upgrade	Tester Road Pump Station: Replace Mechanical and Electrical Equipment	2-40 HP Pumps and Electrical Controls		Obsolescence	$620,000	End of Useful Life Approx. 2024
W-51	Pump Station Upgrade	North Hill Pump Station: Replace Mechanical and Electrical Equipment	2-20 HP and 1-100 HP Pumps and Electrical Controls		Obsolescence	$800,000	End of Useful Life Approx. 2029
W-52	Pump Station Upgrade	Trombley Pump Station: Replace Mechanical and Electrical Equipment	1-5 HP, 2-10 HP, and 1-125HP Pumps and Electrical Controls		Obsolescence	$850,000	End of Useful Life Approx. 2031
W-53	Fire Flow Conveyance	Replace 6” pipe along Old Owen Rd	966	8	Increase pressure during residential county fire flow	$443,000	Needed When ADD Reaches approx. 2.52 MGD

Table W 11-1 Capital Improvement Program

CIP No.	Type of Improv.	Description	Configuration		Basis for Improvement	Opinion of Probable Project Cost	Trigger[1]
			Length (ft)	Dia. (in)			

Note:
1) Trigger event for when improvement is needed.
2) Approximate year as identified by City staff.
3) Replacement of 4-inch water mains serving fire hydrants and replacement of asbestos-cement water mains are both ongoing projects for the City. City staff proceed with water main replacement projects as funds are available within the City's existing rate structure. The Project Cost per year included herein is assumed and may be increased or decreased depending on availability of funds and other City project costs.

Chapter SW 4 Existing Stormwater Facilities

4.1 Introduction

This Chapter describes the study area in general, drainage basins within City limits, and the City's existing stormwater conveyance system. A detailed discussion of the Stormwater Management Utility's current and future services is presented in subsequent chapters.

4.2 Study Area General Description

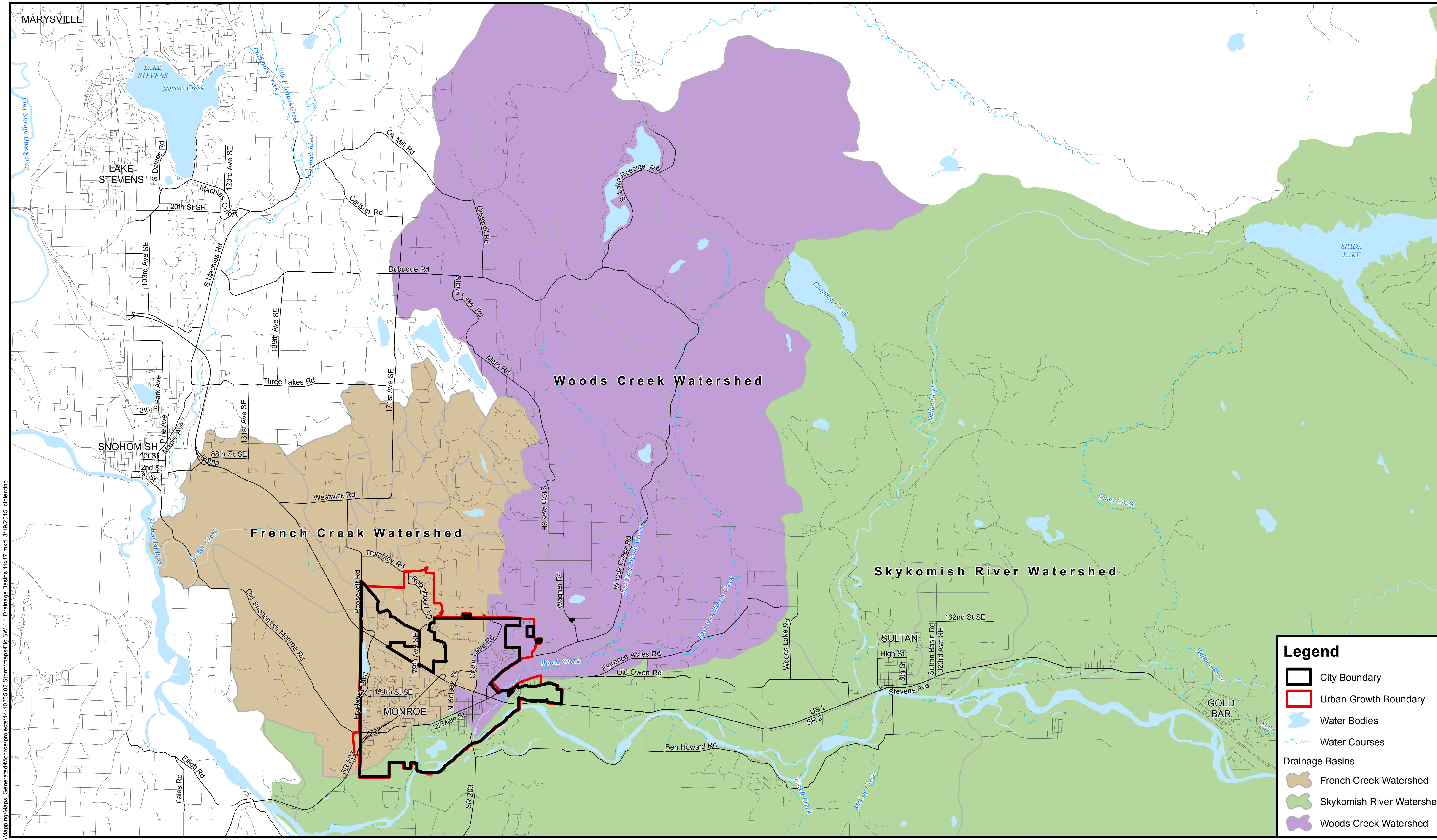
The City of Monroe is located 14 miles southeast of Everett on the Skykomish River in Snohomish County. The City encompasses an area of 5.2 square miles and lies within three drainage basins: Woods Creek, French Creek, and the Skykomish River. Figure SW 4.1 illustrates City limits and the Urban Growth Boundary in relation to the drainage basins.

The climate in Monroe tends to be moderate year round, with an average annual rainfall of approximately 49 inches. The average maximum temperature is 77 degrees F in August, the warmest month. The average minimum temperature is 33 degrees F in December, the coldest month.

4.3 Existing System Description

Monroe's drainage system consists of constructed facilities and natural channels that convey and treat stormwater runoff prior to its discharge into receiving waters. The drainage system includes but is not limited to: catch basins, pipes, ditches, swales, ponds, infiltration facilities, and other drainage system components. Portions of the City are underlain with permeable soils that facilitate infiltration of stormwater runoff. The drainage system is owned and maintained by the City of Monroe, but there are also privately owned and maintained systems within the City limits.

Starting in 2003, City staff began developing an automated mapping system using GIS software that illustrates the overall drainage system and manages the associated physical data. The database is not yet complete and data collection efforts continue. Figure SW 4.2 illustrates the current view of the GIS-based stormwater conveyance system. The associated GIS inventory will be incorporated as part of this Plan by reference. The inventory describes the sizes, lengths, and characteristics of facilities that are known to be the responsibility of the City. The following sections describe the constructed drainage system components and provide summary characteristic information.



Snohomish County base data 2014
Data sources supplied may not reflect current or actual conditions. This map is a geographic representation based on information available. It does not represent survey data. No warranty is made concerning the accuracy, currency, or completeness of data depicted on this map.
BHC Consultants LLC., assumes no responsibility for the validity of any information presented herein, nor any responsibility for the use or misuse of the data.

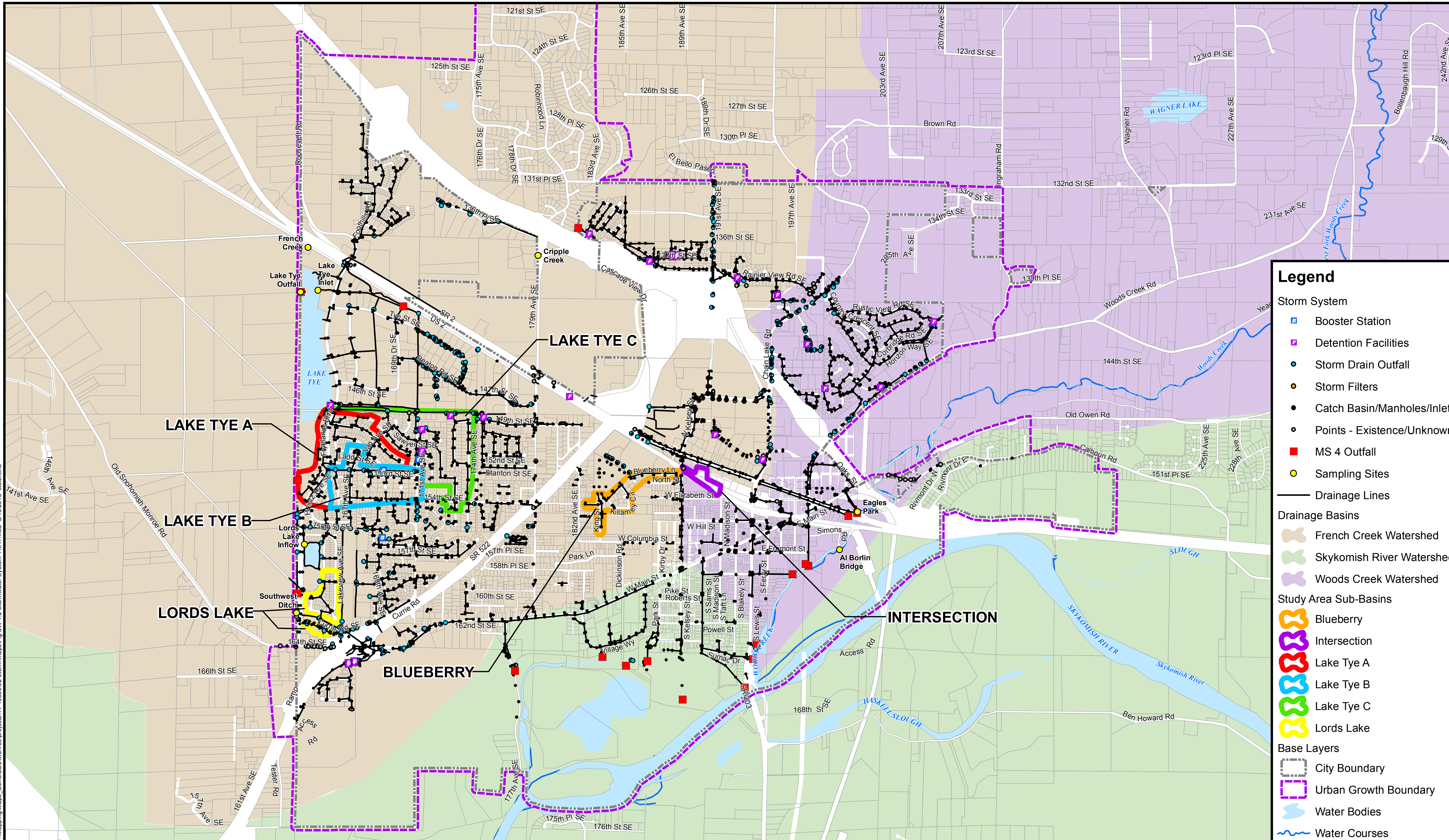
BHC CONSULTANTS

MONROE WASHINGTON

Stormwater Drainage Basins
Utility Systems Plan - Stormwater
City of Monroe, Washington
March 2014

Figure
SW 4.1

P:\Mapping\Maps_Generated\Monroe\projects\14-10355.02 Storm\maps\Fig SW 4.1 Drainage Basins 11x17.mxd 3/19/2015 ctolentino



P:\Mapping\Maps_Generated\Monroe\projects\14-10355.02 Storm\maps\Fig SW 4.2 Stormwater System 11x17.mxd 3/19/2015 ctolentino

BHC CONSULTANTS

Stormwater System: City of Monroe 2014

Snohomish County base data 2014
Data sources supplied may not reflect current or actual conditions. This map is a geographic representation based on information available. It does not represent survey data. No warranty is made concerning the accuracy, currency, or completeness of data depicted on this map.
BHC Consultants LLC., assumes no responsibility for the validity of any information presented herein, nor any responsibility for the use or misuse of the data.

NORTH

0 1,000 2,000 4,000 Feet

MONROE WASHINGTON

Stormwater System
Utility Systems Plan - Stormwater
City of Monroe, Washington
March 2015

Figure
SW 4.2

4.3.1 Stormwater Pipe

Approximately two-thirds of the City's stormwater conveyance system consists of pipe. Pipes range in size from eight inches to forty-eight inches in diameter, and convey stormwater via outfalls into the receiving waters identified in 4.3.11, below.

Some stormwater pipes have storage or water quality treatment structures built into the system. The City owns approximately 50 miles of stormwater pipe with the pipe inventory consisting primarily of PVC, HDPE and concrete pipe. A portion of the downtown area is a combined sanitary/stormwater sewer which discharges to the wastewater treatment plant.

4.3.2 Culverts

Culverts are short sections of pipe used to convey stormwater/streamflow and which generally connect open ditches or streams either under or adjacent to roads. Culvert pipes are usually concrete or corrugated metal. There are approximately 21 culverts within the City of Monroe storm drainage system.

4.3.3 Catch Basins

Catch basins are underground sumps which are used to collect stormwater. In Monroe, most catch basins discharge directly into a piped conveyance system. The sump at the bottom of a catch basin is used to capture sediment and other debris from incoming stormwater. Some catch basins are equipped with trapped outlets, which prevent most floating debris and oil from leaving the catch basin. The City owns 1,917 catch basins that are connected to stormwater conveyance piping.

A number of catch basins in Monroe do not connect to a piped storm drain system but instead serve as a point for infiltration of the stormwater runoff. These types of catch basins are called "rock holes" and are located in the residential neighborhoods in the southeastern portion of the City between Main St and the Skykomish River. The City owns approximately 25 rock hole catch basins in this area.

4.3.4 Ditches

Ditches are constructed earth trenches lined with vegetation or concrete that convey stormwater in areas not served by piped conveyance systems. The City owns approximately 15 miles of ditches.

4.3.5 Biofiltration Swales

Biofiltration swales are grass-lined, flat-bottomed ditches whose purpose is to filter the runoff in order to provide water quality treatment. They differ from ditches in that the vegetation must be appropriately maintained to function properly. The shape, slope, width, and length of the swales are specifically designed to achieve appropriate levels of water quality treatment. Most of the biofiltration swales in the stormwater drainage system are privately owned. These privately owned swales area maintained by the property owners, whereas City owned swales are maintained by the City.

4.3.6 Retention/Detention Ponds and Underground Storage Facilities

Retention/detention ponds and underground storage facilities (such as vaults and pipes) store stormwater runoff. The purpose of these facilities is to temporarily store the runoff so that it can be released at a controlled rate to nearby receiving waters or infiltrated into the ground, preventing potential downstream flooding or erosion.

When land is developed, and no flow control facilities are installed, both the total volume of runoff and the peak flows typically increase due to:

- Loss of vegetation that slows the release of runoff.
- Compaction of the soil column that reduces infiltration rates.
- Placement of impervious surfaces (pavement, rooftops, etc.) that intercept rainfall, preventing soil infiltration and conveying a larger volume of runoff more quickly to a discharge location, thereby increasing the peak flow.

The controlled rate of release from these storage facilities is designed to generally mimic the rate of stormwater runoff that occurred from the land, prior to any development. The volume of runoff these facilities can store is that required to hold the additional volume of water that occurs after development, until it can be released at the appropriate/controlled rate. The City owns 15 detention ponds and nine underground vaults.

4.3.7 Infiltration Trenches

Some locations within the City contain soils that are suitable for stormwater infiltration, and as a result, several infiltration trenches have been constructed. The trenches are located underneath City streets and infiltrate locally generated stormwater runoff. Multiple infiltration trenches typically are located in each infiltration facility, along with water quality pretreatment and an overflow connection to local stormwater or combined piping systems. The stormwater drainage system contains both public and privately owned infiltration facilities.

4.3.8 Oil/water Separators

Oil/water separators are generally underground vaults designed to trap sediments, oil, and floatable materials. The inlet and outlet are typically located on opposite ends of the vault, which is also equipped with baffle walls extending above and below the water surface and with a gap above the floor of the vault. Runoff flows underneath the baffles and out of the vault, while the oil floats to the surface and is retained in the vault by the baffle. Some oil/water separators contain oil-absorbing booms. The City owns seven oil/water separators.

4.3.9 Outfalls

The stormwater drainage system discharges to receiving waters in the Woods Creek, French Creek and Skykomish River watersheds. Outfall locations are shown in Figure SW 4.2.

4.3.10 Filtration Systems

The City-owned filter treatment systems are located along various storm drain lines. Filters are located on Lewis Street leading to the outfall into Woods Creek at the intersection of S. Ann Street and Fremont Street. There are also filters at Sky Valley Food Bank and S. Kelsey St. In total the City maintains 33 individual canisters located in five vaults.

Table SW 4-1 summarizes the estimated quantities of drainage system infrastructure, as described in Section SW 4.3.

Table SW 4-1 **City of Monroe Stormwater Facility Summary**

Facility	Quantity	Unit
Catch Basins connected to stormwater pipe	1,917	Each
Catch Basins with infiltration only (Rock Holes)	25	Each
Oil/water separators	7	Each
Stormwater Pipe	50	Miles
Ditches	15	Miles
Filters (Individual Canisters)	33	Each
Underground Vaults	9	Each
Detention Ponds	15	Each
Infiltration Trench System	2.4	Miles
Culverts	21	Each
Outfalls	18	Each

4.3.11 Receiving Waters

The stormwater conveyance system discharges to the following receiving waters via the outfalls listed in Section SW 4.3.9 (Refer to Figure SW 4.2):

- Woods Creek
- French Creek
- Cripple Creek
- Flying “F” Creek
- Backhoe Creek
- Skykomish River

The mouth of Woods Creek is located within the eastern portion of the City, discharging to the Skykomish River between Buck Island and S Lewis Street, at the southern boundary of the City. The majority of the Woods Creek watershed lies outside of and to the northeast of the City.

The northwest portion of the City lies within the headwaters of Cripple Creek, discharging to the southwest, into upper French Creek. The majority of French Creek is located outside of and to the north and west of the City. French Creek discharges to the Snohomish River over three miles from the western boundary of the City and downstream of the confluence with the Skykomish River.

Portions of south and east Monroe drain directly to the Skykomish River, both upstream and downstream of the confluence with Woods Creek. The Skykomish River discharges into the Snohomish River further downstream of the City. Ultimately, all stormwater runoff originating within City limits discharges to the Snohomish River, through either the Skykomish River or French Creek basins. These receiving waters are characterized in detail, in Section SW 4.4, below.

4.4 Watersheds

The City of Monroe is comprised of three primary watersheds: Woods Creek, French Creek, and the Skykomish River. The Skykomish watershed drains southern and eastern portions of the City, Woods Creek drains the eastern portion, and French Creek drains the central and western areas of the City.

Water quality criteria for temperature, dissolved oxygen, total dissolved gas, pH, turbidity, and bacteria are identified in WAC 173-201A-200. Criteria for nutrients are in WAC 173-201A-230. Criteria for toxic substances are in WAC 173-201A-240.

4.4.1 Woods Creek Watershed

The Woods Creek watershed is 64 square miles. Of that, 1.1 square miles (< 2%) are in the City of Monroe. The creek's headwaters are Northeast of the City in the foothills of the Cascades. The discharge to the Skykomish River is in the City limits. The area within the City limits includes Buck Island, which is located between Woods Creek and Skykomish River just upstream of the confluence. It is primarily undeveloped. The total length of Woods Creek is approximately 17 miles. The City's stormwater drainage system discharges to the creek at six locations, as shown in Figure SW 4.2. Because the City comprises a small percentage of the overall watershed, the City has a relatively minor impact on water quantity and quality characteristics.

Watershed Water Quality

The City of Monroe has two water quality sampling sites in the Woods Creek watershed measuring temperature, dissolved oxygen, and fecal coliform concentrations. The measurements are included in Appendix SW-A: Water Quality Measurements. Sampling site locations are identified in Figure SW 4.2.

Woods Creek is listed under the following Total Maximum Daily Loads (TMDL's) by the Department of Ecology. Refer to Section SW 6.3.6 for further discussion of TMDL requirements.

Table SW 4-2 Water Quality for Woods Creek Watershed		
Category	**Parameter**	**Listing ID**
2	Dissolved Oxygen	7436
4A	Bacteria	7437
4A	Bacteria	7440
5	Temperature	7807
2	Bacteria	9834
4A	Bacteria	9835
4A	Bacteria	21980
1	Bioassessment	22315
1	Bioassessment	22316
2	pH	40813
5	Temperature	48562

http://apps.ecy.wa.gov/wats/SearchResults.aspx

Watershed Fish Habitat

Maps from the Washington Department of Fish and Wildlife indicate documented presence in Woods Creek of fall and summer Chinook, Coho, fall Chum, Pink and summer and winter Steelhead and the presumed presence of Bull Trout. The maps also indicate rearing of Coho and fall Chum, and spawning of Pink and winter Steelhead. Endangered Species listings for Puget Sound apply as well to the watersheds which ultimately discharge to the Sound. Table SW 4-3 summarizes those listings.

Table SW 4-3 Endangered Species Listings		
Species	**Federal**	**State**
Bull Trout	Threatened	State Candidate
Chinook	Threatened	State Candidate
Coho	Species of Concern	None
Chum	Threatened	State Candidate
Steelhead	Threatened	None

http://wdfw.wa.gov/conservation/endangered/esa/federally_listed_esa_fish.pdf

The Washington State Department of Ecology collected data from the creek where it crosses Old Owen Road on September 13, 1999. This is available on DOE's website (http://www.ecy.wa.gov/apps/watersheds/wriapages/07.html) under "Stream bioassessment stations." The temperature was measured at 11.9 degrees Celsius (53.4 degrees Fahrenheit). Dissolved oxygen was measured at 9.8 mg/l. The pH was measured at 7.9.

The substrate was measured in four locations. The creek bed was between 32-42% cobble, 16-230% course gravel, 20-30% fine gravel, and 8-20% sand. No wood, silt, clay, bedrock, or other materials were found.

The River Invertebrate Prediction and Classification Systems score is 1.04. A score of 1 means that all expected taxanomic categories are present. A score less than 0.86 is thought to indicate a degraded stream relative to a reference condition. This indicates that from the perspective of invertebrates, Woods Creek is healthy.

Watershed Planning Status

Woods Creek is located in Water Resource Inventory Area (WRIA) 7, the Snohomish River watershed. Although Woods Creek is not referenced directly in WRIA 7, it is included since it is located within the greater Snohomish River watershed.

Watershed Hydrology

Watershed hydrology is influenced by the contributing area, topography, soil types, land use/vegetation, and climate/rainfall.

The soils in the Woods Creek watershed are primarily composed of alluvial and lacustrine deposits with moderately low to moderately high infiltration capacities. There are also areas of glacial till, which have very low to moderately low infiltration capabilities, and glacial outwash, which have high to very high infiltration rates. Within the City limits, soils are comprised primarily of alluvial deposits near the Skykomish River and glacial outwash and glacial till soils further upstream.

There is a small ridge running northeast-southwest separating the Woods Creek and the French Creek watersheds. The Woods Creek watershed drains to the southeast over relatively flat slopes.

Current land use is primarily residential inside the City limits, with some open space, commercial, and industrial areas. Land use outside the City limits is a mixture of agricultural, rural residential, and forest. Historically, the watershed was forested.

Lower Woods Creek Subbasin

Lower Woods Creek is the only subbasin of the Woods Creek watershed located in Monroe.

4.4.2 French Creek Watershed

The French Creek watershed is 28 square miles. Of that, 3.5 square miles (< 12%) are in the City of Monroe. The creek's headwaters are north and west of the City. French Creek discharges to the Snohomish River approximately four miles west of the City limits. Some of the drainage courses discharging into the creek downstream of the City have been straightened into ditches along agricultural land. The total length of French Creek is approximately 8 miles. Because Monroe encompasses a larger percentage of the French Creek watershed than the Woods Creek or Skykomish River watersheds, it has a more significant role in the quantity and quality characteristics of water in the stream.

Watershed Water Quality

The City of Monroe has six water quality sampling site within the French Creek watershed. Sampling site locations are identified in Figure SW 4.2. The sampling sites measure temperature, dissolved oxygen, fecal coliform concentrations and one site visually monitoring the depth of Lake Tye. Sampling site data are included in Appendix SW-A: Water Quality Measurements.

French Creek is listed under the following TMDL's by the Department of Ecology. Refer to Section SW 6.3.6 for further discussion of TMDL requirements.

Table SW 4-4 Water Quality for French Creek Watershed

Category	Parameter	Listing ID
1	Temperature	6437
5	Dissolved Oxygen	7272
5	pH	7273
4A	Bacteria	7274
2	Temperature	7275
5	Dissolved Oxygen	7276
2	Dissolved Oxygen	7278
4A	Bacteria	7279
4A	Bacteria	7280
5	pH	7282
5	Temperature	9273
5	Temperature	10640
2	Ammonia-N	10642
5	Dissolved Oxygen	40743
5	pH	40748
2	Temperature	40932

http://apps.ecy.wa.gov/wats/Default.aspx

Watershed Fish Habitat

Maps from the Washington Department of Fish and Wildlife indicate documented presence in French Creek downstream of Monroe of Coho, Summer Steelhead, and Winter Steelhead, and presumed presence of Bull Trout. The maps indicate presence of Coho within the City limits. Endangered Species listings for Puget Sound apply as well to the watersheds which ultimately discharge to the Sound. Table SW 4-3 summarizes those listings.

Watershed Planning Status

French Creek is located in WRIA 7, the Snohomish River watershed. Although French Creek is not referenced directly in WRIA 7, it is included since it is located within the greater Snohomish River watershed.

Watershed Hydrology

Watershed hydrology is influenced by the area, topography, soil types, land use/vegetation, and climate/rainfall.

The soils of the portion of the French Creek watershed located within the City limits are comprised mainly of alluvial and lacustrine deposits which have moderately low to moderately high infiltration capabilities, some glacial outwash which have high to very high infiltration rates, and glacial till, which have moderately low to very low infiltration capabilities. A portion of the watershed contained peat, which was removed and replaced with gravel pit run.

There is a small ridge running northeast-southwest separating the Woods Creek and the French Creek watersheds. The area within French Creek watershed drains to the northwest over relatively flat slopes.

The portion of the watershed located within the City is comprised primarily of residential and light industrial areas. Downstream of the City limits the watershed contains primarily agricultural lands. Upstream of the City limits the watershed contains a mixture of forest and rural residential lands. Historically, the watershed was forested.

Cripple Creek Subbasin

Cripple Creek drains the northern portion of Monroe and is located in the French Creek watershed. It also drains a large area located outside of the City limits.

It flows west along Highway 2 before diverging from the highway and flowing through a series of agricultural drainage ditches, ultimately joining with French Creek prior to discharging to the Snohomish River.

4.4.3 Skykomish River Watershed

The Skykomish River watershed covers 836 square miles. Of that, 1.4 square miles (< 0.2%) are in the City of Monroe. The river's headwaters are upstream of the City in the Cascade mountains, and the watershed includes Woods Creek. The Skykomish River discharges to the Snohomish River approximately two miles southwest of the City limits.

The majority of stormwater runoff collected and conveyed in Monroe discharges via dedicated stormwater piping to the outfalls shown in Figure SW 4.2. Portions of older areas of town, however, convey stormwater and sanitary wastewater together in a combined sewer system, which discharges to the waste water treatment plant on South Sams Street. In 2000, an overflow in the combined system was plugged to prevent discharges to the river during periods of high flows. Since then, there have been no overflows.

Watershed Water Quality

The Department of Ecology maintains a sampling site on the Skykomish River, adjacent to the southeast side of Buck Island. Sampling has occurred since 1971. Since 1977, sampling data exists for every year except 1994. The overall Water Quality Index has been rated "good" in the 19 years that it has been calculated. The overall rating accounts for all constituents that are monitored. A Water Quality Index of 80 and above (out of 100 possible) is considered an indicator of good water quality (meeting or exceeding expectations). The lowest overall rating calculated for that period was 80.

The last measured year was in 2013. The 2013, scores for individual constituents are all 75 or higher, as shown in Table SW 4-5, below. Scores for individual constituents for previous years were as low as 70, which are still considered to be of moderate quality.

Table SW 4-5 Water Quality Index for Skykomish River at Buck Island

Constituent	Score
Fecal coliform bacteria	87
Oxygen	81
pH	90
Suspended solids	80
Temperature	75
Total persulf nitrogen	91
Total phosphorus	91
Turbidity	85

Data obtained from DOE Station 4 of WRIA 7 (http://www.ecy.wa.gov/apps/watersheds/riv/station.asp?theyear=&tab=wqi&scrolly=289&wria=07&sta=07C070)

Watershed Fish Habitat

The Skykomish River contains fall and summer Chinook salmon, Coho, fall Chum, Pink, summer and winter Steelhead and Bull Trout. Endangered Species listings for Puget Sound apply as well to the watersheds which ultimately discharge to the Sound. Table SW 4-3 summarizes those listings.

Watershed Planning Status

The Skykomish River is located in Water Resource Inventory Area (WRIA) 7, the Snohomish River watershed. Although the Skykomish River is not referenced directly in WRIA 7, it is included since it is located within the greater Snohomish River watershed. No additional regulations for the Skykomish River are included in the WRIA 7 planning documents.

Watershed Hydrology

Basin hydrology is influenced by the area, topography, soil types, land use/vegetation, and climate/rainfall. The Skykomish River drainage basin within the City limits is 1.4 square miles. The watershed includes Woods Creek.

The soils of the portion of the Skykomish River basin located within the City limits are comprised mainly of alluvial and lacustrine deposits, with some glacial till. Very little glacial outwash is present.

Stormwater runoff discharges to the Skykomish River from two areas within the City. The southeastern area of the City, east of Woods Creek, discharges directly to the Skykomish River primarily via gently sloping overland flow. A portion of the City south of Main Street and west of Woods Creek discharges to the Skykomish River through seven outfalls, as shown in Figure SW 4.2.

Land use for the Skykomish River watershed located within the City includes residential, commercial, light industrial and open space. A sand and gravel mine is also located next to the River. Outside of the City limits the basin contains primarily forest lands, with some agriculture and urban areas. Historically, the basin was primarily forested.

Woods Creek Subbasin

Woods Creek is a tributary to the Skykomish River. Refer to Section SW 4.4.1.

Chapter SW 5 Current Stormwater Management Utility Program

5.1 General Description

The City of Monroe created its Stormwater Management Utility in 1996. Like other small to medium-sized cities, the City leverages existing staff to manage, operate, and implement its stormwater system utility program. The Public Works Director administers the Stormwater Management Utility, but relies on coordination and communication with the Public Works Department management leads to execute elements of the Stormwater Management Utility Program. All of the work for the Stormwater Management Utility is carried out with the Public Works Department. Staff allocated to stormwater tasks also perform work for other utilities and departments such as finance, water, sewer, and streets.

The Stormwater Management Utility Program consists of numerous elements. These elements are described below and are organized into four categories based on the department or departments that perform the work. Each category and its elements are described in detail below.

- Public Works – Design and Construction Division Stormwater Services
- Public Works Operation and Maintenance Division Services
- Program Support and Administration
- Capital Improvement Program

5.2 Public Works – Design and Construction Division Stormwater Services

The City of Monroe Public Works – Design and Construction Division Stormwater Services staff contributes to the following Stormwater Management Utility program elements:

- Management and Administration
- New Development and Plan Review (including inspections)
- Flood Hazard Planning, Monitoring and Response
- Technical Assistance/Customer Service
- CIP Planning, Design and Project Management

A brief description of each of these activities, along with the estimated actual annual expenditures (averaged over the 3 year period 2011-2013), is given below where it is specifically tracked by the City (using activity codes). A three year average annual expenditures is taken because the actual effort toward any particular activity can vary year to year. The detailed development of the estimated annual cost is included on Table SW 5-1. For the maintenance type activities, the table also breaks down the infrastructure quantity that are maintained by the City, frequency of maintenance, crews sizes, and production rates in order to assess for staff FTE requirements and maintenance service levels.

Table SW 5-1 2013 Stormwater Maintenance Program and Operations and Maintenance Activities

	Monroe Task # (2013)	Maintenance Activity	Units to be Maintained or Installed	Production Unit	Hours/ Year	Daily Production	Crew Size	Units Processed per Year	Years to Process all Units	Freq. (times/yr)	Annual Person Days[2]	Full-time Labor Equiv.[1]	Labor Cost[3]	Annual Cost
Cleaning and Inspection	497	Catch Basin Cleaning	1917	Each	155	35	3	678	3	0.35	58	0.31	$30,950	$30,950
	477	Catch Basin Inspection	1917	Each	20	100	2	250	8	0.13	5	0.03	$2,662	$2,662
	492	Ditch Clearing - Vegetation Control & Sediment Removal[7]	77,334	LF	104	1610	3.75	20936	4	0.27	49	0.26	$25,958	$25,958
	N/A	Street Sweeping	49	Mile	1250	3.8	1	594	0.08	12	156	0.83	$83,200	$83,200
	487	Filter Maintenance	30	Each	10	10	3	13	2	0.42	4	0.02	$1,997	$1,997
	489	Clean Control Structures and Oil/Water Separator	36	Each	10	8	3	10	4	0.28	4	0.02	$1,997	$1,997
	488	Storm Retention Pond-Swale Maintenance	2.7	Mile	20	0.15	3	0.38	7	0.14	8	0.04	$3,994	$3,994
	490, 491	Culvert Jetting & Vactoring	21	Each	15	2	3	3.75	6	0.18	6	0.03	$2,995	$2,995
	486, 494	Clean Pipes	50	Mile	165	0.5	3	10.3	5	0.21	62	0.33	$32,947	$32,947
	485	Clean Retention Ponds - Annual Vegetation Maintenance and Inspection	15	Each	60	2	2	15	1	1.00	15	0.08	$7,987	$7,987
	485	Clean Retention Ponds - Large Scale Vegetation Maintenance (every 3 yrs +/-)	15	Each	49	1	4	6	2	0.41	24	0.13	$12,979	$12,979
	484	Clean Retention Ponds - Sediment Management	15	Each	30	0.8	4	3	5	0.19	15	0.08	$7,987	$7,987
	N/A	Cleaning/Inspection/Other Non-Specific activities	-	-	-	-	-	-	-	-	225	1.20	$119,808	$119,808
	New	Clean/Maintain Underground Detention Vaults	9	Each	-	2	3	-	-	-	-	0	-	-

Table SW 5-1 2013 Stormwater Maintenance Program and Operations and Maintenance Activities														
	Monroe Task # (2013)	Maintenance Activity	Units to be Maintained or Installed	Production Unit	Hours/ Year	Daily Production	Crew Size	Units Processed per Year	Years to Process all Units	Freq. (times/yr)	Annual Person Days[2]	Full-time Labor Equiv.[1]	Labor Cost[3]	Annual Cost
Repair and Replacement[5]	493	Storm Mainline Repairs	264,000	LF	15	150	6	281	Not Applicable	Not Applicable	11	0.06	$5,990	$5,990
	495	Storm Manhole Repairs	604	Each	10	1	3	1	Not Applicable	Not Applicable	4	0.02	$1,997	$1,997
	496	Storm Outfall/Weir Repairs	319	Each	5	1	3	1	Not Applicable	Not Applicable	2	0.01	$998	$998
	498	Catch Basin Repairs	1917	Each	4	1	4	0	Not Applicable	Not Applicable	2	0.01	$998	$998
	502	Catch Basin Installs	1	Each	2	1	4	0.23	Not Applicable	Not Applicable	1	0.01	$499	$499
NPDES Compliance	503	NDDES Overhead	-	-	-	-	-	-	-	-	8	0.04	$3,994	$3,994
	504	NPDES Stormwater Quality Monitoring	-	-	-	-	-	-	-	-	17	0.09	$8,986	$8,986
	505	NPDES IDDE	-	-	-	-	-	-	-	-	21	0.11	$10,982	$10,982
	506	NPDES Stormwater Facility Inspection	-	-	-	-	-	-	-	-	17	0.09	$8,986	$8,986
	507	NPDES Public Education and Outreach	-	-	-	-	-	-	-	-	32	0.17	$16,973	$16,973
	508	NPDES Reporting and Record Keeping	-	-	-	-	-	-	-	-	21	0.11	$11,182	$11,182
	509	NPDES Training	-	-	-	-	-	-	-	-	4	0.02	$1,997	$1,997
	510	TMDL Overhead	-	-	-	-	-	-	-	-	2	0.01	$998	$998
	511	TMDL Sampling[4]	-	-	-	-	-	-	-	-	8	0.04	$3,994	$4,994
Facility and Equipment Maintenance and Repair	Fund 520	Equipment Maint/Repair & Vehicle Maint	-	-	-	-	-	-	-	-	-	-		$279,000
	Fund 530	Facility Maintenance	-	-	-	-	-	-	-	-	-	-	-	$47,000

Table SW 5-1 2013 Stormwater Maintenance Program and Operations and Maintenance Activities

	Monroe Task # (2013)	Maintenance Activity	Units to be Maintained or Installed	Production Unit	Hours/ Year	Daily Production	Crew Size	Units Processed per Year	Years to Process all Units	Freq. (times/yr)	Annual Person Days[2]	Full-time Labor Equiv.[1]	Labor Cost[3]	Annual Cost
Management and Administrative	Fund 001	Administration Fees[6]	-	-	-	-	-	-	-	-	-	-	-	$89,457
	512	Stormwater Capital Construction									2	0.01	$998	$998
	499	Citizen Concerns	-	-	-	-	-	-	-	-	24	0.13	$12,979	$12,979
	474	Maint Crew Administrative Tasks	-	-	-	-	-	-	-	-	146	0.78	$77,875	$77,875
	476	Stormwater Plan Review									9	0.05	$4,992	$4,992
	470, 478	Stormwater Disaster Response and Recovery									0	0.00	$100	$100
	480	GPS - Storm Field									4	0.02	$1,997	$1,997
	481	GPS - Storm Office									84	0.45	$44,928	$44,928
	482	Storm - Potholes and Utility Locates									2	0.01	$998	$998
	483	Stormwater Training (non NPDES)									2	0.01	$998	$998
	501	Weather Station									2	0.01	$998	$998
	508	Coordination with Other Agencies									5	0.03	$2,796	$2,796

Table SW 5-1 2013 Stormwater Maintenance Program and Operations and Maintenance Activities

	Monroe Task # (2013)	Maintenance Activity	Units to be Maintained or Installed	Production Unit	Hours/ Year	Daily Production	Crew Size	Units Processed per Year	Years to Process all Units	Freq. (times/yr)	Annual Person Days[2]	Full-time Labor Equiv.[1]	Labor Cost[3]	Annual Cost
Management and Administrative	N/A	Director					-					0.05	$8,056	$8,056
	N/A	Manager	-	-	-	-	-	-	-	-		0.18	$26,056	$26,056
	N/A	Supervisor	-	-	-	-	-	-	-	-		0.37	$43,109	$43,109
	N/A	French Creek												$97,000
	N/A	Administrative Assistance	-	-	-	-	-	-	-	-		0.13	$12,259	$12,259
Subtotals and Total	**Field Crew Labor Subtotal (Cleaning & Inspection and Repair & Replacement)**											**3.47**		**$345,946**
	NPDES Compliance											**0.68**		**$69,091**
	Facility and Equipment Maintenance and Repair											**-**		**$326,000**
	Management and Admin Labor Subtotal											**2.23**		**$425,597**
	Total											**6.38**		**$1,166,633**

Notes:
1) FTE calculation based on recorded annual activity charges averaged over 2011-2013.
2) Annual Person Day for activity based on field crew staff availability for field work of 1,500 hrs/year.
3) Labor costs based on average wage of $32.50/hr + $15.50 (for benefits), or $48/hr.
4) Total Annual cost includes $1,000 in sampling non-labor costs.
5) These system repairs and new installs are for projects < $65k. When projects are greater, they are implemented as part of the CIP.
6) Stormwater Utility's portion of Administrative Fees and IT fees (averaged 2012-2014).
7) For simplicity, table does not reflect that a portion of ditch vegetation maintenance is funded out of general fund.
8) The FTE calculation for Category 485 (0.21 FTE) was split between annual maintenance and large scale maintenance. The FTE estimate for large scale maintenance was estimated by taking the total FTE from City records (0.21 FTE) and subtracting the estimate effort on annual vegetation maintenance.

5.2.1 Management and Administration

Management and Administration activities include Stormwater Management Utility decision and policy making activities, workload and budgetary coordination, and interaction with other City offices and departments.

5.2.2 New Development and Plan Review (including inspections)

The Design and Construction Division staff reviews all private development plans within the City to ensure they meet the City's standards for permanent stormwater facilities, as well as for temporary erosion and sediment controls during construction. In its effort to control runoff from new development or redevelopment, staff reviews plans submitted for permits and performs construction site field inspections of new or redeveloped property. In compliance with the NPDES Phase II permit, the City adopted the 2005 Stormwater Management Manual for Western Washington (Ecology Stormwater Manual) by reference (Monroe Municipal Code 15.01).

The average annual expenditures provided by the Design and Construction Division staff was estimated at $5,000. There has been significant increase in new development activities in 2014, and the effort required for this activity will increase. This is further discussed in Chapter SW 5.

5.2.3 Flood Hazard Planning, Monitoring and Response

Local and regional flood planning, monitoring and response is performed by Public Works staff but is paid for by the General Fund and through the Monroe Emergency Management Office. Flood related work occurs within two areas: 1) participation in the National Flood Insurance Program, and 2) the planning and implementation efforts of the Monroe Emergency Management Office.

To participate in the National Flood Insurance Program (NFIP), the WA State Department of Ecology requires local governments to adopt and administer regulatory programs compliant with the minimum standards of the NFIP. The City of Monroe voluntarily participates in the NFIP's Community Rating System (CRS). By participating in the Community Rating System, the City is able to earn discounts on flood insurance for its residents with homes in the flood hazard areas. As of May 2013, the City achieved a Class rating of 5 in the CRS, which provides a 25 percent reduction in rates for its resident flood insurance policy holders residing in flood hazard areas. Maintaining the CRS is paid for in part by the Monroe Emergency Management Office.

5.2.4 Technical Assistance/Customer Service

Customer Services activities are minimal and are limited to an as-needed basis by a variety of staff, typically from the Design and Construction Division with some support from Operation and Maintenance. In 2013, the incurred expense was estimated to be $13,000.

5.2.5 CIP Planning, Design and Management

The Design and Construction Division staff oversees the planning, design, and construction management of the City-owned projects in its Capital Improvement Program (CIP). Depending upon the size of the project, Division staff may perform the project design work or outsource the design to consultants. For the latter, the Division is still needed for managing and reviewing the developed design. Similarly, construction management efforts may be handled within the

Division for small projects or outsourced for larger projects. The stormwater CIP varies year to year, and can be as high as about $600,000.

5.3 Public Works – Operation and Maintenance Department Services

The Public Works – Operation and Maintenance Division staff is responsible for the stormwater system maintenance, inspection, repairs, as well as other activities that help the City comply with regulatory requirements, primarily the NPDES Phase II requirements. As noted above, Table SW 5-1 shows primary stormwater maintenance and repair activities performed by Public Works Department Operation and Maintenance staff, as well as the daily production rates, units cleaned or repaired per year, and the FTE required. Activities performed by the Operation and Maintenance Division include the following categories:

- Management and Administration
- Cleaning
- Repair and Replacement, and CIP Construction (when less than $65,000)
- Facility, Equipment and Vehicle Repair and Maintenance
- Public Education and Involvement
- Stormwater System Inventory
- Illicit Discharge, Detection and Elimination
- Reporting and other NPDES compliance
- Coordination with Other Agencies

5.3.1 Public Works Management and Administration

Public Works Management and Administration activities include field supervision, professional training, meetings and conferences, inventory control, and planning and maintenance recordkeeping.

5.3.2 Cleaning and Inspection

Cleaning and inspection activities fully funded by the Stormwater Management Utility include street sweeping; vegetation and sediment removal from detention facilities; and all sediment removal from catch basins, piped conveyance systems, culverts and ditches. The Utility also partially funds several road related cleaning activities including 50% of roadside shoulder and ditch mowing, shoulder maintenance, road shoulder vegetation control by spraying, and street tree maintenance. The Utility also funds 20% of labor for City-owned facility maintenance (such as the decant facility and City shops).

Some cleaning and inspection activities are performed on a routine basis while others are performed on an as-needed basis. Activities performed on a routine basis include street sweeping; road side mowing and shoulder work; ditch mowing and sediment removal; catch basin and pipe cleaning; and detention pond vegetation clearing. Activities performed more on an as-needed basis include and sediment removal from detention ponds and vaults, and cleaning of stormwater filter systems. More detailed information about the various cleaning tasks is included below including facility quantities and cleaning frequency.

Street sweeping

The Utility owns two vacuum type street sweepers and a 50 mile route within the City is swept on a regular basis that results in these streets being swept on the average of nearly 12 times per year, or approximately once every month. Although some streets that are more susceptible to sediment accumulation are swept more frequently, while those less susceptible are swept less frequently. The estimated annual costs for street sweeping is $83,200.

Ditch and road side vegetation and sediment removal

The Stormwater Management Utility funds 50 percent of the cost for roadside and ditch vegetation cleaning and 100 percent of the sediment removal to maintain proper drainage. The remaining 50 percent of the workload for vegetation control is funded by the General Fund as part of the street maintenance efforts. Approximately 15 miles of roadway shoulders and ditches are maintained.

The average annual cost to the Stormwater Utility for this activity is $26,000.

Detention/retention facility cleaning

There are generally three main activities for detention/retention facility pond cleaning. Perimeter vegetation control including mowing and noxious weed management is performed annually. The annual maintenance includes an inspection to look for other issues with the facility that may require more involved maintenance. More significant or larger scale vegetation control such as tree removal or removing nuisance vegetation is done approximately every three years. Sediment management, i.e., removal of accumulated sediment in the pond bottoms, is done every 4 to 5 years.

Sediment removal from vaults and tanks is done on an as-need basis. The City owns one very large vault and 8 smaller vaults. The larger vault is estimated to need cleaning every 10 years.

The average annual cost for this activity is $29,000.

Catch basins, pipes/culvert and control facilities

Separate activity codes are used for cleaning activities for catch basins (497), pipes (486 & 494), and detention/retention control structures/oil water separators (489). Cleaning of these structures and pipe involves vactoring out wet solids and transporting to a City-owned decant facility constructed in 2008. More detailed information about these activities is as follows:

- Catch basins. The City maintains 1,917 catch basins. In recent years at current staffing levels, the City has been able to maintain approximately one-third of all catch basins each year.
- Pipes. The City contains approximately 50 miles of stormwater pipe. In recent years at current staffing levels, the City has been able to maintain approximately one-fifth of all pipe each year. This primarily includes jetting/vactoring accumulated sediment.
- Culverts. The City has 21 culverts it is responsible to maintain. In recent years at current staffing levels, the City has been able to maintain approximately one-sixth of all culverts each year.
- Detention/Retention Facility Control Structures and Oil/Water Separators. The City has 36 structures requiring inspection and maintenance. In recent years at current staffing levels, the City has been able to maintain approximately one-fourth of all structures each year.

The average annual costs for these activities were estimated as follows; $31,000/catch basin cleaning; $33,000/pipes; $3,000/culverts; and $2,000/control structures.

As noted above, vactor waste is treated at the decant facility constructed in 2008. The City's current method of disposing of vactor waste is very efficient. It is noted, however, that the Department of Ecology is currently having ongoing discussions with several counties and cities regarding the possibility of changing the treatment requirements for vactor waste that, if implemented, could result in changes to how the City uses the decant facility and increase disposal costs.

5.3.3 Repair and Replacement and CIP Construction

This activity covers stormwater system repair and replacement and capital improvement construction activities for catch basins, pipe and culverts that are under $65,000 in total cost paid for by the Stormwater Management Utility. This activity is usually a minor focus of the program and is in response to smaller system deficiencies as they are identified. The average annual expenditure between 2011 and 2013 was $10,000. When system repairs and replacement or new construction projects are in excess of $65,000, they are implemented through the Utility's Capital Improvement Program.

5.3.4 Equipment, Vehicle and Facility Repairs/Maintenance

Public Works staff perform as much maintenance and repairs on the City's utility-related equipment, vehicles, and facilities as they are equipped to do so. The Stormwater Management Utility funds its shared portion of the total cost of these repairs and maintenance while the other public works utilities and departments (water, sewer, and streets) fund the remaining portion. The estimated average expenditure for these activities since 2012 has been $326,000.

5.3.5 Public Education and Involvement

Public education, outreach, involvement, and participation is an important element of the Stormwater Management Utility program. The program is aimed at residents, businesses, industries, elected officials, policy makers, planning staff and other employees of the City of Monroe. The goal of the program is to reduce or eliminate behaviors and practices that cause or contribute to adverse stormwater impacts. The program was largely developed in response to minimum requirements established by the NPDES Phase II permit since 2009. In consideration of the NPDES permit requirements, the program was developed locally, targeting the City of Monroe, and also coordinated with regional programs, such as the Snohomish County Conservation District, and Snohomish County Surface Water Management.

Education and outreach efforts are prioritized to target the following audiences and subject areas:

- General public
- Businesses, including home-based and mobile businesses
- Homeowners, landscapers, and property managers
- Engineers, contractors, developers, review staff and land use planners

The City of Monroe continues to develop a stormwater specific webpage to help increase public awareness of stormwater related issues. The City is also exploring outreach activities with the Monroe School District such as elementary, middle school and/or high school curriculum, including stewardship activities. The City also has a focus element on illicit discharge detection and elimination (IDDE) public education efforts.

The City of Monroe continues to measure the understanding and adoption of the targeted behaviors among the targeted audience. The resulting measurements will be used to direct education and outreach resources most effectively, as well as to evaluate changes in adoption of the targeted behaviors. In 2012, the City conducted a study "Assessment of Residential and Business Understanding and Adoption of Targeted Stormwater Behaviors" (Hebert Research, 2012). The goal of this research was to measure the public's knowledge and practices regarding stormwater in the City as well as to assess Monroe businesses' stormwater practices and behaviors. The research results may be used to help tailor educational outreach methods to improve the target audience's understanding of the problem and how to change behaviors in the most effective manner. One outcome of the research was the development of a set of priority issues where the public's understanding of stormwater problems can be improved. An example of a high priority issue was the public's understanding about the best approach for private car washing. Only 26% of the participants had the desired response when they were asked whether they "Agree" or "Disagree" with the following statement: "When I wash a motor vehicle at home, the soapy water ends up in a ditch or on the street". The desired answer is "Disagree" because, to best protect the environment soapy water is best handled by allowing it to be absorbed into a lawn or the ground.

The research and ongoing assessment of the City's program has caused redirection and expansion of the education program in some areas.

The estimated annual expenditure for the Public Education and Involvement is $17,000.

5.3.6 Storm System Inventory

Beginning in 2003, Public Works began an effort to collect and store geographic information in order to develop and maintain the City's storm system inventory mapping. Since then the City has continued to build and expand the mapping system information. The GIS based maps include the drainage system features showing pipes, structures, and stream drainages. The City staff conservatively estimate that they are 90% complete. The City continues to make recent improvements to the mapping, such as developing a numbering convention to allow easier information retrieval, making electronic application so that new or revised information obtained in the field can be fed directly into maintenance and mapping applications, and adding information that is needed for compliance with the NPDES permit. Examples of the required NPDES permit information is to map all known municipal separate storm sewer system outfalls (24-inch diameter or equivalent) and receiving waters and structural stormwater best management practices (BMPs) owned, operated, or maintained by the City.

The City will update the maps as improved field data becomes available and new systems come on line. This is a continual process and the City budgets for mapping updates each year.

The average annual expenditure between 2011 and 2013 was $46,000.

5.3.7 Illicit Discharge Detection and Elimination (IDDE)

The City's IDDE program is managed by the Public Works – Operation and Maintenance Divisions' designated lead for NPDES based programs. This person is also the City's IDDE community point-of-contact. The program is an ongoing program and was tailored to be in compliance with the NPDES permit, beginning in 2011. The program is intended to detect and remove illicit connections, discharges as defined in 40 CFR 122.26(b)(2) and improper disposal, including any spills not under the purview of another responding authority, into the municipal separate storm sewers owned or operated by the City.

The IDDE program is multi-faceted and is described in the following paragraphs. The main elements include;

- IDDE Related Mapping Support
- IDDE Ordinance adoption that prohibits illicit discharges,
- Ongoing IDD&E Program to detect and address non-stormwater discharges, spills, illicit connections and illegal dumping into the City of Monroe's municipal separate storm sewer system
- IDDE Related Public Information
- IDDE Program Evaluation and Assessment
- IDDE Training

IDDE Related Mapping Support

The City has ongoing GIS data collection procedures in place as previously discussed above. A portion of the mapping is tailored to comply with the NPDES permit. These include;

- Development of Municipal Separate Storm Sewer Map (see discussion above Storm System Inventory) – including all known municipal separate storm sewer system outfalls (24-inch diameter or equivalent) and receiving waters and structural stormwater best management practices (BMPs) owned, operated, or maintained by the City.
- Track and map of all connections to the municipal separate storm sewer system authorized or allowed by the City of Monroe after February 16, 2007. This is being done through a coordinated effort of Public Works Design and Construction Division and Operation and Maintenance Department.

IDD&E Ordinance

The City of Monroe implemented an ordinance to effectively prohibit non-stormwater, illegal discharges, and/or dumping into the City of Monroe's municipal separate storm sewer system to the maximum extent allowable under State and Federal law. The ordinance, MMC 13.34, was adopted in August of 2009. The ordinance prohibits several categories of non-stormwater discharges. For some non-stormwater discharges, the ordinance prohibits them unless certain stated conditions are met. Examples of the prohibited non-stormwater discharges include trash or debris, construction materials petroleum and automotive products (oils, gases, antifreeze, etc.). Examples of discharges allowed if certain conditions are met include discharges from potable water sources, including water line flushing, fire hydrant system flushing, and chlorinated swimming pool discharges if discharges are de-chlorinated to a concentration of 0.1 ppm or less (and pH-adjusted and reoxygenized if necessary).

Ongoing IDD&E Program:

The City of Monroe implemented an ongoing program prior to August 2011 to detect and address non-stormwater discharges, spills, illicit connections and illegal dumping into the City of Monroe's municipal separate storm sewer system. Key elements of the program are described below (refer to the City's Annual SWMP for more detailed information).

- Developed City procedures for locating priority areas likely to have illicit discharges, such as: evaluating land uses and associated business/industrial activities present; identifying areas where complaints have been registered in the past; and identifying areas with storage of large quantities of materials that could result in spills.
- Developed City procedures for field assessment activities, including visual dry weather inspection of priority outfalls identified as a part of the IDDE mapping described above.
- Developed City Procedures for characterizing the nature of, and potential public or environmental threat posed by, any illicit discharges found by or reported to the City. The City follows the "Reporting Discharges and Spills under the Municipal Stormwater NPDES Permits" FAQ Publication Number: 07-10-089 (Rev. 09/09).
- The IDDE program has a compliance objective to investigate (or referring to the appropriate agency) within 24 hours, on average, any complaints, reports or monitoring information that indicates a potential illicit discharge, spill, or illegal dumping; and immediately investigating (or referring) problems and violations determined to be emergencies or otherwise judged to be urgent or severe.
- Developed City Procedures for tracing the source of an illicit discharge; including visual inspections, and when necessary, opening manholes, using mobile cameras, collecting and analyzing water samples and/or other detailed inspection procedures.
- Developed City Procedures for removing the source of the discharge; including notification of appropriate authorities; notification of the property owner; technical assistance for eliminating the discharge; follow-up inspections; and escalating enforcement and legal actions if the discharge is not eliminated (consistent with the IDDE Ordinance).
- Developed ongoing training for public employees regarding the identification and notification of illicit discharges within the City.

Since 2009 the City has tracked reported illicit discharges. On average, there are 27 reported discharges (with an average of 13 reported by City maintenance crews, one by other agencies traveling through the City, and 13 by the public). The nature of the reported discharge is also tracked and examples include; paint, concrete wash, food waste, solvents, vehicle cleaning washwater, sewage, and automotive fluids.

The estimate average annual expenditure between 2011 and 2013 was $11,000.

IDDE Related Public Information

The City's IDDE public information strategies have been ongoing using a variety of techniques since 2011. The IDDE related public information campaign builds on the general public education and involvement described in Section SW 5.3.5 and targets the general public, homeowners, business owners and property managers with the intent to identify and correct illicit discharges. Some of which are highlighted below:

- Letters have been and continue to be distributed to residential areas and businesses within the City. Letters are written to address specific stormwater violations that occur within that area. The Stormwater Compliance Coordinator goes door-to-door and discusses the violation with each party involved and explains the "Do's and Dont's" associated with each situation. The coordinator also canvasses the surrounding neighborhoods. This gives the coordinator a chance to educate the citizenry on illicit discharge detection and elimination. Each letter has information about spills and illegal dumping and how to report them.
- The Stormwater Compliance Coordinator speaks with residents and visitors at two community events held annually. The two events are the Easter Egg Hunt and the National Night Out against Crime. The coordinator can speak with residents and business owners one on one about stormwater related issues and water quality concerns. IDDE materials are displayed in the stormwater booth at these events.
- The City coordinated with Snohomish County Surface Water to distribute 3,400 pet waste stickers to Monroe residents for placement on their garbage cans. The stickers identified those homes/businesses that properly dispose of their pet's waste.
- Billing inserts addressing issues relating to IDDE were inserted into water bills in the 2010, 2011 and in 2012. The flyer included information on pet waste, car washing and proper fertilization techniques (in English and Spanish).
- Information was placed on Channel 21(public access channel) including an ad requested citizens to contact the City of Monroe Hotline to report clogged storm drains, accidental spills or anyone illegally discharging waste into Monroe's stormwater system.
- The City has given away mutt mitt containers and has also placed mutt mitt dispensers on walkways and in City parks.
- An Eagle Scout Project in 2012 resulted in over four hundred storm drain markers being placed around the City.

A hotline for reporting illicit discharges and spills was established prior to February of 2009. The hotline was advertised on several media such as TV21, the City's local access channel as well as the Galaxy Theatre in Monroe for a year (totaling over 25,000 times). The spill hotline is also included in every letter that is hand delivered or hung on doors. The City keeps a record of calls received and follow-up actions taken in accordance. Complaint calls for spills and discharges are logged and responded to that same day. After hours, calls are routed to our Public Works Department, which has 24 hour staffing. They make the determination of who will respond, depending on the nature of the discharge. Actions requiring an ERTS number from Ecology (or that are sent to us via the ERTS system) are also tracked with this system.

IDDE Program Evaluation and Assessment:

The City of Monroe adopted and implements ongoing procedures for program evaluation and assessment, including tracking the number and type of spills or illicit discharges identified; inspections made; and any feedback received from public education efforts. This information is summarized in the City's Annual Stormwater Management Program Report in accordance with NPDES requirements.

IDDE Training:

The City of Monroe provided appropriate training for field staff on the identification and reporting of illicit discharges into the City's municipal separate storm sewer system. The City documents and maintains records of the training provided and the staff trained. For example, eighteen employees were trained to identify illicit discharges in 2012. The estimated annual expenditure was $2,000.

5.3.8 NPDES/Other Regulatory Compliance

The City's Phase II Permit Annual Report and its appendices are developed by the City's Public Works – Operation and Maintenance Division staff. The City completed its Annual Report and Stormwater Management Program in 2014, as required by its NPDES permit for the permit term August 1, 2013 to July 31, 2018. The Annual Report is intended to provide a written description of the City's Stormwater Management Program organized into the following categories; Public Education and Outreach, Public Involvement and Participation, Illicit Discharge and Detection Elimination, Controlling Runoff from New Development, Redevelopment, and Construction Sites, and Municipal Operations and Maintenance. One change from prior years in the reporting requirement is that the Annual Report is intended to describe the planned events of the coming year as opposed to accomplishments during the prior year. The average annual expenditure on reporting was estimated to be $11,000.

The Utility also engages in other activities in order to help comply with the NPDES Phase II requirements (a detailed description of these requirements is contained in Chapter SW 6). The City is required to train staff on various aspects of NPDES. The City must also perform inspection of private facilities approved after August 2009 and document these inspections.

The City also has an existing water quality sampling program to comply with the Total Maximum Daily Load (TMDL) requirements. As discussed in Chapter SW 4, a TMDL was issued for the Snohomish River Tributaries (Fecal Coliform), which affects the French Creek and Woods Creek watersheds in Monroe. In response to the TMDL requirements, the City implemented a sampling plan that includes an adequate number of sampling points and adequate sampling frequency to characterize the receiving water. The sampling sites include the following:

- Entrance to Al Borlin Park
- Eagles Park
- Lords Lake Outfall
- Cripple Creek at 179th Avenue SE
- French Creek downstream of SR-2
- Lake Tye Outfall
- Southwest Ditchline (East side of Fryelands Blvd. North of Lords Lake)
- Lake Tye Inlet

- Lake Tye Pump Station Ditch (inflow)

The locations of these sites are shown on Figure SW 4.2. These sites are sampled monthly. In addition, a Bacteria Pollution Control Plan (BPCP) was developed by the City in 2010. The goal of the BPCP was to reduce the amount of bacterial pollution in stormwater runoff through a variety of techniques including education, regulation, monitoring, and enforcement. Many of the recommended actions identified in the BPCP, including a pet waste ordinance, recommendations for enforcement strategies, and recommendations for education have been incorporated into the City's surface water management program. There are also some administrative reporting requirements for the City's TMDL program. The average annual expenditure on these supporting activities was estimated to be $30,000.

5.3.9 Coordination with other Agencies

The Design and Construction Division coordinates with other Snohomish County municipalities and with Snohomish County on a monthly basis to share information regarding the Phase II NPDES permit. There is ongoing coordination with Snohomish County and the Snohomish County Conservation District regarding efforts to improve fish habitat and obtain funding for fish habitat projects. A particular example is to obtain funding for fish habitat and passage improvements along Cripple Creek near the Intersection of SR 2 and Roosevelt Road SE.

Additional informal coordination with other agencies such as the Snohomish County, the Monroe Correctional Complex, and the Washington State Department of Transportation occur on an ongoing basis. Also, formal agency coordination related to stormwater and its impact on fish occurs with staff from the Mayor's office and that office's membership in the Snohomish Basin Salmon Recovery Forum.

This effort incurs an approximate annual expense of $2,800.

5.4 Program Support and Administration

Other departments or groups within the City support the Stormwater Management Utility. In a larger city, these services may be implemented by Utility staff. For Monroe, these services provided by other City departments and offices demonstrate the same level of successful coordination and communication that exists between the Design and Construction and Operations and Maintenance Divisions.

5.4.1 French Creek Assessment

The Stormwater Management Utility contributes funds to the French Slough Flood Control District of Snohomish County for the operation and maintenance of drainage facilities within the French Creek watershed. The City meets with the District about four times per year. The City provides input to the District's annual maintenance needs and budget. The City's contribution is generally about 38% of the District's total budget. In 2013, the City contributed $97,000 to the French Creek Assessment, but it can vary year to year between about $82,000 to $115,000.

5.4.2 Program Support and Financial Services

The Stormwater Management Utility pays for a portion of the City's operation costs in return for support services from groups and departments within the City such as Information Technology, Human Resources, Administration, Financial Services, Customer Service, and Custodial Services. The Stormwater Program also contributes to funds to maintain City Hall where the majority of the City departments and groups reside. The estimated annual average of the fees between 2012 and 2014 was $89,500.

5.5 Capital Improvements Program and Projects

The Stormwater Utility includes a capital improvement program element to make improvements to the system and/or solve stormwater utility problems. In addition, this program component is sometimes shared with other utility or road projects to fund the stormwater portion of a project. Examples of past projects constructed or supported by the Stormwater Utility include:

- Lewis and Stretch Street Project (stormwater portion)
- Hill Street Project (Kelsey St. to Madison St)(stormwater portion)
- South Kelsey St. Infiltration/Conveyance Improvement
- East Fremont Street Reconstruction Project (stormwater portion)
- North Blakeley Infiltration/Conveyance Project (stormwater portion) (under construction)
- Pike St. Sewer and Stormwater Separation (stormwater portion)

The average annual CIP is about $600,000 plus any grant funding, but can vary year to year.

5.6 Summary of Existing Stormwater Management Utility Program

The Stormwater Management Utility work is performed primarily by the Public Works Department staff with support from other City offices, utilities, and departments. Table SW 5-2 lists the Stormwater Utility Management Program elements and also presents an estimated cost and FTE per element for 2013. These estimates are based on FTE and wage estimates, Stormwater Management Utility budget information and also interviews with Public Works staff on their stormwater related work.

Table SW 5-2 2013 Stormwater Management Utility Estimated FTE and Costs by Program Element

Stormwater Program Element	Estimated 2013 FTE	Estimated 2013 Cost [1,2]
Public Works - Design and Construction Division Stormwater Services		
Management and Administration	1.50	$162,000
New Development and Plan Review (including inspections)	0.05	$5,000
Flood Hazard Planning, Monitoring and Response	0.00	$100[6]
Technical Assistance/Customer Service	0.13	$13,000
Public Works- Operations and Maintenance Division		
Cleaning;		
Repair and Replacement; CIP construction (less than $65,000	3.36	$335,000
in scope)	0.11	$10,000
Facility and Equipment Maintenance and Repair	-	$326,000
Management and Administration[3]	1.53	$169,000
Public Education and Involvement	0.17	$17,000
Stormwater System Inventory	0.47	$47,000
Illicit Discharge Detection and Elimination	0.11	$11,000
Reporting and Other NPDES/Regulatory Requirements[4]	0.40	$41,136
Coordination with other Agencies	0.03	$3,000
Program Support and Administration		
French Creek Assessment		$97,000
Program Support and Financial Services[5]		$89,000
Capital Improvements Program and Projects[7]		$600,000
Totals	7.9	$1,925,000

Notes
1) Rounded to nearest $1,000.
2) Estimate based on annual average over 3 yr period 2011-2013.
3) Cost includes maintenance crew administrative tasks, non-NPDES training, weather station, Director, Manager, Supervisor, and Administrative Assistant.
4) Cost includes NPDES OH activities, NPDES Stormwater Quality Monitoring, NPDES Facility Inspection, NPDES Training, TMDL Overhead and Sampling.
5) Cost includes Stormwater Utility share of IT and Administration Fees.
6) Cost for this activity has been minor in recent years.
7) Cost for CIP implementation varies year to year. $600,000 is the estimated average CIP.

Chapter SW 6 Regulatory Requirements

6.1 Introduction

Through the process of owning, operating, maintaining, and constructing the City's surface water management system, the City's Stormwater Management Utility is responsible for City programs that ensure compliance with a number of stormwater related local, state, and federal regulations. These regulations govern things such as the quality of surface water discharged, construction or other activities that affect aquatic habitat and endangered species, development within critical areas, and rules for participating in the flood insurance program. In some cases these rules apply because of construction activities the City conducts or regulates. In other cases these regulations apply because the Stormwater Management Utility serves as the owner and operator of the City's Municipal Separate Storm Sewer System (MS4).

The City of Monroe is located within Snohomish County and is surrounded by rural and agriculture lands of the unincorporated County. No other cities or jurisdictions are adjacent to the City's boundaries. The City coordinates with the County on NPDES, flooding, water quality, and fish habitat issues. City staff coordinates with agencies at the State level including the Department of Ecology (DOE) on activities related to WRIA 7 and NPDES permitting and with the Washington Department of Fish and Wildlife for Hydraulic Project Approval permits required for work in streams such as culvert replacements and channel restoration.

Lastly, City staff coordinates with agencies at the federal level on activities requiring United States Army Corps of Engineers Permits, specifically for work in wetlands that require a Clean Water Act Section 404 permit. There are additional federal regulations within the Clean Water Act and the National Flood Insurance Program that the City is required to follow. But DOE has been given permitting authority under the Clean Water Act and the Revised Code of Washington. As a result, the City coordinates directly with the Department of Ecology for several of these regulations.

This section summarizes the regulations, as well as the agency coordination required for the City's Stormwater Program.

6.2 City Ordinances and Regulations

This section provides an overview of the City's ordinances and regulations relevant to surface and stormwater management. The City's regulations are set forth in the Monroe Municipal Code.

6.2.1 Monroe Municipal Code 1.04-Enforcement

This City code establishes a method to enforce civil violations of the Monroe Municipal Code. The code has three escalating methods of enforcement, 1) voluntary correction, 2) notice of code violation, and 3) civil infraction. With respect to stormwater, this code provides enforcement of violations of any City ordinance.

6.2.2 Monroe Municipal Code 6.04-Nuisances

This City code covers a wide range of prohibited public nuisances including the pollution of public waters. Specifically the code prohibits "The pollution of any public well or cistern, stream, lake, canal or body of water by sewage, creamery or industrial wastes or other substances."

Abatement of nuisances defined in this code is enforced by the City through a City of Monroe police officer, health officer or building inspector. The offense can incur a misdemeanor charge and if a person or organization is found guilty, a fine up to $500 can be assessed.

6.2.3 Monroe Municipal Code 13.32-Stormwater Management Utility

The creation and purpose of the Stormwater Management Utility is documented in Monroe Municipal Code 13.32 (adopted in 1996). Creation of this utility provides the City the opportunity to manage and improve the collection of stormwater within the City and to protect public health and stormwater quality. The Utility allows for the collection of service charges and fees from Monroe residents to implement stormwater related activities such as a stormwater capital improvement program, stormwater operation and maintenance program, and meeting regulatory requirements of the Department of Ecology NPDES Phase II Permit.

Other items specified in this code include descriptions of the Stormwater Management Utility Fund, the Stormwater Management Utility's authority to establish and adjust rates and charges, limitation of liability, classification of property imperviousness, service charge exemptions, system development charge, and the annual review of charges and fees. The code (by Ordinance 015/2009) adopted the 2009 Stormwater System Plan.

The Stormwater Management Utility is administered by the City Engineer with assistance from the Public Works Department and the Finance Department staff.

6.2.4 Monroe Municipal Code 13.34-Illicit Discharge and Elimination

The purpose of this chapter is to provide for the health, safety, and general welfare of the City through the regulation of nonstormwater discharges to the stormwater drainage system. More specifically, this chapter was added to the City's municipal code in 2009 to comply with the NPDES permit requirements, and regulate the contribution of pollutants to the stormwater drainage system and prohibit illicit connections and discharges. It also establishes the legal authority to carry out inspections, surveillance and monitoring necessary to ensure compliance with this chapter (Ord. 013/2009 § 1).

The chapter includes definitions of illicit discharges. Examples include but are not limited to trash or debris, construction materials, petroleum products, antifreeze and other automotive products, metals in either particulate or dissolved form, paints, degreasers and/or solvents, drain cleaners, pesticides, herbicides, fertilizers, soaps and detergents, and swimming pool water (unless treated). The chapter also allows for conditional discharges. Examples of conditional discharges include potable water, including water from water line flushing and swimming pool discharge, provided that it is dechlorinated and pH-adjusted if necessary. Another example might include lawn watering and irrigation runoff.

The chapter includes enforcement, including penalties and remedies, by referencing chapter 1.04 of MMC.

6.2.5 Monroe Municipal Code 14.01-Flood Hazard Area Regulations

The flood hazard areas of Monroe are subject to periodic inundation that results in property damage, health and safety hazards, disruption of commerce and governmental services, extraordinary public expenditures for flood protection and relief, and impairment of the tax base. These flood losses are caused by the cumulative effect of obstructions in areas of special flood hazards that increase flood heights and velocities, and when inadequately anchored, damage uses in other areas. Uses that are inadequately flood proofed, elevated, or otherwise protected from flood damage also contribute to the flood loss. (Ord.004/2006 § 2; Ord. 021/2005 § 1; Ord. 006/2014) The purposes of this code are to:

1. Protect human life and health;
2. Minimize expenditure of public money and costly flood-control projects;
3. Minimize the need for rescue and relief efforts associated with flooding and generally undertaken at the expense of the general public;
4. Minimize prolonged business interruptions;
5. Minimize damage to public facilities and utilities such as water and gas mains, electric, telephone and sewer lines, streets, and bridges located in areas of special flood hazard;
6. Help maintain a stable tax base by providing for the sound use and development of areas of special flood hazard so as to minimize future flood blight areas;
7. Ensure that potential buyers are notified that property is in an area of special flood hazard; and
8. Ensure that those who occupy the areas of special flood hazard assume responsibility for their actions.

This code is administered by the City Engineer who has authority to grant or deny special flood hazard area development permits.

The code provides general standards for new development or substantial improvement in the floodplain. Some of the key standards include:

- Anchoring to prevent flotation.
- Specifying materials that are more resistant to flood damage.
- Requiring utilities to be designed to minimize infiltration from floodwater and avoid damage from floods.
- Requiring new residential construction or substantial improvement to elevate the lowest floor, including the basement one or more foot above the base flood elevation.
- Requirement that prevents encroachments into the floodway portion of the floodplain unless it can be demonstrated that the proposed encroachment will not result in any increase in flood levels.

6.2.6 Monroe Municipal Code 15.01-Stormwater Management

The purposes of this code are to:

1. Minimize water quality degradation and sedimentation in streams, ponds , lakes, wetlands, and other water bodies;
2. Minimize the impact of increased runoff, erosion and sedimentation caused by land development and maintenance practices;
3. Maintain and protect groundwater resources;
4. Minimize adverse impacts of alterations on ground and surface water quantities, locations and flow patterns;
5. Decrease potential landslide, flood and erosion damage to public and private property;
6. Promote site planning and construction practices that are consistent with natural topographical, vegetative, and hydrological conditions;

7. Maintain and protect the stormwater management infrastructure within the City and downstream;
8. Provide a means of regulating clearing and grading of private and public land while minimizing water quality impacts in order to protect public health and safety; and
9. Provide minimum development regulations and construction procedures which will preserve, replace or enhance, existing vegetation to preserve and enhance the natural qualities of lands, wetlands and water bodies (Ord. 1032, 1994).

In summary, this code outlines requirements for stormwater quality and quantity for new and redevelopment and details various erosion and sediment control requirements. The code was updated (Ordinance 009/2013), in part, to be in compliance with the then current NPDES permit. It established the minimum stormwater design standards for new development and redevelopment as the 2005 Stormwater Management Manual for Western Washington. It also promotes the use of low impact development techniques such as rain gardens, dispersion, and pervious pavement. The City Engineer is designated as the Administrator and is responsible for the general administration and coordination of this City code.

6.2.7 Monroe Municipal Code 15.02-Stormwater Maintenance

The purposes of this code are to:

1. Provide for inspection and maintenance of stormwater facilities in Monroe to provide for an effective, functional stormwater drainage system.
2. Authorize the City Engineer to require that stormwater facilities be operated, maintained and repaired in accordance with this chapter.
3. Establish the minimum level of compliance which must be met.
4. Guide and advise all who conduct inspection and maintenance of stormwater facilities (Ord. 1038, 1994).

This code states that property owners are responsible for the maintenance, operation or repair of stormwater drainage systems and BMPs. Property owners shall maintain, operate and repair these facilities in compliance with the requirements of Monroe Municipal Code 15.02 and the DOE Stormwater Manual. This City code outlines maintenance requirements for all stormwater facilities within the City to be maintained according to the most recent version DOE Stormwater Manual (Ord. 1038, 1994). The City Engineer is designated as the Administrator and is responsible for the general administration and coordination of this code section.

6.2.8 Monroe Municipal Code 19.01-Shoreline Master Program

This code adopts the Shoreline Master Program. The purpose of this code is to protect the shorelines within the City. In Monroe, the Skykomish River is identified as a Shoreline of the Statewide Significance. Preference is, therefore, given to the following uses in descending order of priority for shorelines of statewide significance (as established by RCW 90.58.020):

1. Recognize and protect the statewide interest over local interest for shorelines of statewide significance.
2. Preserve the natural character of the shorelines.
3. Result in long-term over short-term benefits.
4. Protect the resources and ecology of the shorelines.
5. Increase public access to publicly owned areas of the shorelines
6. Increase recreational opportunities for the public in the shoreline.

Approximately three miles of shoreline in the City are under the jurisdiction of the Shoreline Management Act of 1971. In addition to the Skykomish River, the Shoreline Master Program also outlines regulations related to the shorelines of Woods Creek and the City's Lake Tye detention pond.

The Director of Community Development enforces the regulations set forth in this code and may delegate enforcement responsibilities to other City officials and staff.

6.2.9 Monroe Municipal Code 20.05-Critical Areas Ordinance

The purposes of this code are to:

1. Protect the public health, safety and welfare by preventing adverse impacts of development;
2. Preserve and protect critical areas as identified by the Washington State Growth Management Act by regulating development within and adjacent to them;
3. Mitigate unavoidable impacts to critical areas by regulating alterations in and adjacent to critical areas;
4. Prevent adverse cumulative impacts to wetlands, streams, shoreline environments, and fish and wildlife habitat;
5. Protect the public resources and facilities from injury, loss of life, property damage, or financial loss due to flooding , erosion, landsides, soils subsidence or steep slope failure;
6. Implement the goals, policies, guidelines and requirements of the city of Monroe comprehensive plan and the Washington State Growth Management Act (Ord. 019/2003).

This code includes regulations that apply to geologic hazards, habitat conservation, and wetlands. The Director of Community Development enforces the regulations set forth in this code and may delegate enforcement responsibilities to other City officials and staff.

6.2.10 Monroe Municipal Code 20.08-Land Clearing and Forest Practices

The purposes of this code are to:

1. Promote the public health, safety and general welfare of the citizens of Monroe;
2. Implement the policies of the State Environment Policy Act;
3. Implement the policies of the state Forest Practices Act pursuant to Chapter 76.09 RCW and Chapter 222-20 WAC;
4. Implement to the goals and policies of the City's Comprehensive Plan; and
5. Comply with all municipal code requirements and public works standards including, but not limited to, erosion control, stormwater, and critical areas protection (Ord. 004/2009).

The Director of Community Development enforces the regulations set forth in this code and may delegate enforcement responsibilities to other City officials and staff. The code specifies application for land clearing requirements, exemptions, and performance standards. It references the critical areas code for special requirements on land clearing and tree cutting in critical areas and critical area buffers.

6.2.11 City of Monroe Comprehensive Plan

The first City of Monroe Comprehensive Plan was developed in 1994 to meet the requirements of the State Growth Management Act. The City's Comprehensive Plan and development regulations are updated at least every five years, pursuant to RCW 36.70A.130, using "best available science" (RCW 36.70A.172). The most recent version is a 20-year plan approved in 2005. This 2005-2025 Comprehensive Plan is the required ten-year update to previous amended versions. It contains the mandatory elements of land use, housing, capital facilities, utilities, and transportation, as well as, four optional elements including natural environment, economic development, parks and recreation, and shoreline management. The plan incorporates a number of goals and objectives relevant to surface water resources. The City's Comprehensive Plan allows for some expansion of the urban growth area and also rezone some portions of the City with a higher density. Greater development densities may result in higher percentages of impervious area, which when unabated can impact water quality, fish habitat, and the rate and volume of runoff.

The City is now in the process of updating the 2005-2025 Comprehensive Plan. This update to the Stormwater System Plan will provide supportive documentation to the Comprehensive Plan update. The identification of capital and program needs included in this document will form the foundation for the stormwater component of the Comprehensive Plan update.

6.3 State Regulations

6.3.1 RCW 43.21C-State Environmental Policy Act

Modeled after the National Environmental Policy Act, the State Environmental Policy Act requires the identification and evaluation of probable impacts of activities for all elements of the environment. The State Environmental Policy Act rules (Chapter 197.11 WAC) became effective in April 1984.

State Environmental Policy Act review occurs in tandem with other agency processes. It is required for all nonexempt construction, demolition, landfills, comprehensive plans, zoning, and development regulations that are licensed, funded, or approved by a government agency. Any nonexempt governmental action—at any level—may be conditioned or denied pursuant to State Environmental Policy Act (RCW 43.21C.060).

6.3.2 RCW 77.55-Hydraulic Code

The Washington Department of Fish and Wildlife (WDFW) requires a Hydraulic Project Approval for construction activities that use, divert, obstruct, or change the natural flow or bed of any waters of the state. The purpose of the requirements, which are administered through the Hydraulic Project Approval permit process, is to protect fish habitat in stream channels, to prevent erosion, and to protect freshwater and near shore marine aquatic life. Any construction activity such as bridge painting, channel improvements, stream restoration, or culvert replacements within the ordinary high water mark of any stream would fall under the Hydraulic Project Approval permit requirements. Flood-damage repair and prevention activities may be permitted as a five-year plan, avoiding the need to permit each individual activity.

A Hydraulic Project Approval is applied for by submitting a Joint Aquatic Resource Permit Application (JARPA) to WDFW. This is the same form that can be submitted for permits from Department of Ecology, the US Army Corps of Engineers, and the Department of Natural

Resources. After a 45-day review period (provided SEPA compliance is complete), WDFW will approve, deny, or condition the permit. WDFW generally may require modifications to plans and specifications that avoids or compensates for project impacts on fish ecology. Possible modifications include, but are not limited to:

- Making a culvert fish passable (includes consideration of 95 and 10 percent exceedance flows, minimum flow depth, and increasing the width of the culvert so that its similar to the stream width);
- Providing large woody debris in a stream channel;
- Specifying construction practices that prevent entry of construction materials into the watercourse;
- Specifying bed material, construction methods, construction period, riparian vegetation, and any required mitigation.

If it is more cost-effective, the applicant may perform off-site mitigation, provided it would generate equal or greater biological functions and values compared to on-site mitigation.

6.3.3 RCW 86.16-Washington Floodplain Management

Chapter 86.16 RCW Floodplain Management establishes statewide authority through regulations promulgated by the Washington State Department of Ecology (Ecology) for coordinating the floodplain management regulation elements of the National Flood Insurance Program. Under Chapter 173-158 WAC, Ecology requires local governments to adopt and administer regulatory programs compliant with the minimum standards of the National Flood Insurance Program (NFIP). Ecology provides technical assistance to local governments for both identifying the location of the 100-year (base) floodplain and in administering their floodplain management ordinances.

Ecology also establishes land management criteria in the base floodplain area by adopting the federal standards and definitions contained in 44 CFR, Parts 59 and 60, as minimum state standards. Ecology has approval authority over local floodplain management ordinances. Federal regulations allow residential and nonresidential development in the floodplain if the proponent demonstrates that the project is constructed to be one foot above the 100-year base flood elevation as determined by a flood insurance study. Ecology will disapprove an ordinance if minimum federal criteria for enrollment in NFIP or state regulations on development in the floodplain are not met. State regulations allow only for repair or reconstruction of existing residential structures within the floodplain that do not increase the ground floor area and that cost less than 50 percent of the market value of the existing structure. The floodplain mapping for the City is contained in the Flood Insurance Study for Snohomish County, Washington and Incorporated Areas, dated September 16, 2005, together with any map revisions.
The City participates in the Community Rating System (CRS), and as a result it receives discounts on flood insurance. Engaging in the following activities gives the City CRS credits:

- Maintaining elevation certificates on all new and substantially improved buildings in the Special Flood Hazard Area.
- Maintaining elevation certificate data in computer format.
- Making copies of elevation certificates on newer properties available at the CRS Coordinator’s office.

- Providing information on Flood Insurance Rate Maps (FIRMs) and the flood insurance purchase requirement to inquirers and publishing a document that tells lenders, insurance agents, and real estate agents.
- Informing insurance agents about the availability of flood certificates.
- Keeping a log of FIRM requests and responses.
- Keeping the City's FIRM updated and maintaining old copies of the FIRM.
- Maintaining flood protection materials in the public library.
- Enforcing the floodplain management provisions of municipal zoning, subdivision, and building code ordinances.
- Enforcing the current municipal building code.
- Using and updating the City's digital mapping system.
- Maintaining the City's elevation reference marks.
- Enforcing the stormwater management provisions of municipal zoning, subdivision, and building code ordinances for new developments in the watershed.
- Enforcing the requirement that all new buildings must be elevated above the street or otherwise protected from drainage problems.
- Implementing the City's drainage system maintenance program.
- Performing inspections and subsequent maintenance if warranted.
- Enforcing the City's stream dumping regulations.

As noted in Section SW 5.2.3, by participating in the Community Rating System, the City is able to earn discounts on flood insurance for its residents with homes in the flood hazard areas. As of May 2013, the City achieved a Class rating of 5 in the CRS, which provides a 25 percent reduction in rates for its resident flood insurance policy holders residing in flood hazard areas.

Recent legal decisions affect FEMA's administration of the NFIP in Washington State and thereby affect Ecology's implementation of this program as well.

In response to a 2004 federal court order, the National Oceanic and Atmospheric Administration, Department of Fisheries (NOAA Fisheries) released a biological opinion in September 2008 addressing the effects of FEMA's continued administration of the NFIP throughout the Puget Sound region. NOAA Fisheries determined the existing NFIP and CRS need revision in order to avoid violating the Endangered Species Act (ESA) when authorizing development in the floodplain. In its Biological Opinion, NOAA Fisheries determined that current floodplain development regulations can impact critical habitat for ESA listed salmon and Southern Resident killer whales. FEMA issued guidance to local jurisdictions in 2010, which includes a model ordinance that incorporates a simple and direct set of rules to protect human development from floods while minimizing the impacts of new construction and redevelopment on aquatic and riparian habitat. Jurisdictions had until September 2011 to adopt the model ordinance or an equivalent ordinance. To achieve compliance, the City will review projects requiring building and/or construction permits, land use actions or environmental review within the designated floodplain on an individual basis. The applicant will need to either provide a habitat assessment that shows the proposed project will not have adverse effect on endangered species or the applicant must provide concurrence from the NOAA Fisheries that the project complies with ESA.

6.3.4 Growth Management Act

Enacted on July 1, 1990, the Growth Management Act is intended to manage growth in Washington's fastest-growing counties through the adoption of local comprehensive land use plans and development regulations. A 1995 Growth Management Act amendment requires all counties and cities in Washington to include the best available science in developing policies and development regulations to protect the functions and values of critical areas.

The standard for all plans consists of 13 advisory goals aimed solely at guiding the development of local comprehensive plans. These advisory goals include encouraging urban growth where reasonable, reducing urban sprawl, encouraging efficient transportation systems based on regional priorities, encouraging the availability and variety of affordable housing, encouraging the retention of open space and recreational opportunities, and protecting the environment.

The City of Monroe Comprehensive Plan was developed to meet the requirements of the State Growth Management Act.

6.3.5 Shoreline Management Act

Washington's Shoreline Management Act was adopted in a 1972 referendum "to prevent the inherent harm in an uncoordinated and piecemeal development of the state's shorelines." The Shoreline Management Act has three broad policies:

1. Encourage water-dependent uses: "uses shall be preferred which are consistent with control of pollution and prevention of damage to the natural environment, or are unique to or dependent upon use of the states' shorelines..."
2. Protect shoreline natural resources, including "...the land and its vegetation and wildlife, and the water of the state and their aquatic life..."
3. Promote public access: "the public's opportunity to enjoy the physical and aesthetic qualities of natural shorelines of the state shall be preserved to the greatest extent feasible consistent with the overall best interest of the state and the people generally."

Ecology provides technical assistance, and reviews and approves local master programs and permit decisions, but the State Shoreline Management Act is administered through a cooperative program between local governments and Ecology. For Monroe, the State Shoreline Management Act is implemented locally by Monroe Municipal Code 19.01. The City has developed its Shoreline Master Program to regulate development along larger streams, lakes, and marine waters. The City administers its Shoreline Substantial Development, Shoreline Conditional Use, and/or Shoreline Variance Permit to help meet the requirements of the State Shoreline Management Act and Monroe Municipal Code 19.01. The Shoreline Management Act includes emphasis on public participation in developing local shoreline programs and in the local permit process.

6.3.6 RCW 90.48.260 and State Implementation of Clean Water Act

The federal Clean Water Act was passed in 1972 "to restore the chemical, physical, and biological integrity of the Nation's water" (33 USC 1251 [a]). There are four sections of this legislation that affect the City's stormwater management program:

- Section 303(d)
- Section 401

- Section 402-NPDES
- Section 404

Washington State has been granted NPDES permitting authority by the EPA and administers the Clean Water Act through regulations promulgated by Ecology for Sections 303(d), 401 and 402 (RCW 90.48.260). These three sections, which the state administers using the same designations as federal, are described in further detail below. Section 404 is described under the Federal Regulations. See Section SW 6.4.2.

Section 303(d)

Section 303(d) (33 USC 1313 [d]) requires states to periodically compose a list of water quality-limited water bodies. Waters on this list require a Total Maximum Daily Load (TMDL) study, i.e. a study that determines the allowable pollutant loading for the receiving waters for the water quality parameter causing the water quality impairment. It is the responsibility of the State to perform the TMDL studies. A TMDL was issued for the Snohomish River Tributaries (Fecal Coliform), which affects the French Creek and Woods Creek watersheds in Monroe.
Other than the TMDL for the Snohomish River Tributaries, waters on the 303(d) list are prioritized for future TMDL studies. For the City, a segment of the Skykomish River adjacent to the south eastern border of the City is on the 2012 303(d) list for temperature and dissolved oxygen; French Creek is on the 2012 303(d) for dissolved oxygen and pH; and Woods Creek is on the TMDL 303(d) list for dissolved oxygen.

Section 401

Section 401 of the Clean Water Act requires that applicants receiving a Section 404 permit from the U.S. Army Corp of Engineers first receive certification from the State that the proposed project will meet state water quality standards and other aquatic protection regulations. In Washington, applicants are required to obtain the Section 401 water quality certification from the Department of Ecology. The 401 Certification can cover both the construction and operation of the proposed project. Any conditions of Ecology's certification become conditions of the federal Section 404 permit. The federal agency cannot issue its permit until the certification is approved, conditioned, or waived by the State. If the State denies a certification, the federal agency cannot issue a permit for the project.

Section 402 – National Pollutant Discharge Elimination System

Section 402 of the Clean Water Act states that pollutants may not be discharged directly to surface waters unless this is done under a National Pollutant Discharge Elimination System (NPDES) permit. In Washington, authority to issue permits and oversee compliance has been delegated to Ecology by the EPA. Ecology asserts requirements and a schedule for compliance. The compliance schedule is never longer than the term of the permit. Permits are supposed to be renewed at least every five years, but Ecology is responsible for writing new permits.

The NPDES program, as it relates to precipitation-induced runoff (considered a point source), provides permits for three types of activities:

- Industrial Activities.
- Operating a Municipal Separate Storm Sewer System (MS4).
- Construction Activities.

Individual Permits can be issued for these activities when there are unique situations that demand this approach. A General Permit covers a group of dischargers that have similar characteristics. Facilities that wish to be covered under a General Permit must submit a Notice of Intent (NOI) to comply with the general permit requirements. Ecology has issued NPDES stormwater general permits for MS4s, industrial activities, and construction activities.

MS4 permits "require controls to reduce the discharge of pollutants to the maximum extent practicable (MEP)." There are no numerical effluent limits, and the EPA does not provide an operational definition of MEP. However, there are several tangible requirements. First, cities must employ best management practices (BMPs). Second, cities are required to develop a strategic plan for reducing the pollutant loadings generated by various land uses. Third, they are required to ensure that no non-stormwater discharges are connected to their system. Fourth, they are required to develop a program to reduce pollution generated by new development.

Permittees are required to report any permit violations to Ecology. Ecology carries out enforcement actions. Enforcement actions can include fines and imprisonment. Permit violators can also be sued by private citizens. Ecology tries to assist permittees in becoming compliant before exercising punitive actions.

In Washington State, the Phase I NPDES MS4 permit covers unincorporated areas of King, Snohomish, Pierce, and Clark counties; Seattle; Tacoma; and the Washington State Department of Transportation (WSDOT). The Phase II Municipal Stormwater Permit rule extends the coverage of the NPDES program to certain "small" MS4s, including the City of Monroe. According to the general permit, Phase II communities are jurisdictions that:

- Own and operate a MS4.
- Discharge to surface waters.
- Are located in urbanized areas.
- Have a population greater than 1,000.

According to Ecology, 104 communities, including Monroe, qualify under these criteria and therefore need to apply for Phase II stormwater permit coverage. The Phase II federal regulations establish minimum requirements for the scope of the permits and content of the related stormwater management program to be developed by each permittee.

The Phase II permit requires activities for permit compliance that fall into six categories:

- Public Education Outreach Involvement and Participation.
- Illicit Discharge Detection and Elimination.
- Controlling Runoff from New development, Redevelopment, and Construction Sites.
- Pollution Prevention and Operation and Maintenance (O&M) for Municipal Operations.
- Stormwater Monitoring.
- Reporting and Recordkeeping.

Up until August 31, 2012, the City was covered under Ecology's initial NPDES Phase II permit that was issued in January 2007 and subsequently amended in 2009. Ecology issued an extension of that permit to be effective from August 1, 2012 to August 1, 2013. At the same time, Ecology also issued a new 5 year permit to be effective on August 1, 2013. It also issued an updated 2012 Ecology Stormwater Management Manual for Western Washington (2012 Ecology Manual or 2012 SWMMWW) which contains stormwater control requirements for new development, redevelopment, and construction sites. The new 2013-2018 Permit retains the first Permit's SWMP structure and phased implementation approach. It continues and builds upon the first Permits Program requirements by increasing certain Permit requirements and adding new ones.

Following issuance of the 2013-2018 permit, several parties including municipal jurisdictions, appealed the permit for a variety of reasons. The appeals were reviewed by the State of Washington Pollution Control Hearing Board (PCHB). Following the ruling by the PCHB, Ecology issued draft revisions on to the 2013-2018 permit (on August 6, 2014) which underwent a public review and comment period. The resulting modifications were issued on December 17, 2014 and became effective on January 16, 2015. In addition, Ecology issued modifications to the 2012 SWMMWW (now referred to as the 2014 SWMMWW).

The following paragraphs, organized by category, summarizes the activities required under the prior Phase II NPDES MS4 permit and formed the basis for the City's NPDES program through 2012. Following this discussion is a description of the key changes in the 2013-2018 permit issued on August 1, 2013. Following this discussion is a brief summary of modifications to the 2013 permit that became effective on January 16, 2015.

Summary of NPDES Phase II Requirements (for permit through 2012)
Public Education, Outreach, Involvement, and Participation

- Implement or participate in an education and outreach program to target audiences. Follow up by measuring understanding and adoption of behaviors by target audiences.
- Create opportunities for public involvement and participation in program decision-making, including:
    - Providing opportunities for public involvement in the development, implementation, and updating of the stormwater management plan.
    - Post an annual report on the City's website (to be updated every year).

Illicit Discharge Detection and Elimination

- Develop and maintain a municipal storm sewer map, including:
    - All known outfalls.
    - All known structural BMPs owned, maintained, and operated by the City.
    - All tributary conveyances (including type, material, and size) and associated drainage areas and land use for outfalls greater than 24 inches in diameter.
    - Geographic areas that do not discharge to surface waters.
    - All connections to the system that are authorized/allowed by the City after February 16, 2007.

    Establish an ordinance prohibiting non-stormwater connections to the MS4 and illegal discharges into the MS4.
- Inform employees and the public about illicit discharges and improper waste disposal. Develop a hotline for public reporting of spills and illicit discharges as well as keep a record of calls and follow-up actions.

- Complete the following activities directed at detecting and addressing non-stormwater discharges, including spills and illicit connections into the MS4.
  - Acquire procedures for locating illicit discharges in priority areas.
  - Conduct field assessment activities for the purposes of verifying outfall locations, identifying previously unknown outfalls, and detecting illicit discharges.
  - Prioritize receiving waters for visual inspection.
  - Conduct field assessment of three high-priority water bodies in 2011, then inspect one high priority water body each subsequent year.
  - Acquire procedures for characterizing the potential public or environmental threat posed by an illicit discharge.
  - Acquire procedures for tracing and removing the source of an illicit discharge.
  - Establish and implement a training program for all field staff that includes identifying who is responsible for identifying, reporting, and cleaning up illicit discharges.

New Development, Redevelopment, and Construction Sites Pollution-Reduction Program

- Establish an ordinance or permitting process which includes:
  - Minimum requirements and technical thresholds, as approved by Ecology.
  - Plan review, inspection, and enforcement capability.
  - Provisions for ongoing annual inspections and other long-term O&M.
- Train staff responsible for implementing the program.

O&M

- Establish maintenance standards equal to or better than those in the 2005 Ecology Manual, Volume 5, Chapter 4.
- Perform annual inspection and maintenance of City-owned treatment and flow-control facilities (not including catch basins).
- Spot-check potentially damaged permanent treatment and flow-control facilities (not including catch basins) after major storm events.
- Inspect all City-owned catch basins and inlets once during the permit term.
- Implement activities to reduce stormwater impacts of City activities such as:
  - Pipe cleaning.
  - Cleaning of culverts in ditch systems.
  - Ditch maintenance.
  - Street cleaning.
  - Road repair and resurfacing.
  - Pavement grinding.
  - Snow and ice control.
  - Utility installation.
  - Pavement striping maintenance.
  - Roadside area maintenance.
  - Dust control.
- Implement policies and practices to reduce pollutants in discharges from City-owned or -maintained land. The following issues should be addressed:

- Fertilizer, pesticide, and herbicide application.
- A nutrient management plan.
- Sediment and erosion control.
- Pest management.
- Landscape maintenance and vegetation disposal.
- Trash management.
- Building exterior cleaning and maintenance.

▪ Start an ongoing training program for City employees whose construction, operations, or maintenance job functions may impact stormwater quality.

▪ Make a Stormwater Pollution Prevention Plan for heavy equipment maintenance/storage yards and material storage yards which are owned or operated by the City and are not covered under the Industrial Stormwater General Permit.

▪ Maintain records of inspection, maintenance, and repair per the reporting requirements section of the permit.

Stormwater Monitoring

▪ Identify three outfalls or conveyances where monitoring could be conducted – one from commercial land use, one from high-density residential land use, and one from industrial land use.
▪ Identify two suitable effectiveness questions and select two sites for monitoring sites and develop monitoring plans that address these questions.

Reporting and Recordkeeping

▪ Make a stormwater management plan (SWMP) and update it annually. The SWMP shall:

  - Describe each of the permit program components according to the specified schedules.
  - Maintain information to evaluate permit compliance and the SWMP.
  - Include a set of actions and activities that reduce the discharge of pollutants to an MEP (maximum extent practicable) standard, meet state AKART (all known and reasonable technologies) requirements, and protect water quality.

▪ Submit an annual report to Ecology. This report shall contain:

  - A copy of the current SWMP.
  - The Annual Report form (Appendix 3 to the permit).
  - The status of sites identified for stormwater and effectiveness monitoring (2011 only).
  - Records of activities for all program components, including public education and outreach activities, as well as inspections and enforcement actions.
  - Include in March 31, 2011 Annual Report:

    ▪ A summary of identified barriers to use low impact development (LID) and measures to address those barriers. Information on LID practices, including LID currently available and that can reasonably be implemented within permit term; potential or planned non-structural actions to prevent stormwater impacts; goals and metrics to identify, promote, and measure LID use; and potential or planned schedules for the permittee to require and implement the non-structural and LID techniques on a broader scale in the future.

▪ Allow public access to the SWMP and all records related to this permit.

To comply with the initial NPDES Phase II permit that was issued in 2007, the City made significant changes to its program in 2008, which involved increasing maintenance and engineering staff as described in the 2009 Stormwater System Plan. Like the initial permit, the new permit beginning in 2013 will be phased in over the permit term. The new permit is anticipated to include greater requirements for the protection of water quality. The following paragraphs provide a description of key permit changes relevant to the City. Section SW 6.5 includes a discussion of how these changes will increase the needs for maintenance and engineering staffing requirements.

Summary of Key Changes (from 2012 permit to new permit that began in August 2013)

Reporting. The new permit requires that the SWMP be written to inform the public of planned SWMP activities for the coming year that address program components in Permit Section S5.A.2. Previous SWMP reports described accomplishments in the prior year.

Internal Coordination and Reporting. Ecology added the requirement for permittees to include coordination among departments within the City to eliminate barriers to compliance with the terms of the permit. In addition, the annual report shall include written description of internal coordination mechanisms by March 31, 2015.

Public Education and Outreach. The new permit proposes requirements that call for continued educational activities that include public participation in stewardship activities for target audiences. These requirements focus on stormwater problems and providing specific actions they can be followed to minimize those problems. This new educational effort would target a priority audience that includes school age children, businesses, engineers, contractors, developers and land use planners. Permittees shall provide opportunities that encourage residents to participate in stewardship activities such as stream teams, storm drain marking, volunteer monitoring and riparian plantings.

Measuring Targeted Behaviors. The new permit requires the measurement of understanding and adoption of the targeted behaviors for at least one target audience in at least one subject area. Resulting measurements shall be used to direct education and outreach resources most effectively.

Public Involvement and Participation. Permittees will be required to post on their website the SWMP Plan and Annual Report. In addition, all other submittals must now be made available to the public upon request.

System Mapping. The requirement for mapping is similar to the previous permit, but now includes more specific requirements for clarity such as mapping of treatment and flow control BMPs/facilities, tributary conveyance mapping of outfalls 24-inch in diameter or greater (including land use). Permittees must make available to Ecology, and federally recognized Indian Tribes upon request, mapping data provided the request doesn't conflict with national security and directives. Permittees are required to update the system map on a regular basis.

Illicit Discharges. The new permit adds hot tubs and spas to its list of conditionally allowable discharges and requires any discharge from dechlorinated pools, spas and hot tubs to be thermally controlled prior to discharge. It has also added language to require permittees to implement a "compliance strategy" that includes various steps in addition to enforcement that permittees may use to achieve compliance with the local illicit discharge and detection elimination (IDDE) code. The compliance strategies include application of operational and/or source control BMPs for pollutant generating sources associated with existing land uses and activities to prevent illicit discharges and maintenance of stormwater facilities which discharge into the Permittee's MS4. The source control BMP shall be based on those source control BMPs found in Volume IV of the 2012 Stormwater Management Manual for Western Washington (now 2014 SWMMWW) or an equivalent manual. These compliance strategies will require the City to update is code relative to illicit discharges by February 2, 2018. The new permit requires Permittees to complete field screening for illicit discharges for at least 40% of the MS4 no later than December 31, 2017 and average 12% each year thereafter. Permittees are required to conduct ongoing training for all municipal staff who, as part of their normal job responsibilities, might come in contact or observe an illicit discharge and implement an ongoing program designed to address illicit discharges (S5.C.3.c).

Drainage Standards for Controlling Runoff from New Development, Redevelopment and Construction Sites. The new permit requires Permittees to update and adopt into City codes and City stormwater design manuals that are equivalent to the 2012 DOE Stormwater Manual (now 2014 SWMMWW) that applies the requirements for new development, redevelopment and construction sites. The City will need to update its drainage code to reference the updated Ecology manual by December 31, 2016.

Inspection of private stormwater treatment and flow control BMPs. To verify adequate long term maintenance, annual inspections are required by the City (S5.C.4.c). The City will need to keep records of inspections and enforcement actions (S5.C.4.c). Whereas, under the initial 2007 permit, the City was only required to inspect projects in excess of one acre, the current permit requires inspections for all projects permitted by the City. With the added types of LID BMPs, these new requirements will require greater effort by the City. A separate inspection frequency is required for residential subdivisions. Due to the tendency for residential subdivision construction activities to extent over long periods of time, more frequent inspections are required. Inspections are required every 6 months until 90 percent of the lots are constructed (S5.C.4.c).

LID requirements. Low Impact Development (LID) is a stormwater and land use management strategy that strives to mimic pre-disturbance hydrologic processes of infiltration, filtration, storage, evaporation and transpiration by emphasizing conservation, use of on-site natural features, site planning, and distributed stormwater management practices that are integrated into a project design. The new permit distinguishes between LID BMPs and LID principles in the permit language, as follows;

- **LID Best Management Practices:** Distributed stormwater management practices, integrated into a project design, that emphasize pre-disturbance hydrologic processes of infiltration, filtration, storage, evaporation and transpiration. LID BMPs include, but are not limited to, bioretention/rain gardens, permeable pavements, roof downspout controls, dispersion, soil quality and depth, vegetated roofs, minimum excavation foundations, and water re-use.
- **LID principles:** Land use management strategies that emphasize conservation, use of on-site natural features, and site planning to minimize impervious surfaces, native vegetation loss, and stormwater runoff.

By highlighting the difference in the new permit (S5.C.4.f), Ecology wanted to emphasize that permittees need to amend stormwater and land use codes, rules, standards, and other enforceable documents as necessary to apply both LID BMPs and LID principles along with new LID standards for development and redevelopment. The intent of the revisions is to make LID the preferred and commonly-used approach to site development. This will likely be difficult for the City, which generally has conditions that are unfavorable for LID.

The new permit also includes significant updates to the LID BMP requirements (within Minimum Requirement #5 in Appendix 1 of the permit) for new development and redevelopment. The requirements are categorized for small projects and large projects. Large projects are generally those that result in 5,000 square feet of new and/or replace hard surfaces (e.g., roofs, pavement, and pervious pavement). Both sets of requirements identify a list of preferred BMPs for three types of surfaces: lawn/landscape areas, roof areas/ and other hard surfaces. The BMPs are prioritized and the project applicant must use the highest preferred BMP for each surface that is feasible for their site. The main difference between the two lists is that the small projects can use rain gardens, while large projects must use bioretention. Bioretention is required for large projects because their long-term performance can be more reasonably predicted and relied upon and this is necessary for projects that need to meet the full range of treatment/flow control requirements.

Watershed Scale Planning: The new permit has added a new requirement for watershed scale planning in areas where impending growth threatens high-value habitat or water resources. The primary objective of the planning would be to identify whether and how the watershed could accommodate the planned growth and still maintain the beneficial uses of the watershed's surface waters. The proposed watershed planning process directs the affected Phase I and Phase II permittees to use their land use management authorities to develop plans that can more comprehensively address the impacts of urbanization. The permit will require some Phase II permittees to participate with Phase I permittees in the watershed planning process (S5.C.4.g). Phase II entities would need to provide information for conducting the necessary analyses, and must participate in the development of strategies to meet the planning objectives. The Phase I permit lists 14 watersheds to be studied. Snohomish County is planning to use Little Bear Creek as its Phase 1 watershed planning basin which is south and west of the City's watersheds so that this requirement will not affect the City.

Maintenance Standards: The new permit requires maintenance standards to be updated and be consistent with those in the 2012 Stormwater Management Manual for Western Washington (now 2014 SWMMWW) (S5.C.5a).

Inspection Requirements: The new permit requires annual inspection of all municipally owned or operated permanent stormwater treatment and flow control BMPs/facilities. Permittees may reduce the inspection frequency based on the evaluation of maintenance records of double the length of time of the proposed inspection frequency (i.e., if the City proposes to inspect a facility every 3 years, it shall be based on the evaluations of six years of data). Inspection of all catch basins and inlets owned or operated by the Permittee are required at least once every two years. The catch basin inspection schedule of every two years may be extended to four years based on maintenance records.

TMDLs. Under the new permit, Ecology identifies (in Appendix 2 of the permit) all TMDLs in Western Washington that have requirements that would not already be addressed by the general requirements found in the permit. That is, if a prior TMDL was not listed in Appendix 2, Ecology presumes that the new permit fully addresses the requirements of the TMDL. For the City, the TMDL for the Snohomish River Tributaries (Fecal Coliform) is still listed in Appendix 2 of the permit. In Appendix 2, it describes where the TMDL applies, and the actions required. Of the several Snohomish County Tributaries listed, the watersheds within the City include French Creek and Woods Creek. This list of actions includes:

- Business Inspections. Permittee inspect commercial animal handling areas and commercial composting facilities to ensure implementation of source control BMPs for bacteria. All qualifying facilities shall be inspected by August 1, 2016. Permittees shall also implement an ongoing inspection program to re-inspect facilities with bacteria source control problems a minimum of every three years.
- Public Education and Outreach: Permittee shall conduct public education and outreach activities to increase awareness of bacterial pollution problems and promote proper pet waste management behavior.
- Operations & Maintenance: Permittee shall install and maintain animal waste collection and/or education stations at municipal parks and other Permittee owned and operated lands reasonably expected to have substantial domestic animal (dog and horse) use and the potential for pollution of stormwater.
- IDDE: Permittee conducting IDDE-related field screening shall screen for bacteria sources in any screened MS4 subbasins which discharge to surface waters in the TMDL area.
- Targeted Source Identification & Elimination: By February 2, 2014, Permittee shall review the fecal coliform data collected under the 2007 Permit to identify a minimum of one high priority area (such as a tributary or a stream segment) that will be the focus of source identification and elimination efforts during the 2013-2018 permit cycle. Permittee shall documentation this with the Annual Report for 2014. Permittee shall begin to implement source identification and elimination efforts in the MS4 subbasins discharging to the identified high priority area no later than August 1, 2014. Stormwater quality sampling for bacteria sources is required as part of this focused source identification and elimination effort. For illicit discharges found, Permittees shall implement corrective schedules and activities as specified in the permit. In addition, each annual report's TMDL summary shall include qualitative and quantitative information about the source identification and elimination activities, including procedures followed and sampling results, implemented in the selected high priority area(s).
- Surface Water Monitoring: Each Permittee shall review the fecal coliform data collected under the 2007 Permit and select surface water monitoring location(s) as appropriate for continued characterization and long term trends evaluation of fecal coliform. Each Permittee shall submit a draft revised QAPP to Ecology for review and approval, no later than February 2, 2015. At a minimum, the monitoring program shall:
    - Begin by August 1, 2015.
    - Collect 12 samples in at least one location per calendar year.
    - Submit available data to the Environmental Information Management (EIM) database by May 31 of each year.
    - Provide data summaries and narrative evaluation of the data in each annual report's TMDL summary.

In response to the TMDL requirements, the City implemented a sampling plan that includes an adequate number of sampling points and adequate sampling frequency to reasonably characterize the receiving water or waste stream. The sampling site locations are described in Chapter SW 4 and shown on Figure SW 4.2. The sites are sampled monthly and will be for the duration of the permit cycle. In addition, a Bacteria Pollution Control Plan (BPCP) was developed by the City prior to January of 2011. The BPCP was posted on the city's website and a public review process for the Bacterial Pollution Control Plan was done prior to April 2011. A Final Bacterial Pollution Control Plan was submitted to Ecology. The BPCP is discussed in Section SW 5.3.8.

Monitoring requirements (S8). The new permit language for this special condition now requires status and trends monitoring by Phase II Permittees. The permit gives Permittees the option of participating in a collaborative, regional approach to stormwater monitoring throughout western Washington or to conduct monitoring individually. The regional approach includes a coordinated monitoring program based on shared costs among permittees, with Ecology acting as the service provider to administer contracts. Permittees will participate in a formal oversight committee. This approach removes specific monitoring requirements from the permits and relieves individual permittees of the obligation to individually conduct monitoring activities. However, the regional monitoring program would not replace individual jurisdiction sampling for illicit discharge detection activities, or sampling conducted to further the goals of an applicable TMDL plan or other local water quality investigation. Permittees and others with monitoring capacity would have the opportunity to receive funds to conduct parts of the regional monitoring program. Ecology indicates that the benefits for a regional approach are:

- Feedback on improvements in water quality in receiving waters.
- Regionally consistent methods to collect comparable and valid data.
- A repository of information on pollution sources.
- Transferable studies of the effectiveness of specific stormwater program activities.

The regional stormwater monitoring program is defined in three separate areas of monitoring:

- Status and trends monitoring to answer basic questions as to whether conditions in receiving waters are improving or deteriorating.
- Regional effectiveness studies that will provide direct quantitative feedback about the results of different stormwater management activities and programs.
- Source identification and diagnostic monitoring information repository to allow permittees to share source identification program information and provide a regional understanding of pollutant sources to support new policy initiatives.

Ecology has developed cost sharing allocations. Ecology's intent was that cost allocation be based on readily available data, verifiable data, and relatively easy to administer. The costs to the City are $11,488/year with the first payment due August 15, 2014. This cost is broken down by Status and Trends Monitoring: $4,073; Effectiveness Monitoring: $6,786; and Source Identification and Diagnostic monitoring: $629.

Ecology believes the regional monitoring program will be more cost-effective than individual monitoring and will produce needed, high-quality information to improve stormwater management practices throughout Western Washington. For these reasons, Ecology encourages all permittees to participate. However, Ecology recognizes that some permittees will prefer to fund collection of monitoring information only inside their jurisdictional boundaries or to collect information more specific to their local needs. For these reasons, the permit includes a choice for local jurisdictions to conduct individual monitoring. The permit includes the permitting requirements for conducting individual monitoring in lieu of participation in the regional program.

The requirements in the new permit are more extensive than the previous permit. In Chapter SW 7.3, a preliminary estimate is made of the cost impacts of the new permit.

Summary of Key Changes in January 2015 Modifications to 2013-2018

As noted previously, in August of 2014 Ecology began a process to modify certain sections of the permit. The modifications were issued on December 17, 2014 and became effective on January 16, 2015.

In general, there are not many substantive changes proposed from the original 2013-2018 permit. The types of changes include definition clarification, some changes in permit deadlines, incorporating the errata on the permit, and other modifications.

One of the proposed changes affecting the City is the modification to one definition (Outfall) and an added definition (Discharge Point). The definition of Outfall was modified to reflect that it includes any location where a discharge leaves the permittee's MS4 to another permittee's MS4 or private or public conveyance system. The added definition of Discharge Point includes the location where a discharge leaves the Permittee's MS4 through the Permittee's MS4 facilities/BMPs designed to infiltrate. The permit also makes it clear that the IDDE requirements and the Municipal Operation and Maintenance requirements will apply to both Outfalls and Discharge Points.

In addition to the proposed permit modifications, the PCHB ordered modifications to the Stormwater Management Manual for Western Washington (SWMMWW). Although there are many minor changes, some of the key modifications in the SWMMWW include:

- Limiting the application of permeable pavement to those roadways that received very low traffic volumes and areas of very low truck traffic.
- Clarifying the process a local jurisdiction is to follow to designate a geographic area as infeasible for permeable pavement and identifying the data required to support such a determination.
- Referencing and incorporating appropriate maintenance requirements for bioretention facilities and permeable pavement.

All of the references to the 2012 SWMMWW in the new NPDES Permit Modifications were edited to simply SWMMWW which now refers to the Stormwater Management Manual for Western Washington as amended in 2014 (or 2014 SWMMWW).

6.4 Federal Regulations

6.4.1 National Environmental Policy Act

The National Environmental Policy Act was passed in 1970. Its goals are to protect, restore, and enhance the environment. The National Environmental Policy Act documentation requirements apply to all activities with a federal nexus, i.e. generally either federally funded or needing federal permits. The National Environmental Policy Act requirements are to adequately describe the environmental ramifications of proposed actions, to fully disclose to the public proposed federal actions and provide a mechanism for public input to federal decision-making, to prepare environmental impact statements, and to consider alternatives and mitigation for every major action (usually construction projects) that would significantly affect the quality of the human environment. The provisions for ensuring that agencies follow the National Environmental Policy Act are in the Council for Environmental Quality provisions for implementation (43 CFR 1500-1508).

6.4.2 Clean Water Act

Clean Water Act was passed in 1972 "to restore the chemical, physical, and biological integrity of the Nation's water" (33 USC 1251 [a]). There are four sections of this legislation that affect the City's surface water program:

- Section 303(d);
- Section 401;
- Section 402-NPDES; and
- Section 404.

As previously stated, the Clean Water Act is a federal regulation but it establishes statewide authority through regulations promulgated by Ecology for Sections 303(d), 401 and 402 (RCW 90.48.260). These three sections are described in Section SW 6.3.6. Section 404 is described here.

Section 404 Wetlands

Section 404 deals with activities involved with filling waters of the United States. The water in question is usually a wetland. A wetland is defined as: "those areas that are inundated or saturated by surface or ground water at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil" (33 CFR 328.3 [b]). The U.S. Army Corps of Engineers (Corps) has regulatory authority to administer a permit program that results in no net loss of these waters of the United States.

When evaluating activities that are regulated by Section 404, the emphasis is to look at alternatives that avoid, then minimize, then compensate for any wetland impacts. Unavoidable impacts are compensated for by a system of replacement ratios that vary depending on the quality of wetlands being impacted.

6.4.3 Endangered Species Act

Puget Sound and its tributary streams in the vicinity of the City provide habitat, or may provide habitat, for aquatic species listed as threatened or endangered under the Endangered Species Act of 1973. The Endangered Species Act prohibits killing or harming an endangered species in any way, including significant modification of critical habitat for that species.

The National Oceanic and Atmospheric Administration, Department of Fisheries (NOAA Fisheries), is responsible for marine species. The U.S. Fish and Wildlife Service is responsible for resident aquatic species. In June 2000, NOAA Fisheries adopted a rule prohibiting the "take" (which includes harassing, harming, pursuing, hunting, shooting, wounding, killing, trapping, or collecting; or attempting any of these things) of 14 groups of salmon and steelhead listed as threatened under the Endangered Species Act.

The City is a member of the Snohomish Basin Salmon Recovery Forum (along with Snohomish County, King County and numerous Puget Sound area cities, major businesses and environmental groups. Members of this group participated in preparing a Regional Road Maintenance Program with the Department of Transportation that resulted in federal agencies approving Monroe's application to be qualified for an Endangered Species Act "take" limit when complying with the Regional Road Maintenance Program. The City received a letter from NOAA Fisheries in 2004 indicating it approved of the Regional Road Maintenance Program the City adopted.

6.4.4 National Flood Insurance Program

Floodplain management regulation elements of the National Flood Insurance Program are administered by the Federal Emergency Management Agency and are implemented in Washington State by the Department of Ecology as discussed in Section SW 6.3.3. Section SW 6.3.3 also contains a discussion on the recent legal decisions effect Federal Emergency Management Agency's administration of the National Flood Insurance Program in Washington State.

6.5 Gap Analysis of State and Federal Regulations that Apply to the Stormwater Management Utility

The City is currently in compliance with existing State and Federal regulations that relate to stormwater. In addition, it is in compliance with the current NPDES phased requirements (phasing in new requirements between 2013 – 2018). However, as the added NPDES Phase II Permit continues to be phase in, the City will need to incrementally add new activities for the remaining three years of the five year permit period. Tables SW 6-1 through SW 6-7 summarize the State and Federal regulations presented earlier in this section, the City's current compliance status, and actions that the City must take to be in compliance in the future.

Table SW 6-1 Controlling Runoff from New Development, Redevelopment and Construction Sites for Public and Private Projects
City of Monroe Status and Plan of Action to meet State and Federal Regulatory Requirements

Regulatory Requirements	City Status and Plan of Action
Ecology Phase II General MS4 Permit (Clean Water Act Section 402) Construction Site Stormwater Runoff Control Design and Construction Standard Requirements are as follows: ▪ The owner or operator of a regulated small municipal separate storm sewer system (MS4) must develop, implement, and enforce a program to reduce nonpoint source pollution from construction sites meeting thresholds set in Appendix A of the permit. ▪ A regulatory mechanism must be used to control erosion and sediment to the maximum extent practicable and allowable under state, tribal or local law. ▪ Procedures must be included for site inspection and enforcement of control measures. ▪ Procedures must be implemented to obtain input from the public. ▪ Water quality impacts must be addressed through site plan review processes. ▪ Construction site operators must control wastes generated at site. ▪ By Dec. 31, 2016, City must adopt standards equivalent to the 2014 SWMMWW. ▪ Must demonstrate compliance by completing 80% or more of required inspections Post-Construction Stormwater Management in New Development and Redevelopment Design and Construction Standard Requirements are as follows: ▪ Owners or operators of regulated small MS4s must develop, implement, and enforce a program that addresses Stormwater runoff from new development and	**City Status:** ▪ Through the Monroe Municipal Code 15.01 and 15.02, the City has implemented the majority of requirements of the NPDES Phase II requirement to control runoff from new development, redevelopment and construction sites. With these codes, the City has currently adopted Ecology's 2005 Manual. ▪ The City maintains records for plan review, inspection reports, warning letters, notice of violations and other enforcement records. The City noted that there have been compliance issues with developers, and in the future it would be appropriate to set better expectation of the development community during the plan review phase that following the require TESC measure will be strictly enforced. ▪ The City also provides copies of the Notice of Intent for Construction Activity and Notice of Intent for Industrial Activity to representatives of proposed new and redevelopment at permit pre-application meetings and with permit applications. **Plan of Action:** ▪ The City is nearly compliant with the Phase II Permit requirements for Controlling Runoff from New Development, Redevelopment and Construction Sites. However, by Dec. 31, 2016, City must adopt standards equivalent to the 2014 SWMMWW. ▪ By Dec. 31, 2016, the City must also update its ordinances to reflect the mandatory adoption of the updated Appendix 1 of the Phase II Permit. To do this

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Table SW 6-1 Controlling Runoff from New Development, Redevelopment and Construction Sites for Public and Private Projects
City of Monroe Status and Plan of Action to meet State and Federal Regulatory Requirements

Regulatory Requirements	City Status and Plan of Action
redevelopment projects that result in land disturbances of the thresholds in Appendix 1 of the permit. ▪ Appropriate structural and non-structural BMPs must be used. ▪ Controls must ensure that water quality impacts are minimized. ▪ Adequate long-term operation and maintenance of BMPs connected to a regulated MS4 must be addressed. The MS4 must inspect private facilities approved after 8/15/09 annually. ▪ For facilities in new subdivisions, the MS4 shall inspect all facilities including catch basins every 6 months until 90% of the lots are fully stabilized ▪ The goal, at a minimum, should be to maintain pre-development runoff conditions. ▪ Must demonstrate compliance by completing 80% or more of required inspections ▪ Revise all development-related enforceable documents (i.e., codes, rules, standards, etc.) to incorporate and require LID.	the City will need to amend Monroe Municipal Code 15.01 Stormwater Management to reflect the Thresholds, Definitions, minimum requirements and exception, adjustment and variance criteria in the updated Appendix 1.

Table SW 6-1 Controlling Runoff from New Development, Redevelopment and Construction Sites for Public and Private Projects
City of Monroe Status and Plan of Action to meet State and Federal Regulatory Requirements

Regulatory Requirements	City Status and Plan of Action
Endangered Species Act 4(d) Rule The 4(d) Rule provides a list of activities that have a high risk of resulting in a “take” of the listed threatened or endangered salmonids. The following list includes items that could be included in design standards that would prohibit activities that the 4(d) rule has determined are likely to result in injury or harm to listed salmonids. Design standards should prohibit: ▪ Construction of structures like culverts, berms, or dams that eliminate or impede a listed species’ ability to migrate or gain access to habitat. ▪ Removal, addition, or alteration of rocks, soil, gravel, vegetation or other physical structures that are essential to the integrity and function of a listed species’ habitat. ▪ Removal of water or otherwise altering stream flow in a manner that significantly impairs spawning, migration, feeding, or other essential behavioral patterns. ▪ Construction of dams or water diversion structures with inadequate fish screens or passage facilities. ▪ Construction of inadequate bridges, roads, or trails on stream banks or unstable hill slopes adjacent to or above a listed species’ habitat. Operations that substantially disturb soil and increase the amount of sediment going into streams.	**City Status:** ▪ The City follows Ecology’s erosion and sediment control Minimum Requirements when working on its Capital Improvement Projects or when these projects are performed by private contractors. ▪ The City and private contractors performing construction for the City implement BMPs and other practices from the City’s NOAA approved Routine Road Maintenance program. ▪ If the City does a project that requires a 404 permit there is a federal nexus that triggers the requirement for an ESA consultation with permitting agencies. **Plan of Action:** The City will obtain the necessary permits for its projects on a case by case basis.

Table SW 6-1 Controlling Runoff from New Development, Redevelopment and Construction Sites for Public and Private Projects
City of Monroe Status and Plan of Action to meet State and Federal Regulatory Requirements

Regulatory Requirements	City Status and Plan of Action
Section 303(d) of the Clean Water Act French Creek and Woods Creek are listed with a TMDL for fecal coliform. As a part of the new NPDES Phase II permit (in Appendix 2 of the permit) several actions are required. The actions are more directly related to prevention of illicit discharges and so the actions are summarized in Table SW 6-2 below. One of the actions includes Business Inspections. The City is to inspect commercial animal handling areas and commercial composting facilities to ensure implementation of source control BMPs for bacteria by August 1, 2016 and every 3 years thereafter.	**City Status:** In response to the TMDL requirements, the City implemented several programs for addressing the TMDL (see Table SW 6-2 below). The City has not yet established a program for business inspections. **Plan of Action**: The City will implement a program targeting the business inspections for commercial animal handling areas and commercial composting facilities.
National Flood Insurance Program This program provides City's the opportunity to proactively reduce flood damage and costs of flood insurance for its residents and businesses by developing a series of activities and programs for the City to implement through the Community Rating System. Recent rulings from NOAA to FEMA indicate the NFIP and the CRS will need to be revised to avoid violating the ESA when authorizing floodplain development.	**City Status:** The City voluntary participates in the Nation Flood Insurance Program (NFIP) and the Community Rating System (CRS) which provides residents and businesses a 25% reduction in premiums for all new and renewed flood insurance policies for structures located in the City's flood hazard area and 5% for other City residents. The City evaluates building in its Special Flood Hazard Areas through its Commercial and Residential building permits. **Plan of Action:** Recent rulings from NOAA to the Federal Emergency Management Agency (FEMA) have determined the existing NFIP and CRS need revision to avoid violating the ESA when authorizing floodplain development. FEMA issued guidance to local jurisdictions in 2010, which includes a model ordinance that incorporates a simple and direct set of rules to protect human development from floods while minimizing the impacts of new construction and redevelopment on aquatic and

Table SW 6-1 Controlling Runoff from New Development, Redevelopment and Construction Sites for Public and Private Projects City of Monroe Status and Plan of Action to meet State and Federal Regulatory Requirements	
Regulatory Requirements	**City Status and Plan of Action**
	riparian habitat. To achieve compliance, the City will review projects requiring building and/or construction permits, land use actions or environmental review within the designated floodplain on an individual basis. The applicant will need to either provide a habitat assessment that shows the proposed project will not have adverse effect on endangered species or the applicant must provide concurrence from the NOAA Fisheries that the project complies with ESA. The City is also working to revise its existing floodplain ordinance. As required by the Growth Management Act, by 2015, the City must complete an update its Critical Areas Ordinance, including floodplain regulations as part of the update to the City's Comprehensive Plan and Development Regulations.
State Growth Management Act The State Growth Management Act (GMA) requires permits for activities in environmentally "critical areas" and for activities that would affect "critical areas".	**City Status:** Through its Critical Areas Ordinance, MMC 20.05, the City has prepared definitions, maps and permit requirements for critical areas. **Plan of Action:** The City will enforce its Critical Areas ordinance to remain compliant.

Table SW 6-1 Controlling Runoff from New Development, Redevelopment and Construction Sites for Public and Private Projects
City of Monroe Status and Plan of Action to meet State and Federal Regulatory Requirements

Regulatory Requirements	City Status and Plan of Action
State Shoreline Management Act The State Shoreline Management Act requires permits for activities along shorelines of the State.	**City Status:** Through its Shoreline Master Program Ordinance, MMC 19.01, the City specifies the permitting process for activities along its Shorelines. Development on or near shore requires a Shoreline Substantial Development, Shoreline Conditional Use, and/or Shoreline Variance Permit. The City will continue to apply its Municipal Code requirements to its Capital Improvement Projects to remain compliant. **Plan of Action:** The City will enforce its Shoreline Master Program ordinance to remain compliant. The City will continue to apply its Municipal Code requirements to its Capital Improvement Projects to remain compliant.
State Hydraulic Project Approval The Department of Fish and Wildlife issues Hydraulic Project Approvals (HPA) for construction activities that affect streams.	**City Status:** These permits are issued by the Department of Fish and Wildlife. The City completes a Joint Aquatic Resources Application (JARPA) for its projects and has not needed to seek an HPA for its projects. The City also implements the construction BMPs outlined in the City's Regional Road Maintenance program approved by NOAA. **Plan of Action:** The City will continue submitting JARPAs for its projects when required and implement the BMPs outlined in the City's Regional Road Maintenance program.

Table SW 6-1 Controlling Runoff from New Development, Redevelopment and Construction Sites for Public and Private Projects
City of Monroe Status and Plan of Action to meet State and Federal Regulatory Requirements

Regulatory Requirements	City Status and Plan of Action
RCW 43.21C State Environmental Policy - Modeled after the National Environmental Policy Act (NEPA), the State Environmental Policy Act (SEPA) requires the identification and evaluation of probable impacts of activities for all elements of the environment. The SEPA rules (Chapter 197.11 Washington Administrative Code (WAC)) became effective in April, 1984. SEPA review occurs in tandem with other agency processes. It is required for all nonexempt construction, demolition, landfills, comprehensive plans, zoning, and development regulations that are licensed, funded, or approved by a government agency. Any nonexempt governmental action—at any level—may be conditioned or denied pursuant to SEPA (RCW 43.21C.060).	**City Status:** The City seeks SEPA review when and where it is required for portions of its Stormwater Management Utility program such as capital improvement projects and updates to development regulations that impact stormwater quality and habitat. **Plan of Action:** The City will continue with seeking SEPA review where necessary.

Table SW 6-2 Prevention of Illicit Discharges
City of Monroe Status and Plan of Action to meet State and Federal Regulatory Requirements

Regulatory Requirements	City Status and Plan of Action
Ecology Phase II General Permit (Clean Water Act Section 402) To prevent illicit discharges, MS4s shall have an ongoing program designed to prevent, detect, characterize, trace, and eliminate connections and illicit discharges to the system. The program shall include the following: ▪ Develop and make periodic updates of a storm sewer system map that shows all outfalls, receiving waters, City-owned treatment and flow control BMPs, tributary characteristics of outfalls 24" or larger (type and material, tributary area size, land use), all new connections authorized since 2/16/2007. ▪ Implement an IDDE Ordinance that prohibits illicit discharges, conditionally allows non-stormwater discharges if conditions are met (e.g., declorinating water during water line flushing), and includes an escalative enforcement SOP ▪ Implement an IDDE Compliance Strategy (incl. education, tech assistance, require BMPs & Maintenance) ▪ Implement an ongoing program designed to identify illicit discharges including: o Field Screen 40% of MS4 by 12/31/17, then 12% annually thereafter o Publically listed spill / discharge report hotline o Training (ongoing) for all field staff (identification, reporting, and response) o Implement IDDE Education (public employees, businesses, and general public)	**City Status:** ▪ The City has prepared a nearly complete inventory of its storm sewer system. ▪ The City has identified a community point of contact and receiver of Illicit Discharge hotline calls. This person also leads the response and investigation for illicit discharges. It investigates illicit discharges identified by customer reports and by routine City field operations. ▪ The City has implemented significant public education efforts to support its IDDE program (including letters, radio ads, speaking engagements, using educational inserts with utility bills, broadcasting on the public network, placing mutts mitts in public spaces. ▪ The City has established a “Spill Hot Line”. ▪ Chapter 13.34 of the Monroe Municipal Code (IDDE) regulates the contribution of pollutants to the stormwater drainage system by stormwater discharges and prohibits illicit connections and illicit discharges. It defines illicit discharges as well as conditional approved discharges (such as potable water for cleaning water systems). It also establishes the legal authority to carry out inspections, surveillance and monitoring. **Plan of Action:** ▪ The City will continue to update its stormwater system inventory as new information is made available through new development of the stormwater system or by field crew investigation and discoveries. ▪ To develop a proactive Illicit Discharge Detection and Elimination Program, the City will need to increase staffing

Table SW 6-2 Prevention of Illicit Discharges
City of Monroe Status and Plan of Action to meet State and Federal Regulatory Requirements

Regulatory Requirements	City Status and Plan of Action
▪ Implement an ongoing program designed to address illicit discharges including procedures to characterize, trace, & eliminate spills/illicit connections ▪ Meet compliance timelines for response, investigations, & elimination established in permit. ▪ Implement ongoing training for IDDE staff ▪ Recordkeeping: Track all permit IDDE activities	efforts to screen the City outfalls and address non-compliance issues, and address training needs. ▪ Some slight modifications to Chapter 13.34 are required to reflect some new prohibited discharges in the NPDES permit.
Endangered Species Act 4(d) Rule The following list includes items that could be included in City regulations that the 4(d) rule has determined are likely to result in injury or harm of listed salmonids: ▪ Standards shall prohibit discharge of pollutants such as oil, toxic chemicals, radioactivity, carcinogens, matagens, teratogens, or organic nutrient laden water (including sewage water) in a listed habitat. ▪ Standards shall prohibit release of non-indigenous or artificially propagated species into a listed species' habitat or into areas where they may gain access to that habitat.	**City Status:** Chapter 6.04 and 15.01 of the Monroe Municipal Code (MMC) prohibits pollution of area water bodies by sewage, creamery or industrial waste and illicit discharges, respectively. **Plan of Action:** When drafting a new ordinance or amending an existing ordinance to prohibit illicit discharges, the prohibition of the items determined to cause injury or harm to ESA listed salmonids should also be included. Amendments to existing ordinances are presented in Section 7 – Recommendations).
Regulation: Section 303(d) of the Clean Water Act French Creek and Woods Creek are listed with a TMDL for fecal Coliform. As a part of the new NPDES Phase II permit (in Appendix 2 of the permit), the list of actions includes: ▪ <u>Business Inspections</u>. Inspect commercial animal handling areas and commercial composting facilities to ensure implementation of source control BMPs for bacteria (by August 1, 2016) and every 3 years thereafter.	**Status:** In response to the TMDL requirements, the City implemented a sampling plan that includes an adequate number of sampling points and adequate sampling frequency to reasonably characterize the receiving water or waste stream (see Section SW 6.3.6 for locations). Eight sites are sampled monthly and will be for the duration of the permit cycle. In addition, a Bacteria Pollution Control Plan (BPCP) was developed by the City prior to January of 2011. The BPCP was

Table SW 6-2 Prevention of Illicit Discharges
City of Monroe Status and Plan of Action to meet State and Federal Regulatory Requirements

Regulatory Requirements	City Status and Plan of Action
▪ Public Education and Outreach: Conduct public education and outreach activities to increase awareness of bacterial pollution problems and promote proper pet waste management behavior. ▪ Operations & Maintenance: Install and maintain animal waste collection and/or education stations at municipal parks and other Permittee owned and operated lands ▪ IDDE: Conducting IDDE-related field screening for bacteria sources in any screened MS4 subbasins which discharge to surface waters in the TMDL area. ▪ Targeted Source Identification & Elimination: By February 2, 2014, identify a minimum of one high priority area that will be the focus of source identification and elimination efforts during the 2013-2018 permit cycle. Begin to implement source identification and elimination efforts in the high priority area no later than August 1, 2014. For illicit discharges found, implement corrective schedules and activities as specified in the permit. ▪ Surface Water Monitoring: Select surface water monitoring location(s) as appropriate for continued characterization and long term trends evaluation of fecal coliform. Begin the monitoring program August 1, 2015.	posted on the city's website and a public review process was completed. **Plan of Action:** In some areas the City is ahead of the phased TMDL implementation as required by the NPDES permit. In general, the City's plan of action will be to continue its monitoring program, and then add the business inspections, as well as conduct the field screening and address sources of bacteria.

Table SW 6-3 Pollution Prevention with Operations and Maintenance Program City of Monroe Status and Plan of Action to meet State and Federal Regulatory Requirements	
Regulatory Requirements	**City Status and Plan of Action**
Regulation: Ecology Phase II General Permit (Clean Water Act Section 402) Develop a Municipal Operations and Maintenance program that includes a training component and has the ultimate goal of preventing or reducing pollutant runoff from municipal operations. Key requirements include: ▪ Implement maintenance standards that are equivalent to the 2014 SWMMWW. For systems that are inspected and the maintenance standard is exceeded, the City needs to perform maintenance in a timely manner as defined in the permit. ▪ Implement annual inspections of all public treatment and flow control BMPs/facilities ▪ Perform field spot checks of BMPs/Facilities after 10-year 24-hr storm ▪ Inspect all catch basins by 8/1/17, then every 2 years after. Catch basins shall be clean per the 2014 SWMMWW. The City also needs to adhere to Appendix 6 - Street Waste disposal. ▪ Implement standard operating procedures to reduce stormwater impacts from all City lands/ROWs ▪ Implement an ongoing training program for City employees involved in activities that may impact stormwater quality. ▪ Implement SWPPPs for all heavy equipment maintenance or storage yards and material storage areas **Regulation: Endangered Species Act 4(d) Rule** The following list of items should be included in a maintenance plan to prevent activities that the 4(d) rule has determined are	**City Status:** ▪ The City and private contractors performing maintenance of City infrastructure adhere to the City's NOAA approved Routine Road Maintenance program. ▪ The City ordinance MMC Chapter 15.02 specifies property owners are responsible for the maintenance of their privately owned stormwater facilities. ▪ The City has currently adopted the 2005 Ecology Manual and associated maintenance standards. This will need to be updated to adopt the 2014 manual. ▪ The City maintains a routine maintenance program for numerous stormwater facilities and related infrastructure such as street sweeping, retention pond vegetation and sediment removal, roadside and ditch vegetation and sediment removal. But maintenance frequencies are not adequate to achieve the adopted maintenance requirements in the permit or the standards in the Ecology manual. ▪ The City has developed a database to record inspections and maintenance or repair activities and tracks Operation and Maintenance activities. ▪ The City has developed SWPPPs for City-owned sites meeting the permit criteria. ▪ The City has an on-going training program for employees and documents these activities. **Plan of Action:** ▪ The City will need to ramp up efforts in order to inspect and clean as necessary all municipally owned catch

Table SW 6-3 Pollution Prevention with Operations and Maintenance Program
City of Monroe Status and Plan of Action to meet State and Federal Regulatory Requirements

Regulatory Requirements	City Status and Plan of Action
likely to result in injury or harm to listed salmon. Maintenance plan shall prohibit: ▪ Maintenance of structures like culverts, berms, or dams if maintenance eliminates or impedes a listed species' ability to migrate or gain access to habitat. ▪ Removing, poisoning, or contaminating plants, fish, wildlife, or other biota that the listed species requires for feeding, sheltering, or other essential behavioral patterns. ▪ Removal, addition, or alteration of rocks, soil, gravel, vegetation or other physical structures that are essential to the integrity and function of a listed species' habitat. ▪ Removal of water or otherwise altering stream flow in a manner that significantly impairs spawning, migration, feeding, or other essential behavioral patterns. ▪ Operation of dams or water diversion structures with inadequate fish screens or passage facilities. Maintenance or operation of inadequate bridges, roads, or trails on stream banks or unstable hill slopes adjacent to or above a listed species' habitat.)	basins by 8/1/2017 and then every 2 years thereafter. There are options to inspection every 2 year that can be considered. ▪ The City will inspect and clean as necessary within permit specified maintenance periods all municipally owned treatment and flow control facilities on an annual basis..
Section 303(d) of the Clean Water Act French Creek and Woods Creek are listed with a TMDL for fecal coliform. See discussion under Table SW 6-2 for the requirements of the TMDL. One of the operation and maintenance requirements is to install and maintain animal waste collection and/or education stations at municipal parks and other City owned and operated lands	**City Status:** The City already provides mutt mitts at parks and other City locations. **Plan of Action:** For TMDL response see Table SW 6-2 above.

Table SW 6-3 Pollution Prevention with Operations and Maintenance Program
City of Monroe Status and Plan of Action to meet State and Federal Regulatory Requirements

Regulatory Requirements	City Status and Plan of Action
State Hydraulic Project Approval - The Department of Fish and Wildlife issues Hydraulic Project Approvals (HPA) for construction activities that affect streams.	**City Status:** These permits are issued by the Department of Fish and Wildlife. The City completes a Joint Aquatic Resources Application (JARPA) for its projects and has not needed to seek an HPA for its projects. **Plan of Action:** In the event the City needs to acquire an HPA for system maintenance, the City should consider obtaining a programmatic HPA to cover maintenance activities in streams or wetlands

Table SW 6-4 Public Education, Involvement, Outreach and Participation Program
City of Monroe Status and Plan of Action to meet State and Federal Regulatory Requirements

Regulatory Requirements	City Status and Plan of Action
Regulation : Ecology Phase II General Permit (Clean Water Act Section 402) Develop a Public Education and Outreach Program designed to reduce behaviors and practices that contribute to adverse stormwater impacts, including the following: ▪ Implement or participate in an education and outreach program to targeted audiences (public, engineers, contractors, developers, land use planners). ▪ Create Stewardship opportunities to encourage residents to participate (e.g., stream teams, storm drain stenciling) ▪ Measure understanding/adoption of targeted behaviors for at least one audience in at least one subject area Involve public participation by accomplishing the following: ▪ Provide for Public Involvement and Participated in SWMP decision making process ▪ Post SWMP Plan and Annual Report on City Website. ▪ Examples of public involvement/ participation that should be considered include public hearings, citizen advisory boards, and working citizen volunteers.	**City Status:** The City currently conducts a significant public education of citizens and businesses on stormwater quality protection and pollution prevention. Part of the program also addresses the TMDL requirements for public involvement and education regarding increase awareness of bacterial pollution problems and promote proper pet waste management behavior. The city posts the annual report on its webpage annually. **Plan of Action:** The City is largely in compliance with the permit requirements. To address the requirement for measuring understanding/adoption for one audience, the City is teaming with Snohomish County, and other municipalities for the "Natural Yard Care Public Outreach and Evaluation Program". The objectives of the this multi-agency effort (lead by Snohomish County) are to improve water quality within the region by educating the public regarding best management practices for residential yard care and measure the understanding and adoption of the targeted behaviors and evaluate the effectiveness of the parties respective education programs in achieving desired behavior.

Table SW 6-5 Reporting
City of Monroe Status and Plan of Action to meet State and Federal Regulatory Requirements

Regulatory Requirements	City Status and Plan of Action
Regulation : Ecology Phase II General Permit (Clean Water Act Section 402) The SWMP document shall: ▪ Include written description to inform the public of the planned SWMP activities of the upcoming year to meet NPDES requirements, any planned actions to meet applicable TMDLs, and any planned actions to meet monitoring (S8) requirements. ▪ Gather, track, and maintain information to evaluate SWMP development, implementation, and permit compliance, including cost of implementation of each program element and number of inspections, enforcement actions and types of public education activities. ▪ The SWMP program shall include coordination among affected entities to encourage coordinated approach on stormwater related activities, projects, and programs. ▪ The SWMP program shall be designed to implement a set of actions and activities to reduce the discharge of pollutants to the maximum extent practicable (MEP), meet state AKART requirements, and protect water quality). **Requirements for Annual Report include:** ▪ Copy of current SWMP ▪ Appendix 3 (Annual Report form) containing a description of the status of implementation of the requirements of the permit during the reporting period, including attachments that include relevant summaries, reports, etc.	**City Status:** The City submitted its 2014 SWMP to Ecology and also posted it on the City's webpage. Note the Annual Report was not required in 2014 due to the timing of the promulgation of the new 2013-2108 permit. **Plan of Action:** The City will continue to submit the SWMP and Annual Reports in subsequent years.

Table SW 6-6 Monitoring
City of Monroe Status and Plan of Action to meet State and Federal Regulatory Requirements

Regulatory Requirements	City Status and Plan of Action
Ecology Phase II General Permit (Clean Water Act Section 402) ▪ Document in Annual Report description of monitoring and storm related studies. ▪ Status and Trends Monitoring: City needs to either contribute to Ecology's regional monitoring effort ($4,073 annually) or implement its own monitoring program meeting Ecology's Option #2 requirements. ▪ Effectiveness Monitoring: City needs to either contribute $4,786 annually or implement its own Effectiveness studies meeting Ecology's Option #2 requirement ▪ Source Identification and Diagnostic Monitoring: City needs to contribute $629 annually to the Ecology's regional monitoring effort.	**City Status:** The City is conducting monitoring for the TMDL and providing the data results in the Annual Report. The City also plans to participate in the regional monitoring program and contribute to Ecology the annual funds for all of the monitoring requirements. **Plan of Action:** Continue with the current ongoing TMDL monitoring and contribute the required funds to Ecology for the regional monitoring program (according to Ecology's schedule).

Table SW 6-7 Enforcement
City of Monroe Status and Plan of Action to meet State and Federal Regulatory Requirements

Regulatory Requirements	City Status and Plan of Action
The City is responsible for enforcing all of its own ordinances as well as state and federally approved or granted permits. Enforcement is required of two categories of activities, new development and existing activities. Examples of new development include the City's municipal codes and permits for private developments and also for public construction projects. Examples of existing activities are illicit discharges and system maintenance.	**City Status:** The City has existing code providing the Stormwater Management Utility Director authority to enforce the Monroe Municipal Code 1.04 Code Enforcement for Monroe Municipal Codes 15.01 Stormwater Management and 15.02 Stormwater Maintenance, and 13.34 Illicit Discharge Detection and Elimination. **Plan of Action:** As the City continues in its efforts to be compliant with the Phase II Permit, the City should follow each enforcement requirement.

Chapter SW 7 Future Program Needs

7.1 Introduction

In addition to performing the current operational programs described in Chapter SW 5, the City must implement additional activities that are needed to comply with new regulatory requirements. More specifically, the City must position itself to be in compliance with the 2013-2018 Phase II NPDES permit requirements. This chapter includes an assessment of the resources needed above the current program to meet these requirements in terms of staffing FTEs and costs.

In addition, this chapter includes a discussion of three policy questions raised by City staff to help guide decisions on the future program. These policy questions relate to when and where to consider the use of permeable pavement; strategies to pursue when private stormwater infrastructure is not being maintained by those responsible for maintenance; and whether to consider alternative stormwater LID mitigation strategies that vary from the conventional Ecology manual standards.

Finally, this chapter includes an assessment of the additional future program needs that could result from future annexations. Currently, the City encompasses a total area of approximately 6.11 square miles. The potential area, if the City expands to all of the area within its urban growth area (UGA) boundary, is 7.67 square miles. This equates to roughly 1,000 acres of potential expansion. This chapter provides both an estimate of the ultimate program staffing and funding level based on the assumption of the City expanding to the full UGA as well as an estimate of the incremental staffing increases in FTEs that should be considered as smaller annexations occur.

7.2 Stormwater Policy Considerations

The following paragraphs provide discussions on three policy questions the City wanted to consider as a part of this plan update. These discussions are summaries of issue papers that are included in Appendix SW-B. Refer to this appendix for more detailed information.

When and Where to Consider Pervious Pavement

The first policy question is in regard to when and where to consider pervious pavement. To assess this question, the consulting team (1) summarized background information from available technical resources, (2) used SCS soils maps to characterize the existing soils and substrata in Monroe with respect to permeability, which provides an indicator of suitability for pervious pavement installations, and (3) conducted a brief informal inquiry to a number of other jurisdictions in the Puget Sound area to obtain input on their policies regulating the use of pervious pavement.

Due to the importance of adequate subsoil conditions for the suitability of pervious pavement, and to provide some additional information regarding the locations within the City that may be either more or less favorable, Soil Conservation Service (SCS) Soils mapping was reviewed and characterized. A map of the City soils is includes in Appendix SW-C and characterizes soils by their SCS soils hydrologic group classifications (A, B, C, and D). An accompanying table in the appendix shows the hydrologic soil group characteristics such as the composition of the soil, the permeability of the substrate and the approximate depth to the hard pan. This information can be used to help assess whether the subsoils create favorable, less favorable or unfavorable conditions for the installation of permeable pavement (as well as other LID infiltration techniques). Generally much of the soils within the City fall into maps units and hydrologic soil groups A and B that provide favorable conditions allowing the installation of permeable pavements. These areas have permeable substrata made of glacial outwash or sand and typically have at least 5 feet deep permeable subsurface conditions (to glacial till substratum). Hydrologic soil group C was characterized as less favorable conditions. These soils typically have a depth to hard pan on the order of 20 to 40 inches, which may not be sufficient for permeable pavement. Unfavorable conditions were identified in hydrologic soil group D area where the soils are organic, the substratum has low permeability or a seasonal water table is perched at shallow depths.

Based on the data gathering from pervious pavement guidance documents, input from other jurisdictions, considerations of the proposed pervious pavement standard changes being considered by Ecology as a part of the 2012 Stormwater Management Manual for Western Washington (Manual) update, and the GIS mapping exercise, the following conclusions and recommendations were developed.

The application and understanding of pervious pavement is still in its learning stage and there is a wide variety of perceptions from municipalities on its use and success. There have been failures and the industry is learning from past experience. Many jurisdictions are still hesitant in proposing wide application. Yet at the same time, some jurisdictions (e.g., Puyallup) are fully embracing pervious pavement and expanding its use. Because the perception is still mixed, and the industry is learning from experience at a relatively fast pace, it is recommended that the City pursue pervious pavement somewhat on the cautious side, so as not to create a non-significant increase in roadway maintenance demands. That said, should grant funding be available, the City should always consider capitalizing on maximizing surface water benefits when projects can be implemented at low costs. More specifically, the City should consider the following recommendations:

- The City should use the figure In Appendix SW-B as a general guidance for initial consideration of where pervious pavement should be considered. Although there are certain to be exceptions due to the variability of soils, this map can be used as an initial indicator.
- Until more data is developed, the City should consider following Ecology’s 2012 Manual, but including the proposed changes to the manual currently under public review. These include;
  - Pervious pavement should be not be considered on non-residential roads (i.e., arterials and commercially used roadways) (note, this does not apply to sidewalks along these roadways), and
  - Avoid configurations where impervious pavement “run-on” has a larger surface area than the adjacent pervious pavement (unless the pavement, base course, and subgrade have been designed to accept runoff from adjacent impervious surfaces).
- The City should follow closely the infeasibility criteria listed in the Manual.
- The City should avoid porous concrete in shaded areas (due to potential of moss growth).
- The City should monitor the development of the WSDOT specification for pervious pavement, and use it when it becomes available.

- The City should continue to pursue grant funding for pervious pavement.

Using Utility Funds on Private Property (for maintenance of drainage infrastructure)

This policy question was is intended to provide some guidance on when to use stormwater utility funds on private property, with focus on performing maintenance on private facilities and vegetation when they are not maintained adequately by the property owner. Stormwater facilities are largely constructed to mitigate the effects of development in terms of water quantity and water quality control. Without proper maintenance, stormwater facilities will not function properly and therefore fail to provide the mitigation they were intended to provide. The City's Public Works Operation and Maintenance Services Department implements a program for routine maintenance of the City-owned stormwater infrastructure. However, inspection and maintenance of private facilities is up to the individual property owners. The City requires maintenance of private facilities through Chapter 15.02 of the Monroe Municipal Code.

MMC Chapter 15.02.080 (Enforcement) states that compliance with the stormwater maintenance requirements is mandatory and that violations may be subject to the general penalties and remedies established in Chapter 1.04 MMC. Chapter 1.04 MMC (Code Enforcement) establishes procedures to enforce violations of the Monroe Municipal Code. It establishes a priority of voluntary correction of code violations, unless the delays in addressing the violation would be hazardous to public health, safety, and/or welfare. If violations are not addressed voluntarily, the code includes provisions to allow the City to abate the violation and recover all costs of the abatement plus payment of penalties of $250/day. This process requires a notice of code violation and allows for an appeal process. The cost of the City's abatement and any penalty are billed to the property owner. The code also allows for filing a lean against the applicable property if the costs are not paid within 90 days. The City's codes for inspection and enforcement were developed to be compliant with the 2008-2012 NPDES permit.

The new 2013-2018 NDPES permit has added timeframe for addressing non-compliance. Per the permit, if a facility inspection done by the City identifies an exceedance of the maintenance standard, unless there are circumstances beyond the City's control, then maintenance shall be performed:

- within 1 year for typical maintenance of facilities, except catch basins and
- within 6 months for catch basins.

Historically, the City of Monroe is likely very similar to many other cities in the region with a less rigid policy on enforcing maintenance of stormwater facilities. With the increasing emphasis on stormwater quality via the NPDES Phase II permit, there are more rigid standards for inspection and maintenance of stormwater infrastructure. It is recommended that the City raise the level of awareness of these requirement amongst staff and public with the goal of meeting NPDES compliance for timelines when maintenance is found to be needed. It is also recommended that the City communicate the requirements of the NPDES permit and the Monroe Municipal Code during the pre-application meetings with prospective builders and designers.

Because of the current process for enforcement includes a potential untimely allowance for voluntary compliance and appeals, it is recommended that the City establish a target timeframe for issuing a notification of maintenance needs when an inspection reveals maintenance is needed, of no more than 1-2 weeks. And then monitor the compliance status on a monthly basis.

The City should also increase public awareness of property owner's responsibility to maintain their stormwater facility BMPs as part of its public education and involvement program by sending out fliers (or other public awareness strategy). Again, refer to Appendix SW-B for more information.

Should the City Consider Alternatives to Low Impact Development Strategies

The new 2013-2018 NPDES Phase II permit is increasing requirements for LID with respect to new development and redevelopment and has established LID design standards in the 2012 Stormwater Management Manual for Western Washington (Manual). LID stormwater designs mimic natural drainage processes by using stormwater site design and best management practices that retain vegetation, limit impervious surfaces, and infiltrate runoff on-site. The updated 2012 Manual revisions now include requirements to manage stormwater through either use of listed LID BMPs, or the achievement of an LID performance standard. The manual does however, include feasibility review for sites that can lessen the need to implement LID, such as where soils are too poor to soak up runoff or too shallow.

The new LID requirements are categorized for small projects and large projects. Large projects are generally those that result in 5,000 square feet of new and/or replace hard surfaces (e.g., roofs, pavement, and pervious pavement). Both sets of requirements identify a list of preferred BMPs for three types of surfaces: lawn/landscape areas, roof areas/ and other hard surfaces. The BMPs are prioritized and the project applicant must use the highest preferred BMP for each surface that is feasible for their site. The requirements are somewhat inflexible (with the exception of the infeasibllity critiera) and will require multiple BMPs within most given sites compared to traditional methods of handling stormwater such as ponds.

With Ecology's greater emphasis on LID, and its increased requirements on the City and development community, the City of Monroe staff wanted to investigate some questions regarding options for LID implementation, such as when and if it is appropriate to classify LID as the second best option compared with traditional methods for treating and detaining stormwater; or are there situations when it makes more practical sense to not incorporate LID fully, and use a hybrid approach with some LID features and some traditional features? The 2012 Manual does allow for alternative drainage standards. However, in order to implement alternative standards and LID approaches, the City would need to demonstrate that the alternative approach is protective of water quality and satisfies State and federal water quality laws.

The issue paper describes three considered options;

- Regional Systems. Regional stormwater controls are facilities designed to manage stormwater runoff from multiple projects and/or properties through a City-sponsored program, where the individual properties may assist in the financing of the facility, and the requirement for onsite controls is either eliminated or reduced.
- Developing Alternative LID Prioritization. As noted above, the Ecology Manual is set up to require certain LID BMPs listed by priority unless they are determined infeasible using the Manual criteria. One option that could be explored is look at the City's geographical service area with respect to the typical data that are used as input to the LID feasibility criterial such as depth to groundwater, land use, soil characteristics, etc. and then

develop its own prioritized list of appropriate LID BMPs for different geographic areas. The advantage of doing this is that the City could use the infeasibility criteria (e.g., high groundwater) and other data to potentially eliminate some BMPs for initial consideration and/or prioritize other LID BMPs. Thus, it could allow developers to more quickly identify which LID BMPs are encouraged and allowed up front rather than having to go through the full Ecology process. Through such an exercise, the City could assess whether options, such as greater reliance on traditional methods are feasible.

- Determine Credit from Infiltration Trenches on Future LID BMP Needs. The City has roughly 2.7 miles of ditches categorized as infiltration trenches that currently provide infiltration and water quality treatment. While these existing ditches are known to infiltrate stormwater runoff and provide water quality treatments, the extent to which they provide treatment any “credit” toward helping the City protect water quality has not been assessed. It could be possible to undertake an analysis to assess the water quality benefit of the existing City infiltration ditches and possibly retrofitting other ditches and whether these could be considered as a credit to offset future LID BMP requirements. Some initial discussion with Ecology would be needed to assess its feasibility

Implementation of any of the above alternative approaches would require additional analysis and investment by the City to further assess their feasibility and understand the extent of benefit that could be achieved. Such analysis is beyond the scope of this current study. In other words, if the City were to pursue one of these options, there would be some risk that the investment spent may not yield any positive outcomes or better way to manage LID. It is also noted that other jurisdictions are looking into alternative strategies for LID implementation, and more information can be learned from these efforts.

Because of this risk that the above alternative approaches may not be feasible or result in significant benefit, and because other jurisdictions are also looking into these types of questions, it is recommended that the City not actively pursue any of these options at the present time. Rather, the City should monitor what other jurisdictions are doing in this area in the coming years. If other jurisdictions are able to identify alternative LID approaches that offer significant advantageous and they are able to successfully obtain Ecology approvals, consideration could be given to applying them to the City of Monroe.

In the meantime, The City should continue the current practice of following the Ecology’s Manual. While this approach would not actively look at a systematic or system wide alternatives to LID, it would not preclude the development community from looking at options within their individual project sites. That is, the proponent of a project would carry the burden of providing the engineering services required to evaluate the infeasibility criteria or other factors and assess LID on a project site by project site basis. The results of the proponent’s work would then determine the extent to which LID will, or will not, remain feasible.

7.3 Future Program Needs to Meet Regulatory Requirements

The City has already made significant strides in its stormwater management program as a result of meeting the requirements of the last NPDES Phase II permit cycle of 2007 to 2012 (and then extended through July 2013). Yet the new NPDES 2013-2018 builds on the prior permit program requirements and increases certain permit requirements as well as adds new requirements. Both the 2007-2012 and the 2013-2018 permit requirements were summarized in Chapter SW 6. More specifically, Section SW 6.3.6 outlines the key changes in the new 2013-2018 permit. This chapter quantifies the anticipated increase in effort, in terms of staffing FTEs and costs, to meet the new permit requirements by using a series of spreadsheet tables. These tables were developed with City staff input and are described below. The following paragraphs provide a description of each table and the methods used to predict additional staff and resource needs, and ultimately the added cost to meet the new NPDES permit requirements.

In general, the City's philosophy at this time is to add the minimum level of staff and resources needed to meet the new NPDES requirements. In other words, the only desired increases in FTEs for the Utility are related to what's necessary to meet the NPDES permit requirements. Other areas such as CIP or repair and replacement program will remain at the same level of service.

Table SW 7-1 presents a summary of the Future Stormwater Maintenance and Operations Program Activities. Table SW 7-1 is similar to Table SW 5-1 except that in includes adjustments to account for changes in the NPDES permit requirements. Follows are some details about Table SW 7-1 development.

- Cleaning and Inspection. For those infrastructure items that require inspection and maintenance more frequently by the new NPDES permit, the spreadsheet was modified to increase the frequency. The new permit typically requires inspection of stormwater facilities annually, with the exception of catch basins, which are required to be inspected every two years. While the permit only requires an inspection, and then maintenance if the threshold for sediment is exceeded, the City has found it to be more efficient to simply clean each catch basin as it is inspected. Therefore, the "Catch Basin Cleaning" activity is projected to increase, while the "Catch Basin Inspection" program is expected to decrease.
- Repair and Replacement. The NPDES permit does not mandate repair and replacement and the City plans to move forward with repair and replacement at the current level of service. Thus no changes from the average of last three years is proposed.
- NPDES Compliance. These activities typically include the non-maintenance related activities required by the NPDES permit, such as public involvement, the illicit discharge and detection program, training and TMDL program. In general, the estimated additional staff time and resources were estimated by taking what the City is doing now (from Table SW 5-1) and estimating what increase in effort or resources is needed to meet the added permit requirements. Within the NPDES Compliance group of activities, the estimated increase in effort was estimated using information developed in Tables SW 7-2a and SW 7-2b (discussed below). Exceptions to this are the categories NPDES Overhead and NPDES Training. NPDES Overhead efforts are general activities not specifically tied to a specific NPDES activity. While it is a relatively minor effort, it was assumed to increase by 50% as a result of the cumulative changes in the NPDES permit requirements. For NPDES Training, which affects City staff on the IDDE program, development review, and maintenance, it was estimated that an additional three weeks of staff time spread amongst these activities will be needed.
- Facility and Equipment Maintenance Repair. Again, this cost category is generally the Stormwater Management Utility's shared portion of the total cost of the repairs and maintenance of City facilities and equipment (shared with other public works utilities and departments (water, sewer, and streets). It was described in Section SW 5.3.4. This cost is expected to remain fairly stable and no increase is projected to be in compliance with the NDPES permit requirements.

- Management and Administrative. There are several separate activities within the broader Management and Administrative category. Most of the activities will not be affected by the new permit requirements. There are two exceptions. First, Stormwater Plan Review is projected to increase in the future, mostly in part due to the greater complexities of stormwater design that will incorporate low impact development (LID) requirements, as well as City staff getting familiar with the new Ecology Manual. The estimated increase for this activity is taken from Table SW 7-2b. Second, the current City efforts towards drainage system inventory and mapping is projected to decrease in the future (category 481 – GPS – Storm Office). This is because the City's mapping is near complete. While there are some new mapping requirements in the permit associated with IDDE, it is estimated that the mapping effort will decrease over time as the City completes its mapping.

Table SW 7-2a and SW 7-2b work together to project the increase in NPDES activity efforts for the non-maintenance related NPDES activities. Table SW 7-2a lists all of the key permit requirements and identifies any specific deadlines as well as the needed additional FTEs to meet the NPDES requirements. For those activities where additional FTEs are forecasted, the development of the FTE estimate, is presented in Table SW 7-2b. Table SW 7-2b also identifies the estimated FTE impact for each year beginning in 2014 for the particular activity. For many activities, no added FTEs are shown in Table SW 7-2a. For these activities, it was assumed that the effort required for the new NPDES permit is not substantively different from the current program to warrant increases in FTE's. City staff helped provide input on these tables. It should be noted that these are estimates based upon past City of Monroe experiences and that of other jurisdictions, where information was available. The future effort that is required may vary from this estimate and be less or more. Follows is a brief discussion for those activities that are projected to require additional FTEs and/or funding.

- <u>IDDE.</u> The new requirements will generally result in the increased need for field screening to identify illicit discharges and then an expanded program to perform tracing the illicit discharges, characterize them, and then the work to eliminate them. The estimate includes an assumption that the City will develop its field screen methodology in 2015 and begin implementing it in late 2015 or 2016. By December, 31 2017, the City must have 40% of the system screened, and then 12% annually thereafter.

- <u>New Development, Redevelopment, and Construction Sites.</u> There are several activities for new development and redevelopment that will increase based on the new permit requirements. These are described as follows (the bulleted titles below batch those in Tables SW 7-2a&b):
  - Review Stormwater Site Plans. While this has been occurring as a part of the current program, it is anticipated that this activity will more time consuming for City staff under the new permit requirements. This is largely because of the new standards for on-site LID requirements and that the City will need to become familiar with them.

- Inspect/Enforce for Erosion and Sediment Control. Similar to reviewing stormwater site plans, the City has been doing erosion and sediment control inspection under the current program. However, the City enforcement and taking greater actions when individual site's erosion and sediment control are not performing adequately can be improved. The estimate for the increased effort includes both time for increased frequency of inspections, and working with developers to maintain proper controls.
- Inspect/Enforce for Proper Construction of (permanent) stormwater BMPs and Maintenance Agreements. The projected increase in effort for proper inspection of permanent stormwater BMPs (quantity and quality) is due to the greater requirements for LID and on-site stormwater BMPs. New development and redevelopment sites will physically have more individual BMPs including LID and conventional pond/quantity control compared to current sites so there will be a need for more inspection. There will also be additional City staff effort to properly ensure that maintenance agreements are recorded.
- Annual Inspections of Private Facilities Approved after August 15, 2009. The projected increase for annual inspections for privately constructed BMPs including an initial additional effort as well as an increase from year to year because of future growth. The reason for the initial increase is due to added number for BMPs on individual sites (resulting from more LID BMPs) and for City staff to become accustomed to the inspection requirements for new LID BMPs.
- Inspect All Facilities (including catch basins) in New Residential Projects Every 6 Months Until 90% of the Lots are Constructed/Stabilized. This activity is projected to increase because the City has not been performing these inspections every 6 months under the current program.
- Enforce Timely Maintenance of Private Stormwater BMPs. When performing the annual inspections, the City will need to follow up with enforcement for those BMPs not being adequately maintained. It is projected that this activity will require increased City staff time compared to the current program. It was assumed that half of the additional time would be for Operation and Maintenance staff and the other half for Design and Construction Staff. Enforcement of private stormwater facility BMP maintenance was also discussed as a separate policy questions above.

Although not considered as a significant cost impact on the Stormwater program, the City will be required to adopt updated drainage design standards (the future 2012 Manual, or amended version).

- <u>Compliance with TMDLs</u>. There are three main activities that are projected to require additional staff time over the current program.
  - Implement Source Control Identification and Elimination. While the City already has an ongoing sampling program, it will need to be enhanced by performing additional monitoring and source identification in a high priority area.
  - Implement Corrective Actions for Bacterial Sources Found. The permit requires that bacterial sources found be corrected according to schedules in the NPDES permit. It is projected that additional staff time will be needed to address these source over the current program.
  - Monitoring and Narrative Evaluation of Data. The City has been conducting sampling on a monthly basis at several locations, however the sampling at times has not been continuous. It is projected that this will required additional staff time, to

ensure the monthly sampling is continuous and that the City begin to perform evaluation of the data and summarize its findings to Ecology's Environmental Information Management (EIM) database.

- Stormwater Management Program Reporting and Coordination. One emphasis of the new permit is to require documentation of the internal City coordination efforts between the various City departments/staff for permit compliance. The initial documentation is due to Ecology on 3/31/2015.

- Stormwater Monitoring. As described in Section SW 6.3.6, there are new monitoring requirements and the City is electing to participate in Ecology's regional water quality monitoring program, which costs are shared amongst the permittees. These costs are as follows:
  - Status and Trends Monitoring - $4,073/yr
  - Effectiveness Monitoring - $4,786/yr
  - Source Identification and Diagnostic Monitoring - $629/yr

As noted above Table SW 7-2b includes timing of permit implementation and the projected increase of FTEs between 2014-2018. The overall total projected increase in FTEs is generally consistent from 2015-2018, showing an increase of 1.55 FTE to 1.57 FTE needed. Based on these results, it indicates that the City should attempt to hire the additional FTEs as soon as possible in 2015, after which the City should be adequately staffed through the rest of the permit term. In Summary, a comparison of the current stormwater program and future recommended program is presented in Table SW 7-3.

Table SW 7-1 Future Stormwater Maintenance Program and Operations and Maintenance Activities

	Monroe Task # (2013)	Maintenance Activity	Units to be Maintained or Installed	Production Unit	Hours/ Year	Daily Production	Crew Size	Units Processed per Year	Years to Process all Units	Freq. (times/yr)	Annual Person Days[2]	Full-time Labor Equiv.[1]	Labor Cost[3]	Annual Cost	Current 2013 Program FTE	Additional FTE	Additional Non-Labor Cost
Cleaning and Inspection	497	Catch Basin Cleaning	1917	Each	219	35	3	959	2	0.50	82	0.44	$43,747	$43,747	0.31	0.13	
	477	Inspection[1]	1917	Each	0	100	2	0	0	0.00	0	0.00	$ -	$ -	0.03	-0.03	
	492	Ditch Clearing - Vegetation Control & Sediment Removal[7]	77,334	LF	104	1610	3.75	20936	4	0.27	49	0.26	$25,958	$25,958	0.26		
	N/A	Street Sweeping	49	Mile	1250	3.8	1	594	0.08	12	156	0.83	$83,200	$83,200	0.83		
	487	Filter Maintenance	30	Each	24	10	3	30	1	1.00	9	0.05	$4,792	$4,792	0.02	0.03	
	489	Clean Control Structures and Oil/Water Separator	36	Each	36	8	3	36	1	1.00	14	0.07	$7,188	$7,188	0.02	0.05	
	488	Storm Retention Pond-Swale Maintenance	2.7	Mile	144	0.15	3	2.70	1	1.00	54	0.29	$28,754	$28,754	0.04	0.25	
	490, 491	Culvert Jetting & Vactoring	21	Each	15	2	3	3.75	6	0.18	6	0.03	$2,995	$2,995	0.03		
	486, 494	Clean Pipes	50	Mile	165	0.5	3	10.3	5	0.21	62	0.33	$32,947	$32,947	0.33		
	485	Clean Retention Ponds - Annual Vegetation Maintenance and Inspection	15	Each	60	2	2	15	1	1.00	15	0.08	$7,987	$7,987	0.08		

Table SW 7-1 Future Stormwater Maintenance Program and Operations and Maintenance Activities

	Monroe Task # (2013)	Maintenance Activity	Units to be Maintained or Installed	Production Unit	Hours/ Year	Daily Production	Crew Size	Units Processed per Year	Years to Process all Units	Freq. (times/yr)	Annual Person Days[2]	Full-time Labor Equiv.[1]	Labor Cost[3]	Annual Cost	Current 2013 Program FTE	Additional FTE	Additional Non-Labor Cost
Cleaning and Inspection (cont.)	485	Clean Retention Ponds - Large Scale Vegetation Maintenance (every 3yrs +/-)	15	Each	120	1	4	15	1	1.00	60	0.32	$31,949	$31,949	0.13	0.19	
	484	Clean Retention Ponds - Sediment Management	15	Each	160	0.8	4	15	1	1.00	80	0.43	$42,598	$42,598	0.08	0.35	
	N/A	Cleaning/Inspection/Other Non-Specific activities	-	-	-	-	-	-	-	-	225	1.20	$119,808	$119,808	1.20		
	New	Clean/Maintain Underground Detention Vaults	9	Each	36	2	3	9	1	1.00	13.5	0.07	$7,188	$7,188	0	0.07	
Repair and Replacement[5]	493	Storm Mainline Repairs	264,000	LF	15	150	6	281	Not Applicable	Not Applicable	11	0.06	$5,990	$5,990	0.06		
	495	Storm Manhole Repairs	604	Each	10	1	3	1	Not Applicable	Not Applicable	4	0.02	$1,997	$1,997	0.02		
	496	Storm Outfall/Weir Repairs	319	Each	5	1	3	1	Not Applicable	Not Applicable	2	0.01	$998	$998	0.01		
	498	Catch Basin Repairs	1917	Each	4	1	4	0	Not Applicable	Not Applicable	2	0.01	$998	$998	0.01		
	502	Catch Basin Installs	1	Each	2	1	4	0.23	Not Applicable	Not Applicable	1	0.01	$499	$499	0.01		
NPDES Compliance	503	NDDES Overhead[9]	-	-	-	-	-	-	-	-	11	0.06	$5,990	$5,990	0.04	0.02	
	504	NPDES Stormwater Quality Monitoring[10]	-	-	-	-	-	-	-	-	17	0.09	$8,986	$8,986	0.09		$9,488
	505	NPDES IDDE	-	-	-	-	-	-	-	-	46	0.24	$24,294	$24,294	0.11	0.13	
	506	NPDES Stormwater Facility Inspection	-	-	-	-	-	-	-	-	82	0.44	$43,597	$43,597	0.09	0.35	
	507	NPDES Public Education and Outreach	-	-	-	-	-	-	-	-	32	0.17	$16,973	$16,973	0.17		

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Table SW 7-1 Future Stormwater Maintenance Program and Operations and Maintenance Activities

	Monroe Task # (2013)	Maintenance Activity	Units to be Maintained or Installed	Production Unit	Hours/ Year	Daily Production	Crew Size	Units Processed per Year	Years to Process all Units	Freq. (times/yr)	Annual Person Days[2]	Full-time Labor Equiv.[1]	Labor Cost[3]	Annual Cost	Current 2013 Program FTE	Additional FTE	Additional Non-Labor Cost
NPDES Compliance (cont.)	508	NPDES Reporting and Record Keeping	-	-	-	-	-	-	-	-	24	0.13	$12,513	$12,513	0.11	0.01	
	509	NPDES Training[11]	-	-	-	-	-	-	-	-	15	0.08	$7,987	$7,987	0.02	0.06	
	510	TMDL Overhead	-	-	-	-	-	-	-	-	22	0.12	$11,648	$11,648	0.01	0.11	
	511	TMDL Sampling[4]	-	-	-	-	-	-	-	-	8	0.09	$9,318	$10,318	0.04	0.05	
Facility and Equipment Maintenance and Repair	Fund 520	Equipment Maint/Repair & Vehicle Maint	-	-	-	-	-	-	-	-	-	-	-	$279,000	-	-	-
	Fund 530	Facility Maintenance	-	-	-	-	-	-	-	-	-	-	-	$47,000	-	-	-
Management and Administrative	Fund 001	Administration Fees[6]	-								-	-	-	$89,457	-		
	512	Stormwater Capital Construction	-								2	0.01	$998	$998	0.01		
	499	Citizen Concerns	-								24	0.13	$12,979	$12,979	0.13		
	474	Maint Crew Administrative Tasks	-								146	0.78	$77,875	$77,875	0.78		
	476	Stormwater Plan Review	-								19	0.10	$9,984	$9,984	0.05	0.05	
	470, 478	Stormwater Disaster Response and Recovery	-								0	0.00	$100	$100	0.00		

Table SW 7-1 Future Stormwater Maintenance Program and Operations and Maintenance Activities

	Monroe Task # (2013)	Maintenance Activity	Units to be Maintained or Installed	Production Unit	Hours/ Year	Daily Production	Crew Size	Units Processed per Year	Years to Process all Units	Freq. (times/yr)	Annual Person Days[2]	Full-time Labor Equiv.[1]	Labor Cost[3]	Annual Cost	Current 2013 Program FTE	Additional FTE	Additional Non-Labor Cost
Management and Administrative (cont.)	480	GPS - Storm Field	-								4	0.02	$1,997	$1,997	0.02		
	481	GPS - Storm Office	-								38	0.20	$19,968	$19,968	0.45	-0.25	
	482	Storm - Potholes and Utility Locates	-								2	0.01	$998	$998	0.01		
	483	Stormwater Training (non NPDES)	-								2	0.01	$998	$998	0.01		
	501	Weather Station	-								2	0.01	$998	$998	0.01		
	508	Coordination with Other Agencies	-								5	0.03	$2,796	$2,796	0.03		
	N/A	Director	-									0.05	$8,056	$8,056	0.05		
	N/A	Manager	-									0.18	$26,056	$26,056	0.18		
	N/A	Supervisor	-									0.37	$43,109	$43,109	0.37		
	N/A	French Creek	-											$97,000			
	N/A	Administrative Assistance	-									0.13	$12,259	$12,259	0.13		

Table SW 7-1 Future Stormwater Maintenance Program and Operations and Maintenance Activities

	Monroe Task # (2013)	Maintenance Activity	Units to be Maintained or Installed	Production Unit	Hours/ Year	Daily Production	Crew Size	Units Processed per Year	Years to Process all Units	Freq. (times/yr)	Annual Person Days[2]	Full-time Labor Equiv.[1]	Labor Cost[3]	Annual Cost	Current 2013 Program FTE	Additional FTE	Additional Non-Labor Cost
	Field Crew Labor Subtotal (Cleaning & Inspection and Repair & Replacement)			(rounded to nearest $1,000)									**4.50**		**$450,000**	**1.04**	
	NPDES Compliance			(rounded to nearest $1,000)									**1.42**		**$152,000**	**0.73**	
	Facility and Equipment Maintenance and Repair			(rounded to nearest $1,000)								**-**			**$326,000**		
	Management and Admin Labor Subtotal			(rounded to nearest $1,000)									**2.03**		**$406,000**	**-0.20**	
	Total			(rounded to nearest $1,000)									**7.95**		**$1,334,000**	**1.57**	

Notes:

1) City plans to simply clean CBs on routine basis rather than separate inspection program.
2) Annual Person Day for activity based on field crew staff availability for field work of 1,500 hrs/year.
3) Labor costs based on average wage of $32.50/hr + $15.50 (for benefits), or $48/hr.
4) Total Annual cost includes $1,000 in sampling non-labor costs.
5) These system repairs and new installs are for projects < $65k. When projects are greater, they are implemented as part of the CIP.
6) Stormwater Utility's portion of Administrative Fees and IT fees (averaged 2012-2014).
7) For simplicity, table does not reflect that a portion of ditch vegetation maintenance funded out of general fund.
8) While there are some additional mapping needed for NPDES, the City's mapping is largely complete, so it is assumed this activity will decrease by approximately 0.25 FTE.
9) The effort spent on NPDES overhead is assumed to increase by 50% for non-specific activities.
10) Current program labor assumed to be the same. Added Cost is non-labor for payments to Ecology for regional monitoring.

The effort towards training is estimated to increase by 3 weeks for various NPDES programs (IDDE, development review, inspection, etc.)

Table SW 7-2a Western Washington Phase II Municipal Stormwater Permit
City of Monroe Stormwater System Utility
NPDES Requirements and Associated City Staffing

Activities	Permit Reference	Deadline	Public Works Division	Existing Hours - FTE	Estimated Additional Hours				
				2013	2014	2015	2016	2017	2018
Public Education, Outreach, Involvement, and Participation				**0.17**					
Provide education and outreach program including:			Operations & Maintenance						
Implement or participate in an education and outreach program to targeted audiences	S5.C.1.a	Annual	Operations & Maintenance		-	-	-	-	-
Create Stewardship opportunities to encourage residents to participate (e.g., stream teams, storm drain stenciling)	S5.C.1.b	Annual	Operations & Maintenance		-	-	-	-	-
Measure understanding/adoption of targeted behaviors for at least 1 audience in at least 1 subject area	S5.C.1.c	2/2/2016	Operations & Maintenance		-	-	-	-	-
Provide public involvement and participation program including:			Operations & Maintenance		-	-	-	-	-
Provide for Public Involvement and Participated in SWMP decision making process	S5.C.2.a	Annual	Operations & Maintenance		-	-	-	-	-
Post SWMP Plan and Annual Report on City Website	S5.C.2.b	Annually on 5/31	Operations & Maintenance		-	-	-	-	-
Illicit Discharge (Part Public Outreach, GIS, and Field Work)				**0.67**					
Fully implement ongoing illicit discharge detection and elimination program including:	S5.C.3	Ongoing	Operations & Maintenance		-	-	-	-	-
Map MS4 (ongoing and periodic updates)	S5.C.3.a.	Ongoing	Operations & Maintenance		-0.25	-0.25	-0.25	-0.25	-0.25
Map Outfalls , receiving waters, & public mitigation strategies	S5.C.3.a.i-iii	Ongoing	Operations & Maintenance		-	-	-	-	-
Map conveyances (>24")(type and material) and tributary areas (size, land use)	S5.C.3.a.i-iv	Ongoing	Operations & Maintenance		-	-	-	-	-
Map all new connections authorized since 2/16/2007	S5.C.3.a.v	Ongoing	Operations & Maintenance		-	-	-	-	-
Map areas that do not discharge to surface waters	S5.C.3.a.vi	Ongoing	Operations & Maintenance		-	-	-	-	-
Provide map to Ecology, Tribes & other MS's upon request	S5.C.3.a.vii-viii	Ongoing	Operations & Maintenance		-	-	-	-	-
IDDE Ordinance and Escalative Enforcement SOP	S5.C.3.b.i-iv	2/2/2018	Operations & Maintenance		-	-	-	-	-
IDDE Compliance Strategy (incl. education, tech assistance, require BMPs & Maintenance)	S5.C.3.b.v	Meet response time lines in Permit	Operations & Maintenance		-	-	-	-	-
Illicit Discharge / Connection Ongoing Program, including:	S5.C.3.c	Ongoing	Operations & Maintenance		-	-	-	-	-
Field Screening methodology (per CPW 2004)(describe in Annual Report)	S5.C.3.c.i	12/31/2017	Operations & Maintenance		-	-	-	-	-
Field Screen 40% of MS4 by 12/31/17, then 12% annually thereafter	S5.C.3.c.i	12/31/2017	Operations & Maintenance		0	0.08	0.05	0.05	0.05
Publically listed spill / discharge report hotline	S5.C.3.c.ii	Ongoing	Operations & Maintenance		-	-	-	-	-
Training (ongoing) for all field staff (identification, reporting, and response)	S5.C.3.c.iii	Ongoing	Operations & Maintenance		-	-	-	-	-
IDDE Education (public employees, businesses, and general public)	S5.C.3.c.iv	Ongoing	Operations & Maintenance		-	-	-	-	-
Illicit Discharge / Connection elimination program, including	S5.C.3.d	Ongoing	Operations & Maintenance		0	0.08	0.08	0.08	0.08
Procedures to characterize, trace, & eliminate spills/illicit connections	S5.C.3.d.i-iii	Ongoing	Operations & Maintenance		-	-	-	-	-
Compliance: Meet timelines for response, investigations, & elimination	S5.C.3.d.iv	Meet response time lines in Permit	Operations & Maintenance		-	-	-	-	-

Table SW 7-2a Western Washington Phase II Municipal Stormwater Permit
City of Monroe Stormwater System Utility
NPDES Requirements and Associated City Staffing

Activities	Permit Reference	Deadline	Public Works Division	Existing Hours - FTE	Estimated Additional Hours				
				2013	2014	2015	2016	2017	2018
Training (ongoing) for IDDE staff	S5.C.3.e	Ongoing	Operations & Maintenance		-	-	-	-	-
Recordkeeping: Track all permit IDDE activities	S5.C.3.f	Ongoing	Operations & Maintenance		-	-	-	-	-
New Development, Redevelopment, and Construction Sites				**0.18**					
Develop/implement/enforce program to reduce pollutants in stormwater runoff from new development, redevelopment, and construction site activities	S5.C.4	Ongoing	Design & Construction		-	-	-	-	-
Ordinance for development, re-development, Construction	S5.C.4.a	12/31/2016	Design & Construction		-	-	-	-	-
Adopt Appendix 1 (or equiv) Standards	S5.C.4.a.i	12/31/2016	Design & Construction		-	-	-	-	-
Adopt Ecology 2012 SWMMWW (or equiv.)	S5.C.4.a.ii	12/31/2016	Design & Construction		-	-	-	-	-
Include legal authority to inspect & enforce the construction and maintenance standards via approval process	S5.C.4.a.iii	12/31/2016	Design & Construction		-	-	-	-	-
Permitting process (for project meeting minimum thresholds)	S5.C.4.b	Ongoing	Design & Construction		-	-	-	-	-
Review all stormwater site plans	S5.C.4.b.i	Ongoing	Design & Construction		0	0.05	0.05	0.05	0.05
Pre-inspection of sites with high sediment loss potential (per Appendix 7)	S5.C.4.b.ii	Ongoing	Design & Construction		-	-	-	-	-
Inspect / Enforce for Erosion and Sediment Control (ESC)	S5.C.4.b.iii	Ongoing	Design & Construction		0	0.05	0.05	0.05	0.05
Inspect / Enforce for proper construction of BMPs, maintenance agreement completed and assigned	S5.C.4.b.iv	Ongoing	Design & Construction		0	0.07	0.07	0.07	0.07
Compliance: Demonstrate completion (> or equal 80% of (ii)-(iv) above	S5.C.4.b.v	Ongoing	Design & Construction		-	-	-	-	-
Enforcement Strategy to be implement to address issues of non-compliance	S5.C.4.b.vi	Ongoing	Design & Construction		-	-	-	-	-
Ordinance establishing long-term O&M, including Inspection & Enforcement	S5.C.4.c.i	12/31/2016	Design & Construction		-	-	-	-	-
Ordinance establishing long-term O&M (per 2012 SWMMWW Chapter 4 Vol. V (or equiv.)	S5.C.4.c.ii	12/31/2016	Design & Construction		-	-	-	-	-
Annual inspection of private facilities approved after 8/15/09	S5.C.4.c.iii	Annually	Operations & Maintenance		0	0.11	0.12	0.13	0.15
Inspect all facilities (incl. catch basins) in new residential projects every 6 months until 90% of lots constructed/fully stabilized.	S5.C.4.c.iv	Every 6 mo. Till 90% stabilized	Design & Construction		0	0.03	0.03	0.03	0.03
Compliance: Demonstrate completion (> or equal to 80% of (iii) - (iv) above)	S5.C.4.c.v	Annually	Design & Construction		-	-	-	-	-
Enforce timely maintenance of private stormwater facilities	S5.C.4.c.vi	Meet response time lines in Permit	Operations & Maintenance		0	0.03	0.03	0.03	0.03
			Design & Construction		0	0.03	0.03	0.03	0.03
Recordkeeping: SOP for tracking all inspection & enforcement activity	S5.C.4.c.vii	Annually	Design & Construction		-	-	-	-	-
Make available Ecology's "NOI" for Construction Activity and Industrial Activity	S5.C.4.d	Ongoing	Design & Construction		-	-	-	-	-
Train all applicable staff on above activities. Track the training.	S5.C.4.e	Ongoing	Operations & Maintenance		-	-	-	-	-
Revise all development-related enforceable documents (i.e., codes, rules, standards, etc.) to incorporate and require LID. Implement.	S5.C.4.f.i	12/31/2016	Design & Construction		-	-	-	-	-
Submit Summary of Results of LID update process	S5.C.4.f.ii	3/31/2017	Design & Construction		-	-	-	-	-
Watershed-Scale stormwater planning: Not Applicable to Monroe (no Phase 1 Partner)	S5.C.4.g	N/A			-	-	-	-	-

Table SW 7-2a Western Washington Phase II Municipal Stormwater Permit
City of Monroe Stormwater System Utility
NPDES Requirements and Associated City Staffing

Activities	Permit Reference	Deadline	Public Works Division	Existing Hours - FTE	Estimated Additional Hours				
				2013	2014	2015	2016	2017	2018
Municipal Operation and Maintenance (See Table SW 7-1 for added FTEs)				**4.16**	**1.04**	**1.04**	**1.04**	**1.04**	**1.04**
Develop and implement O&M plan, including:	S5.C.5	Ongoing	Operations & Maintenance		-	-	-	-	-
Establish maintenance standards equal or better than 2012 Ecology Manual, Volume 5, Chapter 4 (or equiv.)	S5.C.5.a	12/31/2016	Operations & Maintenance		-	-	-	-	-
If standards call for maintenance, then do so in timely manner	S5.C.5.a.i-ii	Meet response time lines in Permit	Operations & Maintenance		-	-	-	-	-
Annual inspection of all public treatment & flow control BMPs/facilities	S5.C.5.b	Annual	Operations & Maintenance		-	-	-	-	-
Municipal Operation and Maintenance (See Table SW 7-1 for added FTEs) (Continued)									
Spot check of BMPs/Facilities after > or equal to 10-year 24-hr storm	S5.C.5.c	Ongoing	Operations & Maintenance		-	-	-	-	-
Inspect all catch basins by 8/1/17, then every 2 years after. Clean per standard. Adhere to Appendix 6 - Street Waste disposal.	S5.C.5.d	8/1/2017	Operations & Maintenance		-	-	-	-	-
Compliance: Demonstrate completion (> or equal to 90% of (b) - (d) above	S5.C.5.e	Ongoing	Operations & Maintenance		-	-	-	-	-
Establish and implement policies/practices to reduce pollutants in discharges from Permittee owned or maintained land (parks, open space, road right-of-way, maintenance yards, stormwater treatment and flow facilities), covering: fertilizer, pesticide, and herbicide application; nutrient management plan; integrated pest management plan; sediment and erosion control; landscape maintenance and vegetation disposal; trash management; building exterior cleaning and maintenance	S5.C.5.f	2/2010	Operations & Maintenance		-	-	-	-	-
Training (ongoing) on Stormwater SOPS to all O&M employees. Training shall be documented.	S5.C.5.g	Ongoing	Operations & Maintenance		-	-	-	-	-
SWPPPs for all heavy equipment and material storage/handling yards (not covered under Industrial Stormwater General Permit). A schedule for implementation of Structural BMPs shall be included in the SWPPP. SWPPP shall include periodic visual observations.	S5.C.5.h	2/2010	Operations & Maintenance		-	-	-	-	-
Record Keeping: Track inspections, maintenance, and repair activities.	S5.C.5.i	Annual	Operations & Maintenance		-	-	-	-	-
Compliance with TMDLS				**0.05**					
Comply with Appendix 2 requirements. Keep records of all actions relevant to TMDL and report in Annual Report.	S8.A	Ongoing	Operations & Maintenance		-	-	-	-	-
Inspect commercial animal handling areas and commercial composting facilities to ensure implementation of source control BMPs for bacteria (by August 1, 2016). Also implement ongoing inspection program to re-inspect facilities with bacteria source control problems a minimum of every three years.	Appendix 2	Aug 1, 2016 (then every 3 yrs)	Operations & Maintenance		-	-	-	-	-
Implement Public Education and Outreach activities to increase awareness of bacterial pollution problems and promote proper pet waste management behavior.	Appendix 2	Ongoing	Operations & Maintenance		-	-	-	-	-

Table SW 7-2a Western Washington Phase II Municipal Stormwater Permit
City of Monroe Stormwater System Utility
NPDES Requirements and Associated City Staffing

Activities	Permit Reference	Deadline	Public Works Division	Existing Hours - FTE	Estimated Additional Hours				
				2013	2014	2015	2016	2017	2018
Operations & Maintenance: Install and maintain animal waste collection and/or education stations at municipal parks and other applicable Permittee owned and operated lands.	Appendix 2	Ongoing	Operations & Maintenance		-	-	-	-	-
IDDE: Permittee conducting IDDE-related field screening shall screen for bacteria sources in any screened MS4 subbasins which discharge to surface waters in the TMDL area.	Appendix 2	Ongoing	Operations & Maintenance		-	-	-	-	-
Implement Targeted Source Identification & Elimination, including the following;	Appendix 2		Operations & Maintenance		-	-	-	-	-
- Review the fecal coliform data collected under the 2007 Permit to identify a minimum of one high priority area that will be the focus of source identification and elimination efforts during the 2013-2018 permit cycle (and document this with the Annual Report for 2014).	Appendix 2	2/2/2014	Operations & Maintenance		-	-	-	-	-
- Begin to implement source identification and elimination efforts in the high priority identified. Stormwater quality sampling for bacteria sources is required as part of this focused source identification and elimination effort.	Appendix 2	8/1//2014	Operations & Maintenance		0.05	0.05	0.05	0.05	0.05
- For illicit discharges found, Permittees shall implement corrective schedules and activities as specified in the permit.	Appendix 2	Meet response time lines in Permit	Operations & Maintenance		0.00	0.05	0.05	0.05	0.05
- each annual report's TMDL summary shall include qualitative and quantitative information about the source identification and elimination activities, including procedures followed and sampling results, implemented in the selected high priority area(s).	Appendix 2	Annually	Operations & Maintenance		-	-	-	-	-
- Conduct Surface Water Monitoring in accordance with Ecology approved QAPP for continued characterization and long term trends evaluation of fecal coliform. At a minimum, the monitoring program shall: Begin by August 1, 2015; Collect 12 samples in at least one location per calendar year; Submit available data to the Environmental Information Management (EIM) database by May 31 of each year; and Provide data summaries and narrative evaluation of the data in each annual report's TMDL summary.	Appendix 2	8/1/2015, then annually	Operations & Maintenance		0.05	0.05	0.05	0.05	0.05
Stormwater Monitoring									
Document in Annual Report description of monitoring and storm related studies.	S8.A	Annually			-	-	-	-	-
Status and Trends Monitoring: City needs to either contribute to Ecology's regional monitoring effort ($4,073 annually) or implement its own monitoring program meeting Ecology's Option #2 requirements.	S8.B	Opt. #1 - 8/15/14 Opt. #2 - 11/31/14	Operations & Maintenance		-	-	-	-	-
Effectiveness Monitoring: City needs to either contribute $4,786 annually or implement its own Effectiveness studies meeting Ecology's Option #2 requirement	S8.C	Opt. #1 - 8/15/14 Opt. #2 - 10/1/14	Operations & Maintenance		-	-	-	-	-
Source Identification and Diagnostic Monitoring: City needs to contribute $629 annually to the Ecology's regional monitoring effort.	S8.D	8/15/2014	Operations & Maintenance		-	-	-	-	-
Stormwater Management Program Reporting and Coordination (S5 & S9)				**0.11**					
<u>The SWMP document shall:</u>					-	-	-	-	-
- Include written description to inform the public of the planned SWMP activities of	S5.A2	Annually	Operations & Maintenance		-	-	-	-	-

Table SW 7-2a Western Washington Phase II Municipal Stormwater Permit
City of Monroe Stormwater System Utility
NPDES Requirements and Associated City Staffing

Activities	Permit Reference	Deadline	Public Works Division	Existing Hours - FTE	Estimated Additional Hours				
				2013	2014	2015	2016	2017	2018
the upcoming year to meet NPDES requirements, any planned actions to meet applicable TMDLs, and any planned actions to meet monitoring (S8) requirements.									
- Gather, track, and maintain information to evaluate SWMP development, implementation, and permit compliance, including cost of implementation of each program element and number of inspections, enforcement actions and types of public education activities.	S5.A3a&b	Annually	Operations & Maintenance		-	-	-	-	-
The SWMP program shall included coordination among affected entities to encourage coordinated approach on stormwater related activities, projects, and programs.	S5.A5	Annually	Operations & Maintenance		-	-	-	-	-
This shall include a written description of the internal coordination mechanisms in the Annual Report.	S5.A5.b	3/31/2015	Operations & Maintenance		0.03	0.01	0.01	0.01	0.01
Annual Report (per Appendix 3 format - containing a description the status of implementation of the requirement of the permit during the reporting period.) Submit Copy of current SWMP	S9A&D S9.D.1	3/31/2015, then Annually Annually	Operations & Maintenance						
Keep all records related to this permit and the SWMP for a period of 5 year.	S9.B	Annually	Operations & Maintenance						
Make all records related to this permit and SWMP available to the public	S9.C	Annually	Operations & Maintenance						
General NPDES Training (see Table SW 7-1 for added FTEs)	Several		D&C and O&M	0.02	0.06	0.06	0.06	0.06	0.06
General NPDES Overhead (Misc. Support) (See Table SW 7-1 added for FTEs)	Several		Operations & Maintenance	0.04	0.02	0.02	0.02	0.02	0.02
Design & Construction Additional Staff to comply with NPDES requirements only					**0.05**	**0.25**	**0.25**	**0.25**	**0.25**
Operations & Maintenance Additional Staff to comply with NPDES requirements only					**0.97**	**1.30**	**1.29**	**1.30**	**1.32**
Total additional staff to comply with NPDES requirements only					**1.02**	**1.55**	**1.54**	**1.55**	**1.57**

Table SW 7-2b Western Washington Phase II Municipal Stormwater Permit
City of Monroe Stormwater System Utility
Estimates of New/Added Efforts to Meet 2013-2018 Permit[1]

Activities	Permit Reference	Deadline	Public Works Division	Year	Annual Effort (hrs)[2]	No. Staff on this Activity	Total Hours	FTE	Non-Labor Costs
Public Education, Outreach, Involvement, and Participation[3]									
Illicit Discharge (Part Public Outreach, GIS, and Field Work)									
Field Screen 40% of MS4 by 12/31/17, then 12% annually thereafter	S5.C.3.c.i	12/31/2017	Operations & Maintenance	2014					
				2015	120	1	120	0.08	
				2016	80	1	80	0.05	
				2017	80	1	80	0.05	
				2018	80	1	80	0.05	
Illicit Discharge / Connection elimination program, including tracing, characterize, and eliminate illicit connections	S5.C.3.d	Ongoing	Operations & Maintenance	2014					
				2015	120	1	120	0.08	
				2016	120	1	120	0.08	
				2017	120	1	120	0.08	
				2018	120	1	120	0.08	
New Development, Redevelopment, and Construction Sites									
Review all Stormwater Site Plans	S5.C.4.b.i	Ongoing	Design & Construction	2014					
				2015	80	1	80	0.05	
				2016	80	1	80	0.05	
				2017	80	1	80	0.05	
				2018	80	1	80	0.05	
Inspect / Enforce for Erosion and Sediment Control (ESC)	S5.C.4.b.iii	Ongoing	Design & Construction	2014					
				2015	80	1	80	0.05	
				2016	80	1	80	0.05	
				2017	80	1	80	0.05	
				2018	80	1	80	0.05	
Inspect / Enforce for proper construction of BMPs, maintenance agreement completed and assigned	S5.C.4.b.iv	Ongoing	Design & Construction	2014					
				2015	100	1	100	0.07	
				2016	100	1	100	0.07	
				2017	100	1	100	0.07	
				2018	100	1	100	0.07	

Table SW 7-2b Western Washington Phase II Municipal Stormwater Permit
City of Monroe Stormwater System Utility
Estimates of New/Added Efforts to Meet 2013-2018 Permit[1]

Activities	Permit Reference	Deadline	Public Works Division	Year	Annual Effort (hrs)[2]	No. Staff on this Activity	Total Hours	FTE	Non-Labor Costs
Annual inspection of private facilities approved after 8/15/09	S5.C.4.c.iii	Annually	Operations & Maintenance	2014				0	
				2015	160	1	160	0.11	
				2016	180	1	180	0.12	
				2017	200	1	200	0.13	
				2018	220	1	220	0.15	
Inspect all facilities (incl. catch basins) in new residential projects every 6 months until 90% of lots constructed/fully stabilized.	S5.C.4.c.iv	Every 6 mo. Till 90% stabilized	Design & Construction	2014					
				2015	40	1	40	0.03	
				2016	40	1	40	0.03	
				2017	40	1	40	0.03	
				2018	40	1	40	0.03	
Enforce timely maintenance of private stormwater facilities	S5.C.4.c.vi	Meet response time lines in Permit	Operations & Maintenance/Design & Construction						
			Operations & Maintenance	2014					
				2015	40	1	40	0.03	
				2016	40	1	40	0.03	
				2017	40	1	40	0.03	
				2018	40	1	40	0.03	
			Design & Construction	2014					
				2015	40	1	40	0.03	
				2016	40	1	40	0.03	
				2017	40	1	40	0.03	
				2018	40	1	40	0.03	

Table SW 7-2b Western Washington Phase II Municipal Stormwater Permit
City of Monroe Stormwater System Utility
Estimates of New/Added Efforts to Meet 2013-2018 Permit[1]

Activities	Permit Reference	Deadline	Public Works Division	Year	Annual Effort (hrs)[2]	No. Staff on this Activity	Total Hours	FTE	Non-Labor Costs
Municipal Operation and Maintenance (See Table SW 7-1 for added FTEs)									
Compliance with TMDLS									
- Begin to implement source identification and elimination efforts in the high priority identified. Stormwater quality sampling for bacteria sources is required as part of this focused source identification and elimination effort.	Appendix 2	8/1//2014	Operations & Maintenance	2014	80	1	80	0.05	
				2015	80	1	80	0.05	
				2016	80	1	80	0.05	
				2017	80	1	80	0.05	
				2018	80	1	80	0.05	
- For illicit discharges found, Permittees shall implement corrective schedules and activities as specified in the permit.	Appendix 2	Meet response time lines in Permit	Operations & Maintenance	2014					
				2015	80	1	80	0.05	
				2016	80	1	80	0.05	
				2017	80	1	80	0.05	
				2018	80	1	80	0.05	
- Conduct Surface Water Monitoring in accordance with Ecology approved QAPP for continued characterization and long term trends evaluation of fecal coliform. At a minimum, the monitoring program shall: Begin by August 1, 2015; Collect 12 samples in at least one location per calendar year; Submit available data to the Environmental Information Management (EIM) database by May 31 of each year; and Provide data summaries and narrative evaluation of the data in each annual report's TMDL summary.	Appendix 2	8/1/2015, then annually	Operations & Maintenance	2014	80	1	80	0.05	
				2015	80	1	80	0.05	
				2016	80	1	80	0.05	
				2017	80	1	80	0.05	
				2018	80	1	80	0.05	

Table SW 7-2b Western Washington Phase II Municipal Stormwater Permit
City of Monroe Stormwater System Utility
Estimates of New/Added Efforts to Meet 2013-2018 Permit[1]

Activities	Permit Reference	Deadline	Public Works Division	Year	Annual Effort (hrs)[2]	No. Staff on this Activity	Total Hours	FTE	Non-Labor Costs
Stormwater Monitoring									
Document in Annual Report description of monitoring and storm related studies.	S8.A	Annually							
Status and Trends Monitoring: City needs to either contribute to Ecology's regional monitoring effort ($4,073 annually) or implement its own monitoring program meeting Ecology's Option #2 requirements.	S8.B	Opt. #1 - 8/15/14 Opt. #2 - 11/31/14	Operations & Maintenance	Annually					$4,073
Effectiveness Monitoring: City needs to either contribute $4,786 annually or implement its own Effectiveness studies meeting Ecology's Option #2 requirement	S8.C	Opt. #1 - 8/15/14 Opt. #2 - 10/1/14	Operations & Maintenance	Annually					$4,786
Source Identification and Diagnostic Monitoring: City needs to contribute $629 annually to the Ecology's regional monitoring effort.	S8.D	8/15/2014	Operations & Maintenance	Annually					$629
Stormwater Management Program Reporting and Coordination (S5 & S9)									
- 'This shall include a written description of the internal coordination mechanisms in the Annual Report.	S5.A5.b	3/31/2015	Operations & Maintenance	2014	40	1	40	0.03	
				2015	20	1	20	0.01	
				2016	20	1	20	0.01	
				2017	20	1	20	0.01	
				2018	20	1	20	0.01	

Notes:
1) The activities listed above are only those activities from Table SW 7-2a where there would be fairly significant increase in effort under the new permit.
2) Estimates are approximate and rounded to nearest 20 hrs/yr.
3) The current Public Education, Outreach, Involvement, and Participation program is robust and is not anticipated to require significant increases in effort.

Table SW 7-3 Summary Comparison of Current and Future Operations and Maintenance Program						
Description	**Current Program**		**Future Program**		**Recommended Increases**	
	FTE	**Cost**	**FTE**	**Cost**	**FTE**	**Cost**
Field Crew Labor Subtotal (Cleaning & Inspection and Repair & Replacement)	3.47	$346,000	4.50	$450,000	1.04	$104,000
NPDES Compliance	0.68	$69,000	1.42	$152,000	0.73	$83,000
Facility and Equipment Maintenance and Repair	-	$326,000	-	$326,000	-	$0
Management and Admin Labor Subtotal	2.23	$426,000	2.03	$406,000	-0.20	-$20,000
Total	6.38	$1,167,000	7.95	$1,1334,000	1.57	$167,000

7.4 Future Program Needs Considering Annexations

As noted previously, the City currently encompasses a total area of approximately 6.11 square miles. The potential area, if the City expands to encompass all of the area within its urban growth boundary, is 7.67 square miles. This equates to roughly 1,000 acres of potential expansion or about a 25 percent increase. This will not occur at once, but will occur over a series of annexations. This section provides both an estimate of the ultimate program staffing and funding level based on the assumption of City expansion to the full UGB as well as an estimate of the incremental staffing increases in FTEs that should be considered as smaller annexations occur.

The estimate for future needs under the scenario that the City expands to the UGB is presented in Table SW 7-4. Several broad assumptions are noted in the table. The main assumption for planning purposes is that the infrastructure quantities to be maintained would be roughly proportional to the increase in corporate area. This may overestimate infrastructure quantities initially, however, as the annexed area would start to develop, additional infrastructure would follow, so the assumption is believed to be reasonable. Another assumption is that maintenance frequencies would be in accordance with the 2013-2018 permit requirements. Another assumption is that it is based upon current land use conditions within the existing City boundary. That is, it does not include estimated increases for full built out of all land uses (i.e., that properties are developed to their maximum allowable zoning).

Overall a project increase of 1.8 FTE (rounded to 2.0 FTE) over the future NPDES compliant program was projected. This would be an increase of 3.4 FTEs over the currently staffed program. Because City expansion will occur through a number of small annexations rather than all at once, it is recommend to establish guidance about adding FTEs when the City achieves certain annexation area thresholds. Based on an overall increase of 2.0 FTEs for roughly 1,000 acres, it is recommended that the City consider adding 0.25 FTE for every 250 acres annexed. As this this is only a fraction of a full hire, the likely scenario would be that the Utility would need to share a portion of the hire with other City departments or programs. Table SW 7-5 presents an overall comparison of the existing program, future program meeting NPDES requirements, and a future program scenario with City expansion to the full UGB.

Table SW 7-4 Future Stormwater Maintenance Program and Operations and Maintenance Activities for Full Built-Out UGA

	Monroe Task # (2013)	Maintenance Activity	Units to be Maintained or Installed	Production Unit	Hours/ Year	Daily Production	Crew Size	Units Processed per Year	Years to Process all Units	Freq. (times/yr)	Annual Person Days[2]	Full-time Labor Equiv.[1]	Labor Cost[3]	Annual Cost	NPDES Compliant Program FTE	Additional FTE
Cleaning and Inspection	497	Catch Basin Cleaning[1]	2396	Each	274	35	3	1198	2	0.50	103	0.55	$54,684	$54,684	0.44	0.11
	477	Inspection[1,2]	2396	Each	0	100	2	0	0	0.00	0	0.00	$ -	$ -	0.00	0.00
	492	Ditch Clearing - Vegetation Control & Sediment Removal[1,7]	96,668	LF	130	1610	3.75	26100	4	0.27	61	0.32	$32,361	$32,361	0.26	0.06
	N/A	Street Sweeping[1]	61	Miles	1563	4	1	742	0.08	12	195	1.04	$104,000	$104,000	0.83	0.21
	487	Filter Maintenance[1]	38	Each	30	10	3	38	1	1.00	11	0.06	$5,990	$5,990	0.05	0.01
	489	Clean Control Structures and Oil/Water Separator[1]	45	Each	45	8	3	45	1	1.00	17	0.09	$,986	$,986	0.07	0.02
	488	Storm Retention Pond-Swale Maintenance[1]	3.38	Mile	180	0.15	3	3.4	1	1.00	68	0.36	$35,942	$35,942	0.29	0.07
	490, 491	Culvert Jetting & Vactoring[1]	26.3	Each	19	2	3	4.7	6	0.18	7	0.04	$3,744	$3,744	0.03	0.01
	486, 494	Clean Pipes[1]	62.5	mile	206	0.5	3	12.9	5	0.21	77	0.41	$41,184	$41,184	0.33	0.08

Table SW 7-4 Future Stormwater Maintenance Program and Operations and Maintenance Activities for Full Built-Out UGA

	Monroe Task # (2013)	Maintenance Activity	Units to be Maintained or Installed	Production Unit	Hours/ Year	Daily Production	Crew Size	Units Processed per Year	Years to Process all Units	Freq. (times/yr)	Annual Person Days[2]	Full-time Labor Equiv.[1]	Labor Cost[3]	Annual Cost	NPDES Compliant Program FTE	Additional FTE
Cleaning and Inspection (cont.)	485	Clean Retention Ponds - Annual Vegetation Maintenance and Inpsection[1]	19	Each	75	2	2	19	1	1.00	19	0.10	$9,984	$9,984	0.08	0.02
	485	Clean Retention Ponds - Large Scale Vegetation Maintenance (every 3 yrs +/-)[1]	19	Each	150	1	4	19	1	1.00	75	0.40	$39,936	$39,936	0.32	0.08
	484	Clean Retention Ponds - Sediment Management[1]	19	Each	200	0.8	4	19	1	1.00	100	0.53	$53,248	$53,248	0.43	0.11
	N/A	Cleaning/Inspection/ Other Non-Specific activities[4]	-	-	-	-	-	-	-	-	281	1.50	$149,760	$149,760	1.20	0.30
	New	Clean/Maintain Underground Detention Vaults[1]	11	Each	45	2	3	11	1	1.00	17	0.09	$8,986	$8,986	0.07	0.02
Repair and Replacement[5]	493	Storm Mainline Repairs	330,000	LF	19	150	6	352	Not Applicable	Not Applicable	14	0.08	$7,488	$7,488	0.06	0.02
	495	Storm Manhole Repairs	755	Each	13	1	3	2	Not Applicable	Not Applicable	5	0.03	$2,496	$2,496	0.02	0.01
	496	Storm Outfall/Weir Repairs	398.75	Each	6	1	3	1	Not Applicable	Not Applicable	2	0.01	$1,248	$1,248	0.01	0.00
	498	Catch Basin Repairs	2396.25	Each	5	1	4	1	Not Applicable	Not Applicable	2	0.01	$1,248	$1,248	0.01	0.00
	502	Catch Basin Installs	1	Each	2	1	4	0.29	Not Applicable	Not Applicable	1	0.01	$624	$624	0.01	0.00

Table SW 7-4 Future Stormwater Maintenance Program and Operations and Maintenance Activities for Full Built-Out UGA

	Monroe Task # (2013)	Maintenance Activity	Units to be Maintained or Installed	Production Unit	Hours/ Year	Daily Production	Crew Size	Units Processed per Year	Years to Process all Units	Freq. (times/yr)	Annual Person Days[2]	Full-time Labor Equiv.[1]	Labor Cost[3]	Annual Cost	NPDES Compliant Program FTE	Additional FTE
NPDES Compliance	503	NDDES Overhead[9]	-	-	-	-	-	-	-	-	11	0.06	$5,990	$5,990	0.06	0.00
	504	NPDES Stormwater Quality Monitoring[10]	-	-	-	-	-	-	-	-	17	0.09	$8,986	$8,986	0.09	
	505	NPDES IDDE[4]	-	-	-	-	-	-	-	-	57	0.30	$30,368	$30,368	0.24	0.06
	506	NPDES Stormwater Facility Inpsection[4]	-	-	-	-	-	-	-	-	102	0.55	$54,496	$54,496	0.44	0.11
	507	NPDES Public Education and Outreach[9]	-	-	-	-	-	-	-	-	32	0.17	$16,973	$16,973	0.17	
	508	NPDES Reporting and Record Keeping[9]	-	-	-	-	-	-	-	-	24	0.13	$12,513	$12,513	0.13	0.00
	509	NPDES Training[9]	-	-	-	-	-	-	-	-	15	0.08	$7,987	$7,987	0.08	0.00
	510	TMDL Overhead[9]	-	-	-	-	-	-	-	-	22	0.12	$11,648	$11,648	0.12	0.00
	511	TMDL Sampling[4]	-	-	-	-	-	-	-	-	22	0.12	$11,648	$11,648	0.09	0.02
Facility and Equipment Maintenance and Repair	Fund 520	Equipment Maint/Repair & Vehicle Maint[4]	-	-	-	-	-	-	-	-	-	-	-	$348,750		
	Fund 530	Facility Maintenance[4]	-	-	-	-	-	-	-	-	-	-	-	$58,750		
Management and Administrative	Fund 001	Administration Fees[6,9]	-	-	-	-	-	-	-	-	-	-	-	$ 89,457	-	
	512	Stormwater Capital Construction[4]									2	0.01	$998	$998	0.01	0.00
	499	Citizen Concerns[4]	-	-	-	-	-	-	-	-	30	0.16	$16,224	$16,224	0.13	0.03
	474	Maint Crew Administrative Tasks [4]	-	-	-	-	-	-	-	-	183	0.98	$97,344	$97,344	0.78	0.20

Table SW 7-4 Future Stormwater Maintenance Program and Operations and Maintenance Activities for Full Built-Out UGA

	Monroe Task # (2013)	Maintenance Activity	Units to be Maintained or Installed	Production Unit	Hours/ Year	Daily Production	Crew Size	Units Processed per Year	Years to Process all Units	Freq. (times/yr)	Annual Person Days[2]	Full-time Labor Equiv.[1]	Labor Cost[3]	Annual Cost	NPDES Compliant Program FTE	Additional FTE
Management and Administrative (cont.)	476	Stormwater Plan Review[4]									23	0.13	$12,480	$12,480	0.10	0.03
	470, 478	Stormwater Disaster Response and Recovery[9]									0	0.00	$100	$100	0.00	0.00
	480	GPS - Storm Field[12]									5	0.03	$2,496	$2,496	0.02	0.01
	481	GPS - Storm Office[12]									84	0.45	$44,928	$44,928	0.20	0.25
	482	Storm - Potholes and Utility Locates[4]									2	0.01	$1,248	$1,248	0.01	0.00
	483	Stormwater Training (non NPDES)[9]									2	0.01	$998	$998	0.01	0.00
	501	Weather Station[9]									2	0.01	$998	$998	0.01	0.00
	508	Coordination with Other Agencies[9]									5	0.03	$ 2,796	$ 2,796	0.03	0.00
	N/A	Director[9]					-					0.05	$8,056	$8,056	0.05	0.00
	N/A	Manager[9]	-	-	-	-	-	-	-	-		0.18	$26,056	$26,056	0.18	0.00
	N/A	Supervisor[9]	-	-	-	-	-	-	-	-		0.37	$43,109	$43,109	0.37	0.00
	N/A	French Creek[9]														0.00
	N/A	Administrative Assistance[9]	-	-	-	-	-	-	-	-		0.13	$12,259	$12,259	0.13	0.00

Table SW 7-4 Future Stormwater Maintenance Program and Operations and Maintenance Activities for Full Built-Out UGA

	Monroe Task # (2013)	Maintenance Activity	Units to be Maintained or Installed	Production Unit	Hours/ Year	Daily Production	Crew Size	Units Processed per Year	Years to Process all Units	Freq. (times/yr)	Annual Person Days[2]	Full-time Labor Equiv.[1]	Labor Cost[3]	Annual Cost	NPDES Compliant Program FTE	Additional FTE
Subtotals and Total		**Field Crew Labor Subtotal (Cleaning & Inspection and Repair & Replacement)**	(rounded to nearest $1,000)									**5.63**		**$562,000**		**1.12**
		NPDES Compliance	(rounded to nearest $1,000)									**1.61**		**$173,000**		**0.19**
		Facility and Equipment Maintenance and Repair	(rounded to nearest $1,000)									**-**		**$408,0000**		
		Management and Admin Labor Subtotal	(rounded to nearest $1,000)									**2.54**		**$457,000**		**0.51**
		Total	(rounded to nearest $1,000)									**9.78**		**$1,600,000**		**1.83**

Notes:
1) Infrastructure Quantity assumed to increase relative to Area and factored by 7.67 sq. mi./6.11 sq. mi. (increase of 25%)
2) Annual Person Day for activity based on field crew staff availability for field work of 1,500 hrs/year.
3) Labor costs based on average wage of $32.50/hr + $15.50 (for benefits), or $48/hr.
4) Assume this activity will increase to ratio of area expansion (25%).
5) These system repairs and new installs are for projects < $65k. When projects are greater, they are implemented as part of the CIP. Assume the quantity and the City effort increase is similar to ratio of area expansion (25%).
6) Stormwater Utilities portion of Administrative Fees and IT fees (averaged 2012-2014).
7) For simplicity, table does not reflect that a portion of ditch vegetation maintenance funded out of general fund.
8) Future Annexations will require new mapping of annexed areas. Assumption is that the effort would approximately revert back to what the City has spent last few years (from Table SW 5-1, .i.e., 45 FTE, for a period of years before annexed area is completely mapped).
9) The effort spent on this activity is assumed to not increase as a result of annexations.
10) The Future program labor cost is assumed to be the same as areas are annexed. The City's contribution to Ecology for regional monitoring is tied to City's corporate area and is assumed to increase by 25%.
11) The effort towards training is estimated to increase by 3 weeks in general various NPDES programs (IDDE, Development review, inspection).

Table SW 7-5 Summary Comparison of Operations and Maintenance Program for Current, Future, and Scenario of City Expansion to UGB

Description	Current Program		Future Program		Future Program with City Expanded to UGB	
	FTE	Cost	FTE	Cost	FTE	Cost
Field Crew Labor Subtotal (Cleaning and Inspection and Repair & Replacement)	3.47	$346,000	4.50	$450,000	5.63	$562,000
NPDES Compliance	0.68	$69,000	1.42	$152,000	1.61	$173,000
Facility and Equipment Maintenance and Repair	-	$326,000	-	$326,000	-	$408,000
Management and Admin Labor Subtotal	2.23	$426,000	2.03	$406,000	2.54	$457,000
Total	6.38	$1,167,000	7.95	$1,334,000	9.78	$1,600,000

Chapter SW 8 Problem Identification and Solution Development

8.1 General Description and Information

This chapter describes results of the hydrologic analyses performed for four of the twelve problem areas that have been identified within the City. The other eight areas are identified for future investigation. Two of the four areas analyzed currently do not have an effective or complete system to convey or infiltrate stormwater runoff and as a result, exhibit localized flooding during typical rainstorms. The other two locations have drainage systems that are no longer functioning as designed presenting the possibility of future localized flooding.

The methodology utilized to perform the hydrologic analysis is discussed in this chapter, along with solutions identified to eliminate localized flooding and results of the analyses. A description of improvements necessary to remedy the issues identified is included. A planning level opinion of probable project costs for the identified improvements are included in Chapter SW 9, Recommendations. Detailed cost information is included in Appendix SW-D. Detailed results of the hydrologic modeling analyses are included in Appendix SW-E.

8.2 Identified Problems and Project Solutions

Problem area identification was conducted during discussions with City staff. These discussions resulted in identification of four areas currently experiencing localized flooding, surcharging of the manholes or failure of existing stormwater treatment facilities. The locations and extents of these four areas are listed below:

A. **Blueberry Lane**, including approximately 2,000 feet of roadway from King Street to North Kelsey Street as shown in Figure SW 8.1. Field survey and City GIS data identified two main stormwater lines in Blueberry Lane discharging into eight inch perforated pipes under Blueberry Children's Park (Park), meant to infiltrate all the stormwater runoff from Blueberry Lane and contributing areas. Localized flooding however occurs six to eight times per year. Maintenance crews noticed mud in the storm piping and flushed the lines, which improved drainage somewhat. There are 22 existing catch basins collecting runoff from 17.5 acres of contributing area and conveying it to the park with seven sections of perforated pipe totaling approximately 500 feet stubbing off of the main line in different locations to infiltrate portions of stormwater before it reaches the Park. The park is approximately one acre of primarily pervious surface.

B. **Intersection of Blueberry Lane and North Kelsey Street**, including 3.6 acres of contributing area from a rail road and 0.8 acres of surrounding parcel area as shown in Figure SW 8.2. The outlet from a stormwater overflow pipe in SR-2 discharges into the problem area. High groundwater in the area also contributes to ponding of stormwater runoff at the intersection. Runoff migrates underneath the railroad track and into the Kelsey Street infiltration system.

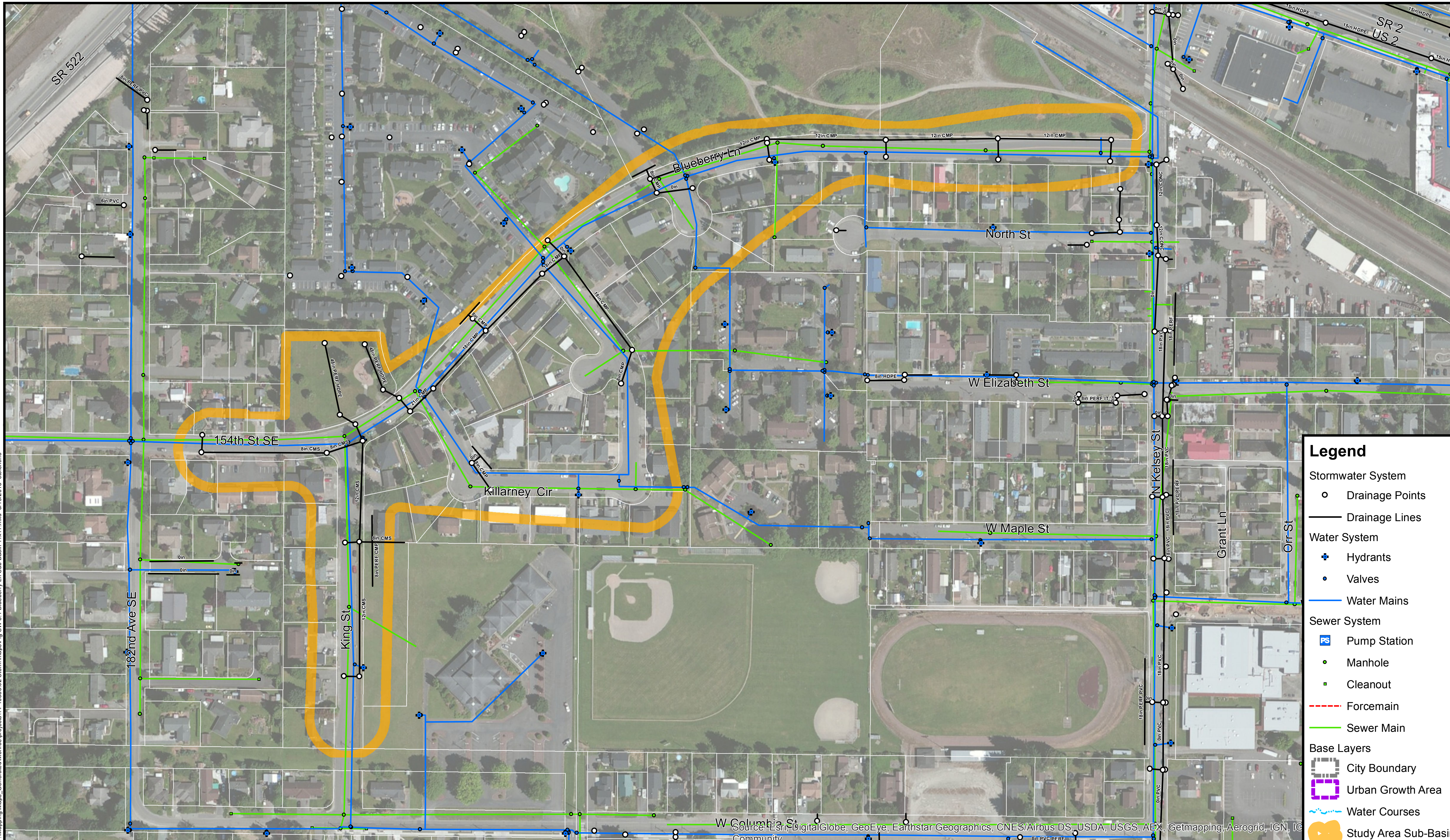
C. **Lake Tye,** including a stormwater treatment bioretention swale which is currently under disrepair and discharges into the South Eastern corner of Lake Tye. GIS Data identified approximately 36,000 feet of storm drain pipes, ditches, and swales discharging into the former swales with a total contributing area of approximately 172.5 acres of mostly residential area and ROW as shown in Figure SW 8.3. There are two main drainage ditches running east to west; the ditch to the south is approximately 1,900 linear feet and the northern ditch is roughly 1,700 feet long.

D. **Lords Lake,** including approximately 2,600 feet of storm drain pipe conveying runoff from 17 acres; 1.4 acres of primarily impervious area from a car dealership to the south and the rest a mixture of ROW and residential parcels as shown in Figure SW 8.4. The drainage system ultimately discharges the stormwater from a culvert into a control structure and drainage channel which discharges into Lords Lake. The drainage channel is surcharged from the lake and backs up into the control structure. The storm drainage system therefore cannot discharge effectively into the lake.

Locations of these study areas in relation to the City's overall existing stormwater system are shown in Figure SW 4.2.

The City of Monroe has identified additional areas with localized stormwater problems that will need to be addressed in the future. Below is a list of the location of these problem areas.

- Monroe St. at the intersection of Park St. on the NE corner
- Monroe St. just East of the intersection of Kelsey St. on the North side
- Park St. at the intersection of Roberts St. on the NE corner
- Dickenson St. at the intersection of W. Columbia St. on the West side
- 115 Dickenson St.
- W. Main St. East of the SR 522 and W. Main St. round a bout
- 615 North St



P:\Mapping\Maps_Generated\Monroe\projects\14-10355.02 Storm\maps\Fig SW 8.1 Blueberry Ln Sub-Basin 11x17.mxd 3/19/2015 cbilentino

BHC CONSULTANTS

Stormwater System: City of Monroe 2014

Snohomish County base data 2014
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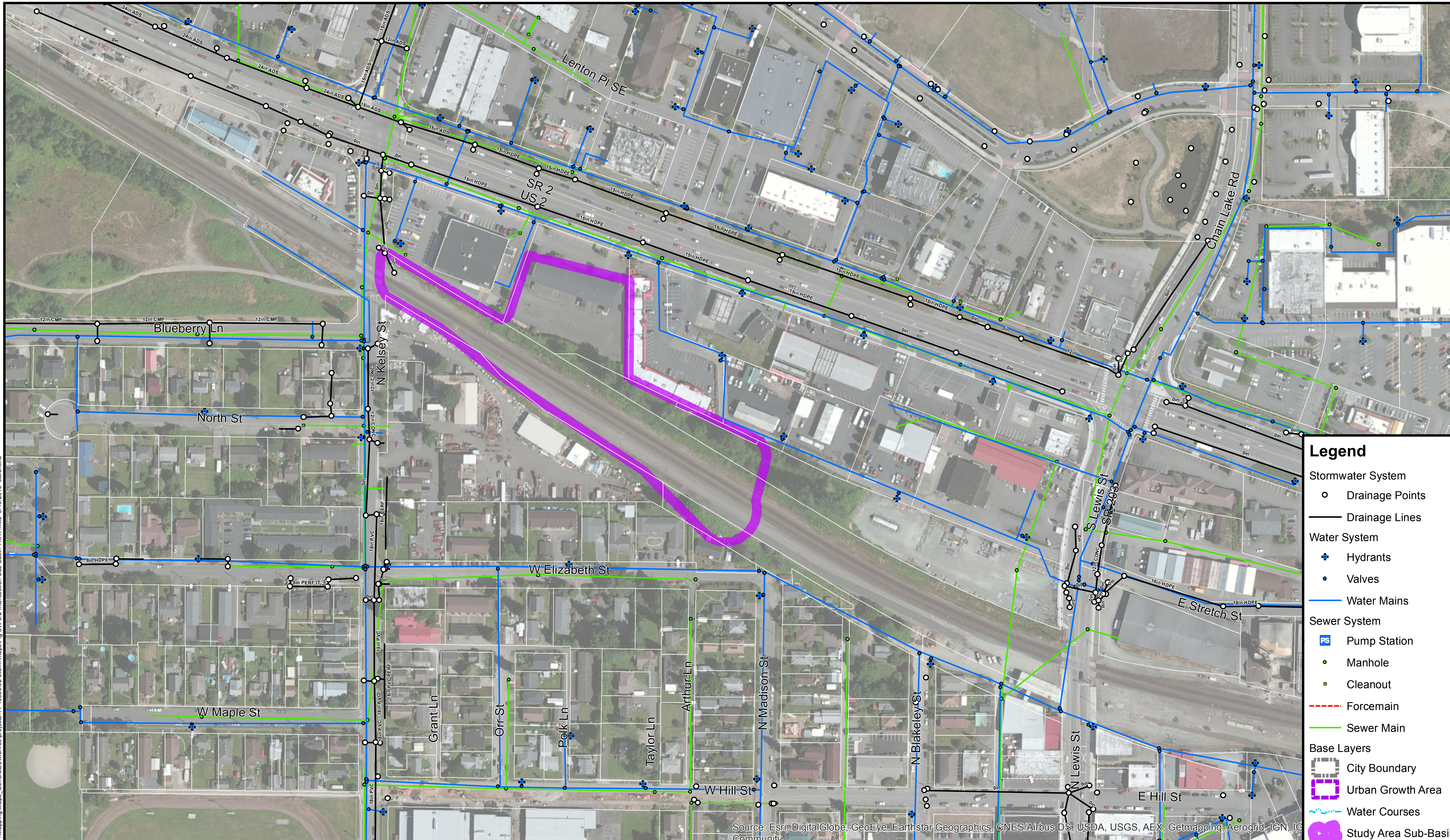
NORTH

0 100 200 400
Feet

MONROE
WASHINGTON

Blueberry Lane Sub-Basin
Utility Systems Plan - Stormwater
City of Monroe, Washington
March 2015

Figure
SW 8.1



P:\Mapping\Maps_Generated\Monroe\projects\14-10355.02 Storm\maps\Fig SW 8.2 Intersection Sub-Basin 11x17.mxd 3/19/2015 ctolentino

BHC CONSULTANTS

Stormwater System: City of Monroe 2014

Snohomish County base data 2014
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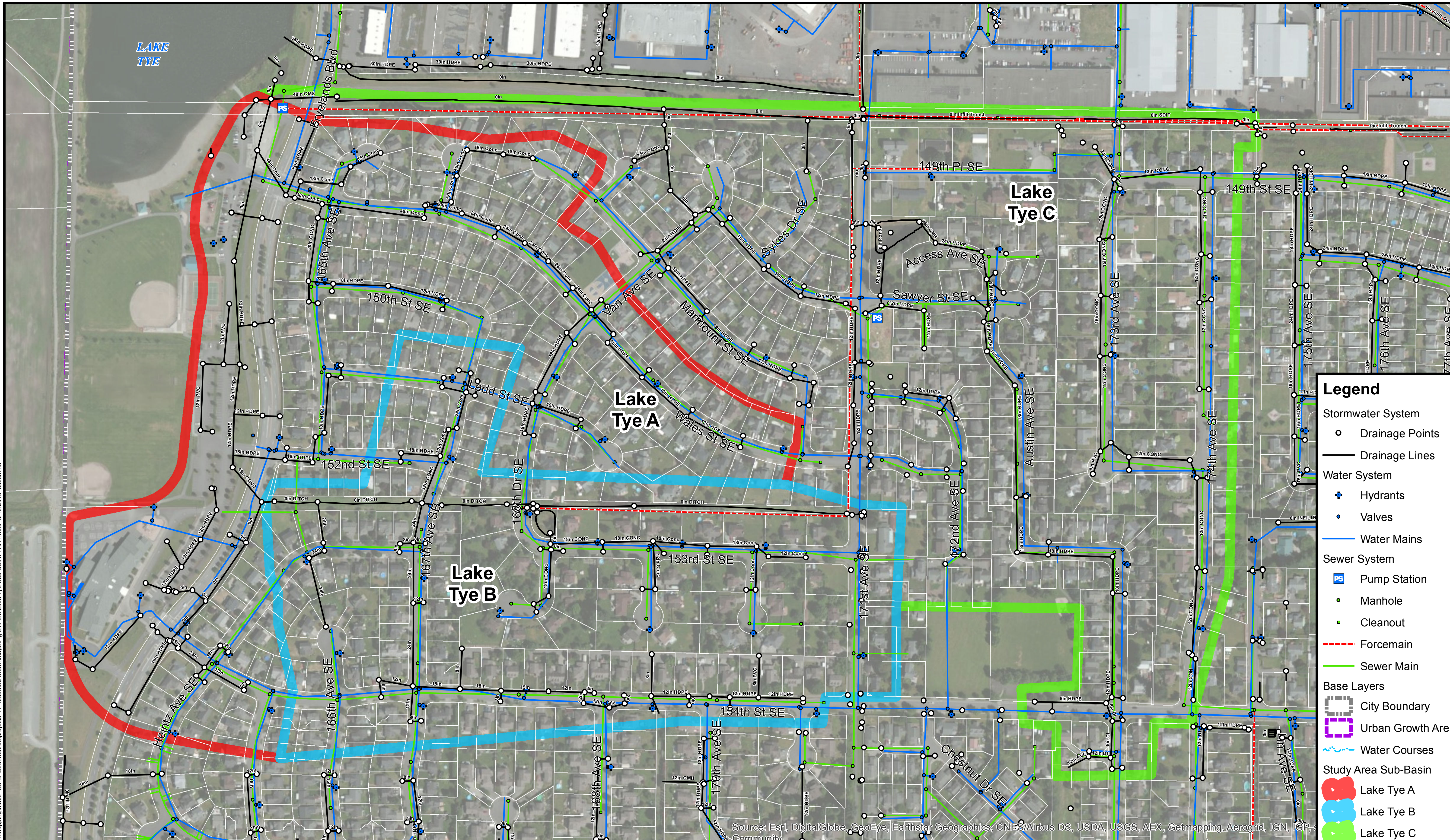
NORTH

0 100 200 400 Feet

MONROE WASHINGTON

Intersection Sub-Basin
Utility Systems Plan - Stormwater
City of Monroe, Washington
March 2015

Figure
SW 8.2



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Stormwater System: City of Monroe 2014

Snohomish County base data 2014
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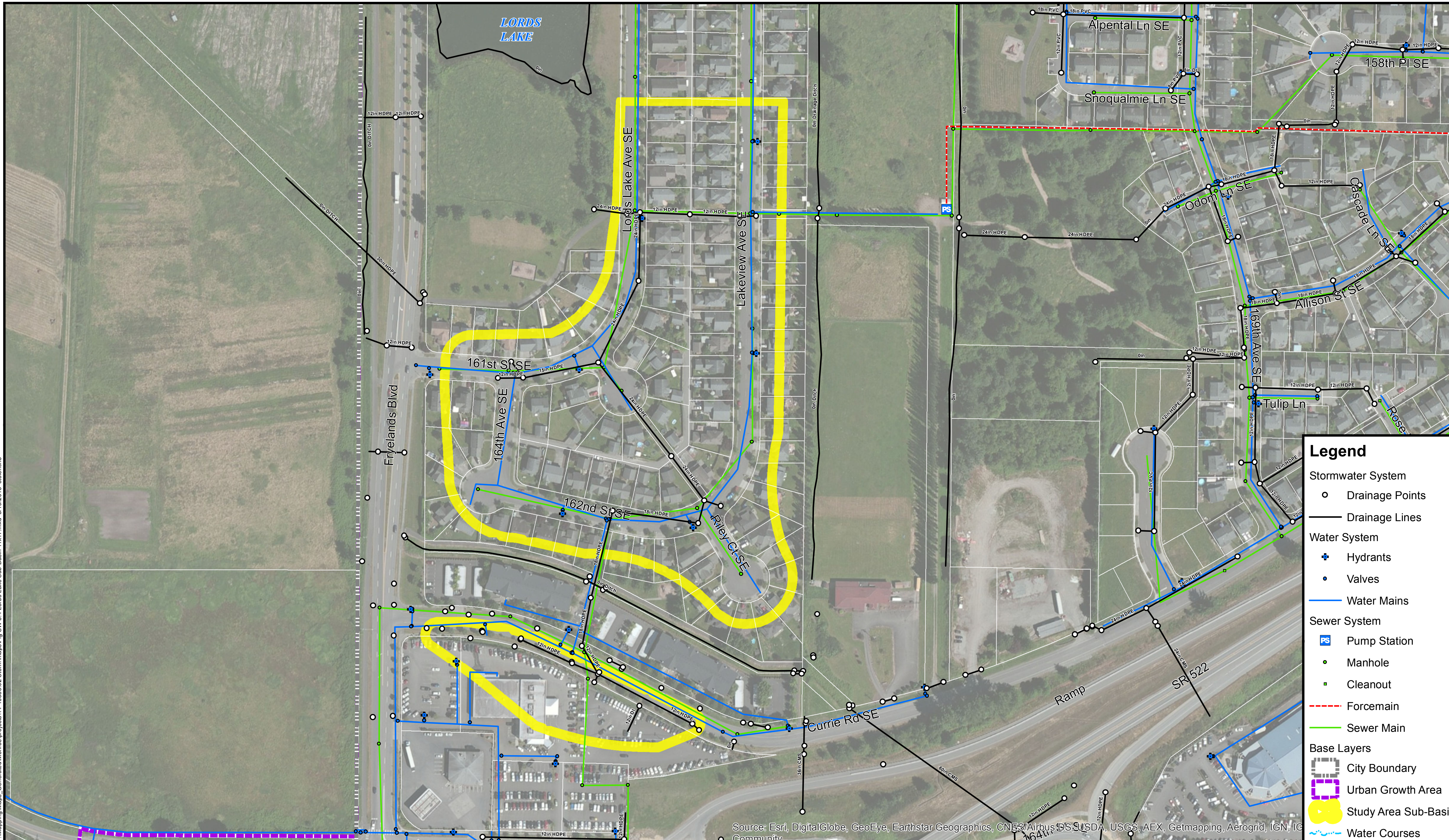
NORTH

0 150 300 600
Feet

MONROE
WASHINGTON

Lake Tye Sub-Basin
Utility Systems Plan - Stormwater
City of Monroe, Washington
March 2015

Figure
SW 8.3



BHC CONSULTANTS

Stormwater System: City of Monroe 2014

Snohomish County base data 2014
Data sources supplied may not reflect current or actual conditions. This map is a geographic representation based on information available. It does not represent survey data. No warranty is made concerning the accuracy, currency, or completeness of data depicted on this map.
BHC Consultants LLC., assumes no responsibility for the validity of any information presented herein, nor any responsibility for the use or misuse of the data.

NORTH

0 100 200 400 Feet

MONROE WASHINGTON

Lords Lake Sub-Basin
Utility Systems Plan - Stormwater
City of Monroe, Washington
March 2015

Figure
SW 8.4

8.3 Hydrologic Analysis

This Section discusses the hydrologic analyses performed to evaluate the identified problem areas and potential solutions. Documentation for the hydrologic analyses is included in Appendix SW-E.

8.3.1 Analysis Methodology and Assumptions

Each study area has unique stormwater problems. The Blueberry Lane and the Intersection study areas experience localized flooding. Based on the previous (2009) Stormwater Comprehensive Plan, it was assumed that reasonable infiltration rates through the native soil can be achieved to control stormwater runoff in the vicinity of these two problem areas identified by the City. The analysis was therefore performed to identify the size and configuration of infiltration facilities required to alleviate these localized flooding problems. It is important to note that since soil infiltration rates can vary, site specific infiltration rates should be determined as part of a predesign study for each of these infiltration facilities. The other two problem areas identified, Lords Lake and Lake Tye, have stormwater treatment bioswales that are in disrepair and are no longer functioning properly. The Lords Lake area was modeled to determine the flow rate required to be treated by a stormwater treatment vault before it is discharged into Lord's Lake so a facility could be sized. The Lake Tye area did not require modeling since the recommended solution was to repair the existing stormwater treatment system and divert some of the flow to an adjacent outfall.

Selection of appropriate computer modeling software is important for identifying the effectiveness of proposed stormwater control and infiltration facilities. The Department of Ecology's Stormwater Management Manual for Western Washington recommends the Western Washington Hydrology Model (WWHM2012) for performing hydrologic analyses to identify stormwater projects compliant with Ecology's regulatory requirements. WWHM2012 is a continuous simulation hydrologic model, based on Hydrologic Simulation Program Fortran (HSPF) software that contains algorithms simulating the natural processes that make up the hydrologic cycle.

Generalized parameter values have been identified and programmed into WWHM2012 software that appropriately simulates the hydrologic response from various soil, slope and ground cover/land use types. WWHM2012 incorporates a user interface that simplifies user input and provides automated results that indicate effectiveness of proposed stormwater facilities, (including infiltration facilities) in meeting criteria. The model includes a range of LID techniques such as bioswales, green roofs and permeable pavement to control and treat stormwater runoff.

The analysis assumptions are as follows:

- 1.8 in/hr infiltration rate for Hydrologic Soil Group C. From a geotechnical study titled "Report of Geotechnical Services; West Hill Street Improvement Project; Monroe, Washington" dated January 21, 2008, Zipper Zeman Associates, Inc (ZZA)
- Streets act as barriers/channels to overland runoff
- All parcels contain the maximum percentage of impervious area as allowed by Monroe Municipal Code (18.10.220 – Maximum lot coverage)
- Rights of Way are 95% impervious
- Infiltration reduction factor (WWHM2012) is 1

- Impervious areas for parcels were assumed to be roof tops in the WWHM2012 Model

Drainage sub-basins tributary to the four study areas were delineated using Snohomish County LIDAR data, to determine one-foot elevation contour intervals. The one-foot interval was necessary to identify flow directions in these relatively flat portions of the City. The drainage sub-basins for each study area are illustrated in Figure SW 4.2. Total impervious areas were then determined for each sub-basin, based on impervious percentages per land use category, as identified in Monroe Municipal Code – 18.10.220 – maximum lot coverage which gives the most conservative estimate. The resulting areas for the three modeled study areas are summarized in Table SW 8-1. The Lake Tye study area did not require modeling. Pervious areas were input to WWHM2012 as lawns, impervious area on parcels was input as roofs, and the ROW was modeled as roads.

Table SW 8-1 Summary of Areas (acres) by Sub-basin

Sub-Basin	Impervious Area		Pervious Area	Impervious	Total Acres
	Roads	Roof	Lawn		
Blueberry Ln	4.9	8.2	5.4	71%	**18.5**
Intersection	3.4	0.6	0.4	91%	**4.4**
Lords Lake	6.3	8	2.7	84%	**17**

Blueberry Lane

The WWHM2012 model for the Blueberry Lane sub-basin was set up to route runoff from two drainage sub-catchments to an infiltration gallery (gallery) in the Blueberry Children's Park, which was modeled as a bottomless detention vault. One sub-catchment represented the park in which the gallery would be installed and the other sub-catchment represented the delineated contributing area, discharging to the gallery via the stormwater conveyance system. The existing perforated pipe stub-outs were not modeled since the frequent localized flooding indicates that they are not functioning as they were intended. The discharge point was used to size the gallery taking into account that there is no conveyance system for the gallery to overflow into.

Intersection

The WWHM2012 model for the Intersection sub-basin was set up to route runoff from the delineated contributing area to an infiltration gallery (gallery) modeled as a bottomless detention vault. The overflow pipe discharging into the project area from the stormwater main in SR-2 was not modeled because it was beyond the scope of this project, but the gallery was sized conservatively. The gallery would be set up with an overflow to the existing stormwater conveyance and infiltration system in Kelsey Street.

Lake Tye

The preferred alternative for the Lake Tye problem area did not require modeling, since the preferred solution is maintenance related.

Lords Lake

The WWHM2012 model for the Lords Lake sub-basin was set up to route runoff from the delineated contributing area to a downstream point of compliance, where mitigated stormwater runoff is compared to baseline conditions. The flow at this point was used to size a filter system which would discharge via an existing conveyance channel to Lord's Lake.

8.3.2 Analysis Results

WWHM2012 model results are summarized in Table SW 8-2. For each study area, the 24-hour volume for a 6 month recurrence interval storm and the related peak flow rate that would need to be treated, was determined to size each stormwater control and treatment alternative that is proposed.

Table SW 8-2 Summary of Water Quality Results by Sub-basin

Sub-Basin	On-line BMP		Off-Line BMP
	24 hr Volume (ac-ft)	Peak Flow Rate (cfs)	Standard Flow Rate (cfs)
Blueberry Ln	1.74	2.46	1.39
Intersection	0.49	0.76	0.43
Lords Lake	1.61	2.40	1.35

The Blueberry Lane and the Intersection areas will not have a bypass system so they will be on-line facilities. Lord's Lake will have an overflow bypass system so it was sized as an off-line facility.

8.4 Water Quality

Stormwater treatment systems will be designed to provide water quality treatment for 72% of the 2-year 24 hour recurrence interval flows, in accordance with the Department of Ecology's Stormwater Management Manual for Western Washington. Conceptually, the proposed stormwater treatment systems will collect runoff that is collected by catch basins and conveyed into each project's respective treatment areas. The infiltration galleries for the Blueberry Lane and the Intersection project areas will have a pre-treatment module before the stormwater enters the gallery. When runoff into the gallery for Blueberry Lane exceeds capacity it would overflow into the Blueberry Children's Park above. The Intersection gallery would overflow into an existing stormwater system in Kelsey Street. The recommended option for the Lord's Lake project area would have a downstream stormwater treatment vault to treat the water before discharging it into Lord's Lake. The vault would have a bypass that would directly discharge excess stormwater into the lake. The second alternative for Lord's Lake is to perform significant maintenance on the existing discharge channel and re-establish it as a stormwater treatment wet swale or wet pond. The maintenance on Lake Tye's existing bioswale would perform the necessary stormwater treatment before discharging into the lake.

8.5 Capital Projects

The following CIPs are based on general SCS information. It is recommended that site specific geotechnical investigations be completed before initiating design and construction.

Blueberry Lane

An infiltration gallery with a pretreatment module is proposed to be installed under Blueberry Children's Park, replacing the existing 8-inch perforated pipes. The existing 24-inch CMP perforated pipe connecting the two influent pipes would be replaced with a standard 18-inch pipe and the downstream manhole would be replaced. An 18-inch pipe would connect the new manhole to the pretreatment module and then to the infiltration gallery. These connections would require approximately 165 feet of 18-inch pipe. The gallery size is currently estimated to be 112 ft long by 80 ft wide and 9 feet deep based on the current conservative estimates of contributing impervious area. The total estimated project cost is approximately $1.5 million in 2014 dollars as outlined in Appendix SW-D.

Intersection of Blueberry Lane and N Kelsey St

An infiltration gallery with a pretreatment module is proposed to be installed under Blueberry Lane near the intersection with Kelsey Street. A catch basin would be installed on the south east side of the intersection of the train tracks and Kelsey Street. The catch basin would capture the water currently migrating under the train tracks and flooding the intersection. The water would be conveyed via approximately 120 feet of 12-inch pipe into a pretreatment module then into an infiltration gallery. The gallery size is estimated to be 40 feet wide, 88 feet long and 5 feet deep. There would be an overflow in the infiltration gallery to convey excess runoff through a 12-inch pipe to an existing stormwater system running south down Kelsey Street. The total estimated project cost is approximately $581,000 in 2014 dollars as outlined in Appendix SW-D.

Lake Tye

The most viable and cost effective option proposed for the Lake Tye problem area is to re-establish the existing stormwater treatment swale through maintenance and to divert the already treated flow coming from the northern ditch into an adjacent outfall via a 30 inch pipe. Check dams of quarry spalls would be added to the northern ditch to ensure that the water receives sufficient treatment during the stormwater design storm. The pipe would run parallel to Fryelands Blvd under a pedestrian walkway. The pipe would connect to the existing system at a manhole in Fryelands Blvd which discharges to Lake Tye through a 36-inch drainage pipe. The total estimated project cost is approximately $95,000 in 2014 dollars as outlined in Appendix SW-D.

Lord's Lake

There are two options proposed for the Lord's Lake problem area. The preferred alternative is to install a stormwater treatment facility in the right of way under Lord's Lake Ave SE next to the existing conveyance channel which discharges into Lord's Lake. The existing oil/water separator would be replaced with a cartridge treatment vault in Lord's Lake Ave SE with an outlet pipe to the existing drainage channel. The existing channel would be cleared out to provide a free flowing exit from the treatment vault effluent pipe. The vault would have a pre-treatment compartment before entering the main portion of the vault containing the treatment cartridges. The vault would be approximately 8-feet wide and 35-feet long, based on the configuration of the 18-inch cartridges. The size of the vault is dependent on the maximum drop available between the vault and the channel. Depending on if there is more or less drop available, different size cartridges could be used which in turn affects the vault size. The lake elevation and invert of the existing outfall will need to be surveyed to determine final sizing. Initial/low flows would enter a riser which discharges to the main compartment with the cylindrical cartridges filled with perlite to treat the stormwater. After treatment, the runoff would be piped to the conveyance channel via a 24-inch pipe. For inflows greater than the water quality treatment threshold, the water will flow under a false floor in the vault and discharge directly into the discharge channel. The total estimated project cost is approximately $398,200 in 2014 dollars as outlined in Appendix SW-D.

The second alternative is to perform extensive maintenance on the existing drainage channel and re-establish it as a bioswale or a wet pond. The City does not favor this option due to the continual maintenance that would need to be performed in an area that is difficult to access. Though the initial cost would be lower than the preferred alternative, the level of the ongoing maintenance that would be required may outweigh the initial planning level cost comparison. The estimated project maintenance cost is approximately $37,800 in 2014 dollars as outlined in Appendix SW-D.

Chapter SW 9 Recommendations

This section contains the projected future needs for the Stormwater Management Utility over the next six years. The needs are based on requirements of the 2013-2018 NPDES Phase II permit and also on infrastructure improvement goals established by the Monroe City Council. Recommendations for the Stormwater Management Utility include staffing increases, revisions and additions to city ordinances, capital improvement projects and other miscellaneous updates to the stormwater program.

9.1 Recommended Changes to Meeting New NPDES Phase II Permit

The general requirements of the new 2013-2018 NPDES Phase II permit were previously described in Chapter 6.3.6. Subsequently, in Chapter SW 7, an analysis was completed to assess the new or added activities needed above the current City Stormwater program to meet the permit requirements in terms of staffing FTEs and costs. The following paragraphs summarize the recommended changes to the City's program to meet the permit requirements. The changes are organized by the major NPDES categories shown in Table SW 7-2a.

Public Education, Outreach, Involvement, and Participation

The City already has a robust public education, outreach and participation program with many elements, several of which are targeted to specific audiences, such as the public, businesses, homeowners, and the development community (such as engineers/contractors).

One of the key changes in the permit is the requirements to measure the understanding and adoption of targeted behaviors for at least 1 audience and 1 subject area. The City is satisfying this requirement by participation in the Natural Yard Care Public Outreach and Evaluation Program, being conducted as a part of an interlocal agreement with several jurisdictions and led by Snohomish County. The objective of the program, which began in early 2014, is to improve water quality within the region by educating the public regarding best management practices for residential yard care as well as to measure the understanding and adoption of the targeted behaviors and evaluate the effectiveness in the program in achieving the desired behavior.

By participating in this interlocal effort and continuing the several ongoing programs, the City will be in compliance with the NPDES permit requirements. The City can also leverage information collected from the "Assessment of Residential and Business Understanding and Adoption of Targeted Stormwater Behaviors (Hebert Research, 2012)". For example, it found that the City could increase awareness of proper private car washing.

Illicit Discharge and Elimination (IDDE) Program

The City already has an ongoing IDDE program, however, the new requirements will generally result in the increased need for field screening to identify illicit discharges and then an expanded program to perform tracing of the illicit discharges, characterize them and then the efforts necessary to eliminate them. The City will need to update and develop its field screening methodology in 2015 and begin implementing it in late 2015 or 2016. By December, 31 2017, the City must have 40% of the system screened, and then 12% annually thereafter.

In addition, the new permit requires some minor updates to the City's ordinances containing IDDE provisions, Chapter 13.34 of the MMC. The updates should include the following:

- Add hot tubs and spas to the list of conditionally allowable discharges. In addition, any discharges from dechlorinated pools, spas and hot tubs need to be thermally controlled prior to discharge.
- Add a "compliance strategy" component to the ordinance that includes various steps in addition to enforcement that the City can use to achieve compliance with Chapter. The compliance strategies should reference the application of operational and/or source control BMPs for both pollutant generating sources associated with existing land uses and activities. The compliance strategy shall also reference maintenance of such BMPs. It is recommended that the source control BMP be based on those source control BMPs found in Volume IV of the 2012 Stormwater Management Manual for Western Washington or an equivalent manual.
- The modifications to Chapter 13.34 are to be made by February 2, 2018.

Finally, the City should continue its ongoing training for all municipal staff who, as part of their normal job responsibilities, might come in contact or observe an illicit discharge.

<u>Controlling New Development, Redevelopment and Construction Sites</u>

There are several expanded or new activities that the permit requires to address controlling stormwater from new development, redevelopment, and construction sites. These were described in both Chapters SW 6 and SW 7, and are summarized below.

- The City will need to update and adopt City codes (MMC Chapter 15.01 Stormwater Management) so that the requirements for new development, redevelopment and construction sites are equivalent to the 2012 DOE Stormwater Manual (or as updated). This needs to be accomplished by December 31, 2016.
- The City should assure increased compliance standards are met in relation to private treatment and flow control BMP inspection. To verify adequate long term maintenance, annual inspections are required by the City for projects approved after August 15, 2009. The City will need to keep records of inspections and enforcement actions. Whereas, under the initial 2007-2012 permit, the City was only required to inspect projects in excess of one acre, the new permit requires inspections for all projects permitted by the City. With the added types of LID BMPs, these new requirements will require greater effort by the City. A separate inspection frequency is also required for residential subdivisions. Due to the tendency for residential subdivision construction activities to extend over long periods of time, more frequent inspections are required. Inspections for residential subdivisions are required every 6 months until 90 percent of the lots are constructed.
- The City should assure increased compliance standard are met in relation to the review of stormwater site plans (for private or public projects). While this has been occurring as a part of the current program, it is anticipated that this activity will be more time consuming for City staff under the new permit requirements. This is largely because of the new standards for on-site LID requirements and that the City will need to thoroughly understand and apply the new requirements.
- The City should assure increased compliance standards are met in relation to adequately inspecting/enforcing erosion and sediment control at construction sites.

Similar to reviewing stormwater site plans, the City has been inspecting erosion and sediment control at construction sites under the current program. However, the City enforcement of, and taking greater actions when individual site's erosion and sediment control are not performing adequately may need to be improved.

- The City should assure increased compliance standards are met in relation to the proper construction of (permanent) stormwater BMPs for site development. The new and expanded requirements for LID and on-site stormwater BMPs will require that City staff become thoroughly familiar with the proper construction and installation techniques. Also, additional staff time is projected because new development and redevelopment sites will physically have a greater quantity of individual BMPs including LID and conventional pond/quantity control compared to current sites so there will be a need for more inspection. There will also be additional City staff effort to properly ensure that maintenance agreements are recorded.
- The City should assure increased compliance standards are met in relation to adequately enforce timely maintenance of private stormwater BMPs. When performing the annual inspections, the City will need to follow up with enforcement for those BMPs not being adequately maintained. It is projected that this activity will require increased City staff time compared to the current program. This is also discussed as a policy question in Section SW 7.2.

<u>Recommendations for Municipal Stormwater Operations and Maintenance</u>

The new permit requires maintenance standards to be updated and be consistent with those in the 2012 (or as amended by Ecology) Stormwater Management Manual for Western Washington. For several stormwater infrastructure items, such as catch basins, stormwater ponds, the new permit requires inspection and maintenance more frequently than under the current program. This analysis and resulting cost implications was presented in Table SW 7-1. The new permit typically requires inspection of stormwater facilities annually, with the exception of catch basins, which are required to be inspected every two years.

<u>Compliance with TMDLs</u>

The new permit affects the fecal coliform TMDL for the Snohomish River Tributaries and for the City, the French Creek and Woods Creek watersheds. Several of the current TMDL activities will meet the new requirements. Examples of these include the City's public education and outreach activities to increase awareness of bacterial pollution problems and promote proper pet waste management behavior and its program to provide animal waste collections at parks and City operated lands. The primary focus of the new and/or enhanced requirements include the following:

- Business inspections of commercial animal handling areas and commercial composting facilities to ensure implementation of source control BMPs for bacteria by August 1, 2016, followed by an ongoing inspection program to re-inspect facilities with bacteria source control problems a minimum of every three years.
- Targeted source identification & elimination. Based on a review of the fecal coliform data collected under the 2007 Permit, the City needs to identify a minimum of one high priority area (such as a tributary or a stream segment) that will be the focus of source identification and elimination efforts during the 2013-2018 permit cycle. The City is currently in discussions with Ecology about the selection of the high priority area.

Following final selection, it will need to be documented in the Annual Report for 2014. The City also needs to begin source identification and elimination efforts in the high priority area. For illicit discharges found, the City will need to implement corrective schedules and activities as specified in the permit. In addition, each annual report's TMDL summary shall include qualitative and quantitative information about the source identification and elimination activities, including procedures followed and sampling results, implemented in the selected high priority area(s).

- Surface Water Monitoring: The City has been conducting sampling on a monthly basis at several locations, however the sampling at times has not been continuous. As a part of the new permit requirement the City is to continue monitoring as appropriate for continued characterization and long term trends evaluation of fecal coliform. The City will need to coordinate with Ecology as to whether the current monitoring Quality Assurance Project Plan (QAPP) meets the new permit requirements (no later than February 2, 2015). Then each year the City will need to submit available data to the Environmental Information Management (EIM) database by May 31 as well as to provide data summaries and narrative evaluation of the data in each annual report's TMDL summary.

<u>Stormwater Monitoring</u>

As described in Section SW 6.3.6, there are new monitoring requirements and the City is electing to participate in Ecology's regional water quality monitoring program, which costs are shared amongst the NPDES Western Washington permittees. These costs are as follows.

- Status and Trends Monitoring - $4,073/yr
- Effectiveness Monitoring - $4,786/yr
- Source Identification and Diagnostic Monitoring - $629/yr

<u>Stormwater Management Program Reporting and Coordination</u>

One emphasis of the new permit is to require documentation of the internal City coordination efforts between the various City departments/staff for permit compliance. The initial documentation is due to Ecology on March 31, 2015.

9.2 Staffing Recommendations

As discussed in Chapter SW 7, in order to meet NPDES requirements, additional staff time will be required to meet several aspects of the permit (as described above). More specifically, Table SW 7-2a presented an estimate for the additional staffing requirements throughout the permit term. However, because the staff forecast was very consistent between 2015 and 2018, it is recommended that the City add the recommended staff in early 2015. The recommended staffing increase is 0.25 Design and Construction staff and 1.3 Operation and Maintenance Staff.

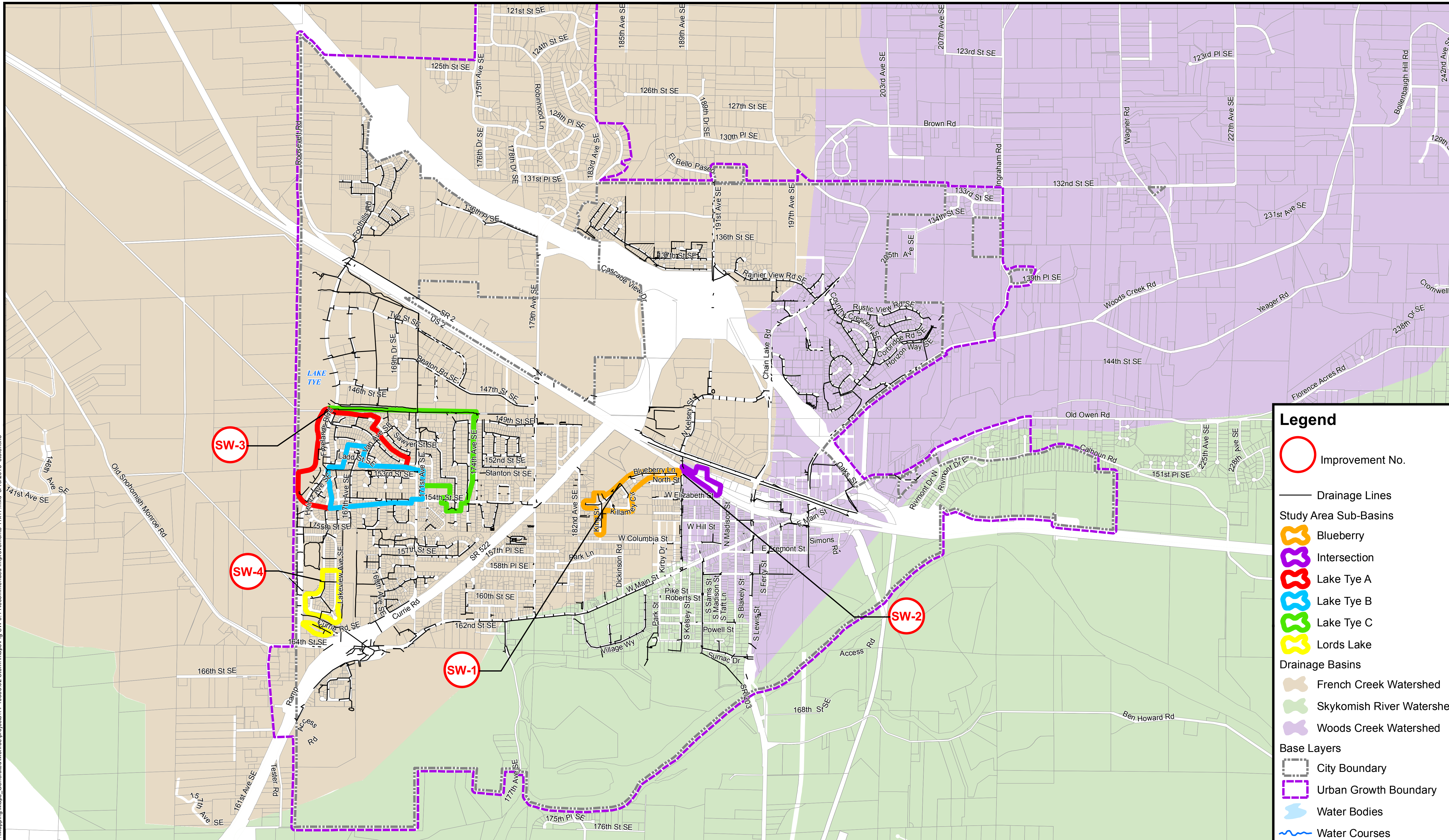
9.3 Recommended Capital Improvements Program

Four Capital Improvement Program (CIP) projects have been developed, to resolve localized drainage problems that have been identified by City staff. The drainage problems are located in areas lacking an effective or complete system of stormwater conveyance, treatment and/or infiltration. Refer to Recommended Improvements Figure SW 9.1 for the location of each project. These capital improvements were developed not only to resolve conveyance problems, but also improve water quality.

9.3.1 CIP Prioritization

Utilities rely on prioritization of CIP projects to manage the cost and resources available for CIP implementation. This would be especially true for an extensive list of CIP projects. Stormwater problems can generally be categorized as either: involving threats to public safety; property damage or localized nuisance flooding. The twelve problem areas identified by City staff in Chapter 8 are all categorized as localized nuisance flooding issues. Four of those problem areas were developed to the planning level design and analysis, while the other eight were identified for future investigation.

Since the four projects that were analyzed are classified in the same priority category, project prioritization was determined based on further discussions with City staff. These four projects recommended for the CIP are listed in the resulting order of priority in Table SW 9-1. The total estimated cost of implementation for the recommended CIP is $2,581,800, not including the additional eight areas identified for future analysis. Table SW 9-1 identifies a combined total of $5,000,000 for these future eight areas for analysis. This total assumes average funding of $250,000 per year over 20 years. As a result of current funding limitations, only the South Kelsey Street project has a firm implementation schedule at this time.



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BHC CONSULTANTS

Stormwater System: City of Monroe 2014

Snohomish County base data 2014
Data sources supplied may not reflect current or actual conditions. This map is a geographic representation based on information available. It does not represent survey data. No warranty is made concerning the accuracy, currency, or completeness of data depicted on this map.
BHC Consultants LLC., assumes no responsibility for the validity of any information presented herein, nor any responsibility for the use or misuse of the data.

MONROE WASHINGTON

Recommended Improvements
Utility Systems Plan - Stormwater
City of Monroe, Washington
March 2015

Figure
SW 9.1

Table SW 9-1 Projected 2015 SWM Program (in 2014 dollars)				
CIP No.	**Recommended Improvement**	**Location**	**Opinion of Probable Project Cost**	**CIP Year**
SW-1	Infiltration/Conveyance	Blueberry Lane	$1,470,000	2015
SW-2	Infiltration/Conveyance	Intersection of Blueberry Ln and N Kelsey St	$581,000	2016
SW-3	Bioswale Maintenance/Conveyance	Lake Tye	$95,000	20??
SW-4A	Stormwater Treatment/Conveyance (Primary Alternative)	Lord's Lake	$398,000	2017
SW-4B	Bioswale/Wet Pond Maintenance (Secondary Alternative)	Lord's Lake	$37,800	2017
		Future Areas for Analysis		
		Crystalwood Drainage Area	$5,000,000	2015-2035
		Monroe St. at the intersection of Park St. on the NE corner		
		Monroe St. just East of the intersection of Kelsey St. on the North side		
		Park St. at the intersection of Roberts St. on the NE corner		
		Dickenson St. at the intersection of W. Columbia St. on the West side		
		115 Dickenson St.		
		W. Main St. East of the SR 522 and W. Main St. round a bout		
		615 North St		

Notes:
1) Projects collectively estimate to equal $5,000,000 total, distributed over 20 years.

9.4 Policy and Other Recommendations

Chapter SW 7 included three policy questions that were assessed as part of the planning effort. The recommendations for these policy questions are stated briefly below. For further explanation of the details, refer to Section SW 7.2.

Policy Recommendations:

When and Where to Consider Pervious Pavement

- The City should use Figure 1 in Appendix SW-B as a general guidance for initial consideration of where pervious pavement should be considered. Although there are certain to be exceptions due to the variability of soils, this map can be used as an initial indicator.
- Until more data is developed, the City should consider following Ecology's 2012 Manual, but including the proposed changes to the manual currently under public review. These include;
  - Pervious pavement should be not be considered on non-residential roads (i.e., arterials and commercially used roadways) (note, this does not apply to sidewalks along these roadways), and
  - Avoid configurations where impervious pavement "run-on" has a larger surface area than the adjacent pervious pavement (unless the pavement, base course, and subgrade have been designed to accept runoff from adjacent impervious surfaces).
- The City should follow closely the infeasibility criteria listed in the Manual.
- The City should avoid porous concrete in shaded areas (due to potential of moss growth)
- The City should monitor the development of the WSDOT specification for pervious pavement, and use it when it becomes available.
- The City should continue to pursue grant funding for pervious pavement

Using Utility Funds on Private Property (for maintenance of drainage infrastructure)

Historically, the City of Monroe is similar to many other cities in the region with a less rigid policy on enforcing maintenance of stormwater facilities. With the increasing emphasis on stormwater quality via the NPDES Phase II permit, there are more rigid standards for inspection and maintenance of stormwater infrastructure. It is recommended that the City raise the level of awareness of these requirement amongst staff and public with the goal of meeting NPDES compliance for timelines when maintenance is found to be needed. It is also recommended that the City communicate the requirements of the NPDES permit and the Monroe Municipal Code during the pre-application meetings with prospective builders and designers.

Because of the current process for enforcement includes a potential untimely allowance for voluntary compliance and appeals, it is recommended that the City establish a target timeframe for issuing a notification of maintenance needs when an inspection reveals maintenance is needed, of no more than 1-2 weeks. And then monitor the compliance status on a monthly basis.

The City should also increase public awareness of property owner's responsibility to maintain their stormwater facility BMPs as part of its public education and involvement program by sending out fliers (or other public awareness strategy).

Should the City Consider Alternatives to Low Impact Development Strategies

It was recommended that the City not pursue any alternative strategies for LID implementation at the present time. This is primarily due to cost for investigating such strategies when the extent of benefits are uncertain and also that other jurisdictions are and will be looking into alternative strategies in the coming years. If other jurisdictions are able to identify alternative LID approaches that offer significant advantageous and they are able to successfully obtain Ecology approvals, consideration could be given to applying them to the City of Monroe.

In the meantime, The City should continue the current practice of following the Ecology's Manual. While this approach would not actively look at a systematic or system wide alternatives to LID, it would not preclude the development community from looking at options within their individual project sites. That is, the proponent of a project would carry the burden of providing the engineering services required to evaluate the infeasibility criteria or other factors and assess LID on a project site by project site basis. The results of the proponent's work would then determine the extent to which LID will, or will not, remain feasible.

Other Recommendations

Although it wasn't specifically discussed as a policy question, an analysis was conducted in Chapter SW 7 to assess the future needs in terms of resources and costs as the City expands geographically through annexations to the ultimate urban growth area. Recognizing that this will take many years and several annexations, a conclusion of this analysis was that the City should add staff incrementally as annexations occur. The analysis suggests adoption of a guideline to add 0.25 FTEs for every 250 acres annexed. As this this is only a fraction of a full hire, the likely scenario would be that the Utility would need to share a portion of the hire with other City departments or programs. This should be considered a guideline and consideration of that actual maintenance needs within any area to be annexed should also be considered.

As mentioned in Chapter SW 5, the City's current operation of treating catch basin vactor waste and street seeping sediment at the decant facility is very efficient. It is noted, however, that the Department of Ecology is currently having ongoing discussions with several counties and cities regarding the possibility of changing the treatment requirements for vactor waste that, if implemented, could result in changes on how the City uses the decant facility and increase disposal costs. It is recommended that the City of Monroe monitor these ongoing discussions during the coming years to assess implications on the City's operation.

Chapter 12 Financial Program

12.1 Introduction

The objective of the financial plan is to identify the total cost of providing water, sewer, and stormwater service and to provide a financial program that allows each utility to remain financially viable during execution of the identified Capital Improvement Programs (CIP). This analysis considers the historical financial condition of each utility, the sufficiency of utility revenues to meet current and future financial and policy obligations and the financial impact of executing the CIP. Furthermore, the plan provides a review of each utility's rate structure with respect to rate adequacy and customer affordability, as well as the promotion of water conservation within the water utility.

12.2 Review of Past Financial Performance

This section includes a historical (2008 to 2013) summary of financial performance based on Statement C-4, "Fund Resources and Uses Arising from Cash Transactions," from the City's annual financial statements. The published statements did not always break out the three types of funds—operating, capital, and debt service—for all three types of utilities—Water, Sewer, and Stormwater. However, the City provided backup detail to the published statements to allow a uniform comparison over this six-year period. With the additional information provided, the following tables show the revenues and expenditures for the combined operating, capital, and debt service funds, first for the water utility, then the sewer utility, then the stormwater utility.

After the historical revenues and expenditures through 2013 are shown, the outstanding debt as of the end of 2013 is shown for each of the three utilities, broken out by individual debt issue.

12.2.1 Review of Historical Operating Income and Expenditures

Water Utility

Table W 12-1 summarizes the water utility's historical financial performance based on Statement C-4. The City currently accounts for water operating activity in Fund 411 "Water Maintenance & Operations", tracks capital activity in Fund 412 "Water Capital Projects", and maintains a combined Revenue Bond Debt Reserve for all three utilities in Fund 450. Each year in the table shows the given year's Water operating, Water capital, and the Water share of the debt reserve funds.

During the historical 2008 to 2013 time period, annual Charges for Goods and Services have increased 34%, which represents an approximate $1 million increase. Total annual operating expenditures (which includes debt service but not capital outlays) have increased 25% in this same period, representing approximately a $654,000 increase.

Table W 12-1 Fund Resources and Uses Arising From Cash Transactions

Water Utility	2008	2009	2010	2011	2012	2013
Beginning Net Cash and Investments						
Unspecified	$ 1,777,346	$ 1,692,980	$ 1,979,878	$ 14,421	$ -	$ -
Reserved	-	-	-	185,454	1,655,377	954,111
Unreserved	-	-	-	470,780	5,580,063	4,973,655
Total Beginning Cash Balance	1,777,346	1,692,980	1,979,878	670,655	7,235,440	5,927,766
Revenues & Other Sources						
Charges for Goods and Services A/R	2,979,940	3,375,921	3,620,000	3,467,220	3,587,523	3,991,290
Fines and Penalties	11,101	-	3,233	813	-	-
Miscellaneous	32,238	13,052	12,119	18,348	31,335	33,478
Capital Contributions	414	-	896,762	60,833	143,055	649,666
Other Financing Sources	258,173	-	517,025	1,126,021	708	823,080
Other	172,365	199,407	-	-	-	-
Total Revenues and Other Financing Sources	3,454,231	3,588,380	5,049,139	4,673,235	3,762,621	5,497,514
Total Resources	**5,231,577**	**5,281,360**	**7,029,018**	**5,343,890**	**10,998,061**	**11,425,280**
Operating Expenditures						
Physical Environment	2,062,729	2,084,234	2,190,578	2,319,324	3,151,668	2,617,698
Other	335,600	112,848	-	-	-	-
Total Operating Expenditures	2,398,329	2,197,082	2,190,578	2,319,324	3,151,668	2,617,698
Debt Services	200,146	191,823	185,835	121,281	657,300	635,228
Capital Outlay	75,742	326	443,452	293,839	1,267,562	319,251
Total Expenditures	2,674,217	2,389,231	2,819,865	2,734,444	5,076,530	3,572,177
Financing Uses	641,442	624,751	3,502,014	312,479	-	823,080
Total Expenditures and Other Financing Uses	**3,315,659**	**3,013,982**	**6,321,880**	**3,046,923**	**5,076,530**	**4,395,257**
Excess (Deficits) of Resources Over uses	1,915,918	2,267,378	707,138	2,296,967	5,921,531	7,030,023
Non-Operating Revenues (Except 384 and 388.80)	-	-	-	4,850,162	6,235	-
Non-Operating Expenditures (Except 584 & 588.80)	222,938	287,498	221,938	223,588	-	-
Subtotal	1,692,980	1,979,880	485,200	6,923,541	5,927,766	7,030,023
Ending Net Cash and Investments						
Unspecified	1,692,980	1,979,880	485,200	-	-	-
Reserved	-	-	-	1,331,994	954,111	940,914
Unreserved	-	-	-	5,591,547	4,973,655	6,089,109
Total	**$ 1,692,980**	**$ 1,979,880**	**$ 485,200**	**$ 6,923,541**	**$ 5,927,766**	**$ 7,030,023**

Sewer Utility

Table SS 12-1 summarizes the sewer utility's historical financial performance based on Statement C-4. The City currently accounts for sewer operating activity in Fund 421 "Sewer Maintenance & Operations", tracks capital activity in Fund 422 "Sewer Capital Projects", and maintains a combined Revenue Bond Debt Reserve for all three utilities in Fund 450. Each year in the table shows the Sewer operating, Sewer capital, and the Sewer share of the debt reserve.

During the historical 2008 to 2013 time period, annual Charges for Goods and Services have increased 43%, which represents about a $1.7 million increase. Total annual operating expenditures (including debt service but not capital outlays) have increased 80% in this same six-year time frame, representing approximately a $2.1 million increase.

Table SS 12-1 Fund Resources and Uses Arising From Cash Transactions

Sewer Utility	**2008**	**2009**	**2010**	**2011**	**2012**	**2013**
Beginning Net Cash and Investments						
Unspecified	$ 5,929,920	$ 5,798,081	$ 6,887,949	$ -	$ -	$ -
Reserved	-	-	-	1,908,525	3,190,019	1,865,478
Unreserved	-	-	-	4,516,580	9,230,422	5,375,919
Total Beginning Cash Balance	5,929,920	5,798,081	6,887,949	6,425,105	12,420,441	7,241,397
Revenues & Other Sources						
Charges for Goods and Services A/R	4,055,893	4,231,963	4,669,764	4,573,494	5,082,059	5,793,404
Miscellaneous	156,258	51,235	33,568	38,219	44,954	26,465
Capital Contributions	-	-	-	156,095	169,425	396,090
Fines and Penalties	-	-	-	8,366	-	-
Other Financing Sources	300,000	273,136	6,605,611	1,734,704	500,000	871,140
Other	(5,292)	11,016	-	-	-	-
Total Revenues and Other Financing Sources	4,506,859	4,567,350	11,308,943	6,510,878	5,796,438	7,087,099
Total Resources	**10,436,779**	**10,365,431**	**18,196,892**	**12,935,983**	**18,216,879**	**14,328,496**
Operating Expenditures						
Physical Environment	2,222,559	2,484,352	2,392,473	2,116,043	2,928,487	2,925,788
Other	184,082	1,454,139	-	-	-	-
Total Operating Expenditures	2,406,641	3,938,491	2,392,473	2,116,043	2,928,487	2,925,788
Debt Services	254,957	226,716	291,745	455,753	1,933,986	1,868,246
Oher Expenditure	-	-	-	865,339	-	-
Capital Outlay	650	-	1,770,478	5,140,954	5,589,330	1,439,273
Total Expenditures	2,662,248	4,165,207	4,454,696	8,578,089	10,451,803	6,233,307
Financing Uses	1,033,536	867,437	7,569,230	25,000	525,000	948,140
Total Expenditures and Other Financing Uses	**3,695,784**	**5,032,644**	**12,023,926**	**8,603,089**	**10,976,803**	**7,181,447**
Excess (Deficits) of Resources Over uses	6,740,995	5,332,787	6,172,966	4,332,894	7,240,076	7,147,049
Non-Operating Revenues (Except 384 and 388.80)	-	2,506,907	-	9,387,410	4,612	549
Non-Operating Expenditures (Except 584 & 588.80)	942,915	951,744	832,953	856,906	3,292	549
Subtotal	5,798,080	6,887,950	5,340,013	12,863,398	7,241,396	7,147,049
Ending Net Cash and Investments						
Unspecified	5,798,080	6,887,950	5,340,013	-	-	-
Reserved	-	-	-	3,643,229	1,865,478	2,112,547
Unreserved	-	-	-	9,220,170	5,375,919	5,034,502
Total	**$ 5,798,080**	**$ 6,887,950**	**$ 5,340,013**	**$12,863,399**	**$ 7,241,397**	**$ 7,147,049**

Stormwater Utility

Table SW 12-1 summarizes the stormwater utility historical financial performance from the Statement C-4. The City currently tracks stormwater operating activity in Fund 431 “Stormwater Maintenance & Operations”, accounts for capital activity in Fund 432 “Stormwater Capital Projects”, and maintains a combined Revenue Bond Debt Reserve for all three utilities in Fund 450. In the table, each year shows the Stormwater utility’s operating and capital funds and the Stormwater share of the debt reserve funds.

During the 2008 to 2013 time period, annual Charges for Goods and Services have increased 21%, approximately a $270,000 increase. Total annual operating expenditures (including debt service but not capital outlays) over that same six-year period have increased 131%, representing about a $765,000 increase.

Table SW 12-1 Fund Resources and Uses Arising From Cash Transactions

Stormwater Utility	2008	2009	2010	2011	2012	2013
Beginning Net Cash and Investments						
Unspecified	$ 146,170	$ 498,321	$ 179,580	$ -	$ -	$ -
Reserved	-	-	-	-	467,879	337,578
Unreserved	-	-	485,535	348,178	1,604,280	1,688,923
Total	146,170	498,321	665,116	348,178	2,072,159	2,026,501
Revenues & Other Sources						
Intergovernmental	46,616	28,384	31,669	18,332	-	-
Charges for Goods and Services A/R	1,279,673	1,373,450	1,498,949	1,505,064	1,522,369	1,548,054
Miscellaneous	9,571	5,298	4,169	6,038	9,285	12,245
Other Financing Sources	382,130	398,467	566,829	338,052	-	205,780
Total Revenues and Other Financing Sources	1,717,990	1,805,599	2,101,617	1,867,486	1,531,654	1,766,079
Total Resources	**1,864,160**	**2,303,920**	**2,766,732**	**2,215,664**	**3,603,813**	**3,792,580**
Operating Expenditures						
Physical Environment	583,859	807,011	955,398	951,745	1,287,767	1,244,318
Total Operating Expenditures	583,859	807,011	955,398	951,745	1,287,767	1,244,318
Debt Services	-	-	-	13,985	104,881	104,799
Capital Outlay	106,173	129,975	1,667	401,870	82,543	542,917
Total Expenditures	690,032	936,986	957,065	1,367,600	1,475,191	1,892,034
Financing Uses	675,807	701,816	1,461,488	324,375	102,119	205,780
Total Expenditures and Other Financing Uses	**1,365,839**	**1,638,802**	**2,418,554**	**1,691,975**	**1,577,310**	**2,097,814**
Excess (Deficits) of Resources Over uses	498,321	665,118	348,179	523,689	2,026,503	1,694,766
Non-Operating Revenues (Except 384 and 388.80)	-	-	-	1,408,112	-	-
Non-Operating Expenditures (Except 584 & 588.80)	-	-	-	-	-	-
Subtotal	498,321	665,118	348,179	1,931,801	2,026,503	1,694,766
Ending Net Cash and Investments						
Unspecified	498,321	665,118	348,178	-	-	-
Reserved	-	-	-	338,052	337,578	321,239
Unreserved	-	-	-	1,593,748	1,688,923	1,373,527
Total	**$ 498,321**	**$ 665,118**	**$ 348,178**	**$ 1,931,800**	**$ 2,026,501**	**$ 1,694,766**

12.2.2 Outstanding Debt Principal

Water Utility

Table W 12-2 outlines the City's outstanding water debt principal as of the end of 2013. The total outstanding principal is just over $6.5 million.

Table W 12-2 Outstanding Debt Principal

Debt Description	Principal Outstanding	Maturity Year
Water and Sewer Revenue Bonds, 2011	$ 4,453,150	2031
2005 Water & Sewer Refunding Bonds ('MONWAT02)	$ 589,950	2021
PW-97-791-026 Draw #1 & #2 (Ingraham Water Reservoir Program)	$ 251,177	2017
PW-02-691-035 ('North Hill Water Reservoir)	$ 1,216,298	2022
Total	**$ 6,510,575**	

Sewer Utility

Table SS 12-2 outlines the City's outstanding sewer debt principal as of the end of 2013. The total outstanding principal is just over $17.9 million.

Table SS 12-2 Outstanding Debt Principal

Debt Description	Principal Outstanding	Maturity Year
Water and Sewer Revenue Bonds, 2011	$ 8,619,000	2031
2005 Water & Sewer Refunding Bonds	$ 2,515,050	2021
2009 Water & Sewer Revenue & Refunding Bonds	$ 3,040,000	2024
Dept of Ecology Loan - LO200009	$ 3,115,218	2022
Dept of Ecology - LO300021	$ 660,532	2022
Total	**$ 17,949,800**	

Stormwater Utility

The City's 2011 "Water and Sewer Revenue Bond" issue included funding for stormwater projects as well as water and sewer projects. **Table SW 12-2** shows that as of the end of 2013, the stormwater share of the outstanding principal from those bonds was nearly $1.3 million.

Table SW 12-2 Outstanding Debt Principal

Debt Description	Principal Outstanding	Maturity Year
Water and Sewer Revenue Bonds, 2011	$ 1,292,850	2031

12.3 Available Capital Resources

The financial plan should identify long-term capital funding strategies in order to ensure that adequate resources are available to fund the capital programs called for in this Plan. In addition to each utility's internal resources—such as accumulated cash reserves, transfers from operating revenue, and system development charges—capital needs can also be addressed by outside sources, such as grants, low-interest loans, and revenue bond financing. The following is a summary of Internal Utility Resources, Government Programs & Resources, and Public Debt Financing.

12.3.1 Internal Utility Resources

Internal utility resources appropriate for funding capital needs include accumulated cash in the capital funds, transfers from operating revenue, capital revenues such as system development charges or local facilities charges. These resources are discussed below.

Utility Funds and Cash Reserves

Ongoing user charges (rates) paid by each utility's customers are an operating revenue that is the primary funding source for all utility activities. While capital revenue cannot be used for operating or maintenance expenses, operating revenues can be used for capital investment. Rate revenue can pay for capital improvement projects in two ways: either paying for debt service or directly paying for capital projects. Funding capital costs directly through rates avoids the interest expense associated with issuing new debt. Rate-funded capital investment should be designed as a regular transfer from operating revenue each year; otherwise, trying to pay for capital projects with current-year operating revenue can lead to rate volatility. If regular transfers of operating revenue are made into the capital fund, then if capital spending is relatively low in any given year, cash reserves can be accumulated that will offset future capital project costs.

System Development Charges

A system development charge (SDC), as provided for by RCW 35.92.025, refers to a one-time charge imposed on new customers as a condition of connection to the utility system. The City of Monroe uses the terms "sewer connection charges" and "water capital improvement charges" for these charges within their municipal code. To simplify the references throughout this chapter, the abbreviation of "SDC" will be used to refer to these two charges.

SDCs are separate from meter installation fees or similar charges for the labor and materials used to make a physical connection. Instead, SDCs are intended to recover a proportionate share of existing systemwide capital investment and to offset a proportionate share of planned systemwide capital costs that are attributable to new development. The purpose of the SDC is two-fold: (1) to promote equity between new and existing customers; and (2) to provide a source of revenue to fund capital projects. Equity is served by providing a vehicle for new customers to share the cost of infrastructure investment. SDC revenues provide a source of cash flow used to support utility capital needs; revenue can only be used to fund utility capital projects or to pay debt service incurred to finance those projects.

In the absence of an SDC, growth-related capital costs would be borne in large part by existing customers. In addition, the net investment in the utility already collected from existing customers would be diluted by the addition of new customers, effectively subsidizing new customers with prior customers' prior payments. To establish equity, a SDC should recover a proportionate share of the existing and future infrastructure costs from a new customer. From a financial perspective, a new customer becomes equivalent to an existing customer by paying the SDC.

Table 12-3 summarizes the City's current water and sewer SDC schedules. The City does not currently have a stormwater SDC.

Table 12-3 Current Connection Charge Schedule

Meter Size	ERUs	Water	Sewer	Stormwater
Current Charge per ERU:		$ 4,335	$ 6,777	N/A
5/8 x 3/4 Inch	1	$ 4,335	$ 6,777	
1 Inch	2.5	$ 10,838	$ 16,943	
1- 1/2 Inches	5	$ 21,675	$ 33,885	
2 Inches	8	$ 34,680	$ 54,216	
3 Inches	16	$ 69,360	$ 108,432	
4 Inches	25	$ 108,375	$ 169,425	
6 Inches	50	$ 216,750	$ 338,850	
8 Inches	80	$ 346,800	$ 542,160	

A SDC study is currently underway to evaluate the City's water and sewer charges. The City does not want a stormwater SDC at this time. According to City staff, existing stormwater infrastructure does not provide a material benefit to future stormwater customers, since current development regulations require on-site mitigation of stormwater impacts.

Local Facilities Charge

While an SDC is the manner in which new customers pay their share of general facilities costs, local facilities funding is used to pay the cost of local facilities that connect each property to the system infrastructure. Local facilities funding is often overlooked in a rate forecast since it is funded upfront by either connecting customers, developers, or through an assessment to properties, but never from rates. Although these funding mechanisms do not provide a capital revenue source toward funding CIP costs, a discussion of these charges is included in this chapter because of their impact on new customers.

There are several mechanisms that can be considered toward funding local facilities. One of the following scenarios typically occurs:

- The utility charges a connection fee based on the cost of the local facilities (under the same authority as the SDC);
- A developer funds extension of the system to their development and turns those facilities over to the utility (contributed capital); or
- A Utility Local Improvement District (ULID) is established, through which local assessment revenue is collected from benefited properties.

A <u>Local Facilities Charge</u> (LFC) is a variation of the system development charge authorized through RCW 35.92.025. It is a city-imposed charge to recover costs related to service extension to local properties. Often called a front-footage charge and imposed on the basis of footage of main "fronting" a particular property, it is usually implemented as a reimbursement mechanism to the city for the cost of a local facility that directly serves a property. It is a form of connection charge and, as such, can accumulate up to 10 years of interest. It typically applies in instances where the City installs the facilities prior to the properties being developed.

The Developer Extension is a requirement that a developer install onsite and sometimes offsite improvements as a condition of extending service. These are in addition to the required SDC and must be built to City standards. The City is authorized to enter into developer extension agreements under RCW 35.91.020. Part of the agreement between the City and the developer might include a late-comer agreement, resulting in a late-comer charge to other properties later served by the developer-funded extension.

Latecomer Charges are a variation of developer extensions whereby a new customer connecting to a previous developer-installed improvement makes a payment to the City based on their share of the developer's cost (RCW 35.91.020). The City passes this on to the developer who installed the facilities. Latecomer obligations are recorded on the title of affected properties. No interest is allowed, and the reimbursement agreement is in effect for a period of 20 years, unless a longer duration is approved by the City.

ULID is another mechanism for funding infrastructure that assesses benefited properties based on the special benefit received by the construction of specific facilities (RCW 35.43.042). ULIDs are usually used to pay for the extension of local facilities, making them an alternative to local facilities charges when for some reason property has been allowed to develop without developer-funded extensions. However, ULIDs may also recover related general facilities costs. Substantial legal and procedural requirements can make this an expensive process, and a ULID can be rejected by a majority of property ownership within the assessment district boundary. ULIDs are not often used to finance stormwater facilities because it has proven difficult to demonstrate required special benefit to properties to be assessed.

12.3.2 Government Programs & Resources

Historically, federal and state grant programs were available to local utilities for capital funding assistance. However, these assistance programs have been mostly eliminated, substantially reduced in scope and amount, or replaced by loan programs. Remaining miscellaneous grant programs are lightly funded and heavily subscribed. Nonetheless, even the benefit of low-interest loans makes the effort of applying worthwhile. Grants and low-cost loans for Washington State utilities are available from various Washington State Departments. Several grant and loan programs that the City might be eligible for are described in greater detail below. Some of these programs may not pertain to all utility functions.

Department of Commerce

A September 2014 document from the Department of Commerce summarizes various loan and grant programs available for utility projects. The document titled "Summary of Some Grant and Loan Programs for Drinking Water and Wastewater Projects" can be found at http://www.commerce.wa.gov/Documents/9-2-14_multi-program_funding_program_summary.pdf

A few of those programs are described below:

Community Development Block Grant (CDBG) General Purpose Grant

These grants are made available through a competitive application process to assist small cities, towns and counties in Washington State in carrying out significant community and economic development projects that principally benefit low and moderate income persons.

- Eligible applicants are Washington State cities and towns with a population less than 50,000 and counties with a population less than 200,000 that are not participating in a CDBG Entitlement Urban County Consortium.
- Eligible projects include public facilities such as water, wastewater, and streets.
- Further details are available at:
  - http://www.commerce.wa.gov/Programs/Infrastructure/CDBG-Program-Overview/Pages/default.aspx
  - http://www.commerce.wa.gov/Documents/2015_CommerceResourceBook.pdf

Community Economic Revitalization Board (CERB)

CERB, a division of the Washington State Department of Commerce, primarily offers low cost loans; grants are made available only to the extent that a loan is not reasonably possible. The CERB targets public facility funding for economically disadvantaged communities, specifically for job creation and retention. Priority criteria include the unemployment rates, number of jobs created and/or retained, wage rates, projected private investment, and estimated state and local revenues generated by the project. According to their website, "CERB funds a variety of projects that create jobs including (but not limited to) domestic and industrial water, storm and sewer water projects, telecommunications and port facilities." Eligible applicants include cities, towns, port districts, special purpose districts, federally recognized Indian tribes and municipal corporations.

Funding details for the 2013 – 2015 Program are as follows per the Washington Commerce website: "$9 million was appropriated to CERB for the 2013-2015 Biennium. By state law, CERB must award 75% of this funding to projects in rural counties. The Board has also allocated $2,182,500 to be available for construction and planning grants on a first-come, first-served basis."

Program	Funding Limitations
Committed Private Sector Partner Construction	• $2 million per project loan award limit • Up to $300,000 or 50% of total award, **whichever is less**, may be grant funds. • 20% cash match required (minimum, percent of total project cost)
Prospective Development Construction	Available to rural communities only. • $2 million per project loan award limit • Up to $300,000 or 50% of total award, **whichever is less**, may be grant funds. • 50% cash match required (minimum, percent of total project cost)
Planning/Economic Feasibility Studies	• $50,000 grant per project award limit • 25% cash match required (minimum, percent of total project cost)

Further details are available at:

- http://www.commerce.wa.gov/commissions/CommunityEconomicRevitalizationBoard/
- http://www.commerce.wa.gov/Documents/2013-15_Policies.pdf
- http://www.commerce.wa.gov/commissions/CommunityEconomicRevitalizationBoard/Pages/CERB-Traditional-Programs.aspx

Public Works Board (PWB) Financial Assistance

The Board's goal is community access to financial and technical resources that help sustain local infrastructure. Cities, towns, counties, and special purpose districts are eligible to receive financial assistance for qualifying projects. When funding is available, the following tools exist:

- Construction Loan Program: http://www.pwb.wa.gov/financial-assistance/Construction/Pages/default.aspx
  - Funding Cycle: Per the Board website, the Governor's proposed 2015-17 budget offers $69.7M for 19 projects.
  - Program Description: Low-interest loans for local governments to finance public infrastructure construction and rehabilitation. Eligible projects must improve public health and safety, respond to environmental issues, promote economic development, or upgrade system performance.
  - Terms: For non-distressed communities, a term of five years or less has an interest rate of 1.28% and a term from six to twenty years has an interest rate of 2.55%.

- Pre-Construction Loan Program: http://www.pwb.wa.gov/financial-assistance/Pre-Construction/Pages/default.aspx
  - Funding Cycle: No funding has been allocated to the Pre-construction loan program for the 2013-15 biennium, but the program still exists and could be funded in a future biennium.
  - Program Description: Local governments may apply for low interest loans to finance pre-construction activities to prepare a project for construction.
  - Terms: Terms are limited to a five year repayment period (the loan term may be converted to 20-years once the project has secured construction funding) with a 1% interest rate.

- Emergency Loan Program: http://www.pwb.wa.gov/financial-assistance/Emergency-Loan/Pages/default.aspx
  - Funding Cycle: No funding has been allocated to the Emergency loan program for the 2013-15 biennium, but the program still exists and could be funded in a future biennium.
  - Program Description: The Emergency Loan Program provides funding to address public works emergencies, thereby helping provide immediate restoration of critical public works services and facilities.
  - Terms: Funds are limited to $500,000 per jurisdiction per biennium, and come with a 20-year term (or the life of the project), and a 3% interest rate. No local match is required.

- Energy and Water Efficiency Loan Program: http://www.pwb.wa.gov/financial-assistance/Energy-Water/Pages/default.aspx
  - Funding Cycle: No funding has been allocated to the Energy and Water Efficiency (EWE) loan program for the 2013-15 biennium, but the program still exists and could be funded in a future biennium.
  - Program Description: The EWE program is designed to encourage energy, water, and efficiency upgrades to existing infrastructure by providing low-cost loans.
  - Terms: The maximum loan amount is $1,000,000. The interest rate is dependent upon the term of the loan. Loans less than 5 years receive a 0.50% rate. Loans between 5 and 10 years receive a 1% interest rate. Loans between 11 and 20 years receive a 1.50% interest rate.

- Drinking Water State Revolving Fund Loan Program: http://www.pwb.wa.gov/financial-assistance/Drinking-Water/Pages/default.aspx
  - Funding Cycle: The DWSRF program has shifted their application cycle to fall, starting September 1, 2014.
  - Program Description: The DWSRF loan program is a federal and state partnership program to provide low-interest loans to finance projects that increase public health protection. A 2012 Washington State law requires all public water systems that receive loans or grants for infrastructure to complete an Investment Grade Efficiency Audit (IGEA). This is an effort to apply energy efficiency to water systems, similar to DOH's Green Projects that was started in 2009, and may be financed as part of the DWSRF loan.
  - Terms: For construction loans, interest rates range from 1% to 1.5% with repayment periods of 20 years or life of the project being financed, whichever is less.

- Further general resources are available at:
  - http://www.pwb.wa.gov/financial-assistance/Pages/default.aspx
  - http://www.pwb.wa.gov/Documents/FINAL-MASTER-GUIDELINES.pdf
  - http://www.commerce.wa.gov/Documents/9-2-14_multi-program_funding_program_summary.pdf

Department of Ecology

Integrated Water Quality Funding Program

This year, Ecology received 227 applications requesting more than $352 million in assistance. Ecology is proposing grant and loan funding for 165 projects totaling approximately $229 million.

- State Water Pollution Control Revolving Fund & Centennial Clean Water Program
  - Design projects associated with publicly-owned wastewater and stormwater facilities. The integrated program also funds planning and implementation of nonpoint source pollution control activities. Terms for State Fiscal Year 2016 include either 2.4% interest for 6-20 year term or 1.2% for 5 year term loans. Forgivable loan principal terms are available for distressed communities.
  - Further general resources are available at: http://www.ecy.wa.gov/programs/wq/funding/cycles/FY2016/index.html

- Stormwater Financial Assistance Program (SFAP)
  - Stormwater grant assistance is available for projects not required by permit. Program available for both cities and counties. The maximum grant award per jurisdiction is $250,000 for pre-construction and $5 million for construction.
  - Further general resources are available at: http://www.ecy.wa.gov/programs/wq/funding/FundPrgms/OthPrgms/StWa12a/FY12aStWa.html
  - http://www.ecy.wa.gov/programs/wq/funding/Training/FY2016/SFY16ApplicantStormwaterSession.pdf.

12.3.3 Public Debt Financing

General Obligation Bonds

General obligation (G.O.) bonds are bonds secured by the full faith and credit of the issuing agency, committing all available tax and revenue resources to debt repayment. With this high level of commitment, G.O. bonds have relatively low interest rates and few financial restrictions.

However, the authority to issue G.O. bonds is restricted in terms of the amount and use of the funds, as defined by Washington constitution and statute. Specifically, the amount of debt that can be issued is linked to assessed valuation.

RCW 39.36.020 states:

> *"(ii) Counties, cities, and towns are limited to an indebtedness amount not exceeding one and one-half percent of the value of the taxable property in such counties, cities, or towns without the assent of three-fifths of the voters therein voting at an election held for that purpose.*
> *(b) In cases requiring such assent counties, cities, towns, and public hospital districts are limited to a total indebtedness of two and one-half percent of the value of the taxable property therein."*

While bonding capacity can limit availability of G.O. bonds for utility purposes, these can sometimes play a valuable role in project financing. A rate savings may be realized through two avenues: the lower interest rate and related bond costs; and the extension of repayment obligation to all tax-paying properties (not just developed properties) through the authorization of an ad valorem property tax levy.

Revenue Bonds

Revenue bonds are commonly used to fund utility capital improvements. The debt is secured by the revenues of the issuing utility and the debt obligation does not extend to the City's other revenue sources. With this limited commitment, revenue bonds typically bear higher interest rates than G.O. bonds and also require security conditions related to the maintenance of dedicated reserves (a bond reserve) and financial performance (bond debt service coverage). The City agrees to satisfy these requirements by ordinance as a condition of bond sale.

Revenue bonds can be issued in Washington without a public vote. There is no bonding limit, except the practical limit of each utility's ability to generate sufficient revenue to repay the debt and provide coverage. In some cases, poor credit might make issuing bonds problematic.

12.3.4 Capital Resource Funding Summary

An ideal funding strategy would include the use of grants and low-cost loans when debt issuance is required. However, these resources are very limited and competitive in nature and do not provide a reliable source of funding for planning purposes. It is recommended that the City pursue these funding avenues but assume bond financing to meet needs above a utility's available cash resources. G.O. bonds may be useful for special circumstances, but since bonding capacity limits are most often reserved for non-utility purposes, revenue bonds are a more secure financing mechanism for utility needs. The Capital Financing Strategy developed to fund the CIP generally follows the funding priority below:

1. Available grant funds and/or developer contributions
2. Interest earnings on allocated fund balances
3. Any other miscellaneous capital resources
4. Annual revenue from system development charges
5. Annual transfers of rate-funded capital or excess cash (above target balances) from operating accounts
6. Accumulated capital cash reserves from prior years
7. Revenue bond financing

12.4 Financial Plan Framework

12.4.1 Overview

The three utilities are self-supporting enterprises, responsible for funding all of their related costs. They do not receive General Fund resources. The main revenue source for each utility is service charges. Subject to statutory authority, the City controls the level of service charges by ordinance and can adjust them as needed to meet financial objectives.

The financial plan can give assurance of financial feasibility only if it considers the total cost of service – operating and capital. To meet this objective, the following analytical steps were taken:

- **Capital Funding Strategy** – The capital funding strategy identifies total costs for the 20-year capital planning period, which is 2016 through 2035. The strategy then shows how those costs can be paid for by some combination of existing reserves, current rate revenue, SDC income, debt financing, grants, or other funding sources. The capital funding strategy affects the annual financial forecast in two ways: debt financing results in annual debt service, and any rate revenue used for capital funding increases the rate revenue requirement. Many of the projects are not assigned to a specific year in the CIP section of this Plan. To model a capital funding strategy, projects were assigned to specific years, assuming the goal of relatively level expenditures. The timing assigned to each project may not reflect the City's actual execution of the capital program.
- **Financial Forecast** – This forecast identifies annual non-capital costs associated with the operation, maintenance, and administration of each system. Included in the financial plan is a reserve analysis that forecasts cash flow and fund balance activity along with testing for satisfaction of actual or recommended minimum fund balance policies. The financial plan evaluates the sufficiency of utility revenues in meeting all obligations, including operating expenses, debt service, and reserve contributions, as well as any debt service coverage requirements associated with long-term debt. If rate revenues under existing rates are projected to be inadequate, then the rate increases needed to meet cash flow requirements and debt service coverage are calculated.

12.4.2 Utility Funds Structure

The City tracks each utility's revenues and expenditures in an operating fund, capital fund, and within a combined revenue bond debt reserve. A brief description is provided below:

- *Operations:* Serves as an operating account where operating revenues are deposited and operating expenses are paid.
  - The City's tracks the operations of each utility in separate funds including: Water Maintenance & Operations (Fund 411), Sewer Maintenance & Operations (Fund 421), and Stormwater Maintenance & Operations (Fund 431).

- *Capital projects:* Serves as a capital account where capital revenues are deposited and capital expenditures are paid. Examples of capital revenues include system development charges, grant proceeds, debt proceeds, and capital transfers from rates.
  - The City's tracks the capital activity of each utility in separate funds including: Water Capital Projects (Fund 412), Sewer Capital Projects (Fund 422), and Stormwater Capital Projects (Fund 432).

- *Restricted Bond Reserve: S*erves as a restricted account set up to comply with revenue bond covenants.
  - The City has a combined Revenue Bond Debt Reserve (Fund 450).

12.4.3 Financial Policies

Following is a brief summary of adopted or recommended financial policies for the City's utilities. Adopted policies are drawn from Resolution No. 2012/018, provided by the City.

Reserve Policies

Utility reserves serve multiple functions; they can be used to address variability and timing of expenditures and receipts; occasional disruptions in activities, costs or revenues; utility debt obligations; and many other functions. The collective use of individual reserves helps to limit the City's exposure to revenue shortfalls, meet long-term capital obligations, and reduce the potential for bond coverage defaults.

- *Operating Reserve* – An operating reserve is designed to provide a liquidity cushion; it protects a utility from the risk of short-term variation in the timing of revenue collection or payment of expenses. Like other types of reserves, operating reserves also serve another purpose: they help smooth rate increases over time. Target funding levels for an operating reserve are generally expressed as a certain number of days of operating and maintenance (O&M) expenses, with the minimum requirement varying with the expected revenue volatility. Industry practice for utility operating reserves ranges from 30 days (8%) to 120 days (33%) of O&M expenses, with the lower end more appropriate for utilities with stable revenue streams and the higher end of the range more appropriate for utilities with significant seasonal or consumption-based fluctuations.

  The City's adopted policy states that the each utility's target operating reserve should equal approximately 45 days of operating expense. The 45-day target is on the high end for stormwater utilities because of the stable nature of stormwater revenue. The 45-day target is on the low end for water utilities because of the variable nature of consumption-based water revenue. We recommend increasing the target for water to 60 days, and we have assumed that for the remainder of this forecast. Doing so does not increase the level of rate increases needed under this forecast.

  Based on the City's 2015 budgeted expenditures, the target operating reserves are approximately equal to the following::
  - Water utility: $550,000 (60 days)
  - Sewer utility: $375,000 (45 days)
  - Stormwater utility: $150,000 (45 days)

- *Capital Contingency Reserve* – A capital contingency reserve is the minimum fund balance in a capital fund, set aside for capital needs that are large, urgent, and unexpected. These needs could result from a sudden asset failure, or they could come from capital project cost overruns. There is more than one way to determine an appropriate level for this reserve. For instance, a utility could choose a certain percentage of the total cost of its assets, or it could base the minimum reserve on the cost of replacing a particular highly critical asset, or it could set the capital contingency as a percentage of average capital spending per year. The most common method is to set a minimum capital fund balance equal to 1% of the original cost of plant in service.

The City's adopted policy states that each utility's target capital reserve should equal 1% of net fixed assets. We recommend using 1% of the "original cost of fixed assets" rather than "net fixed assets". An original cost basis results in a more conservative target, assuming that "net fixed assets" represents original cost less accumulated depreciation. In this financial plan, the following targets are assumed:

– Water: 1% of the original cost of fixed assets; approximately $275,000 in 2015
– Sewer: 1% of the original cost of fixed assets; approximately $450,000 in 2015
– Stormwater: The greater of $100,000 or 1% of the original cost of fixed assets. The target of $100,000 is approximately 15-20% of the average annual, long-term capital expenditures identified in this Plan. This provides a conservative target floor until the 1% of original cost of assets exceeds $100,000 in 2019.

  The stormwater utility has a small amount of fixed assets relative to its planned capital expenditures. For example, total estimated fixed assets at the end of 2013 totaled just under $4 million, and the stormwater utility is expected to add another $4 million in fixed assets by 2016 or 2017.

- *Revenue Bond Reserve* – Bond covenants often establish reserve requirements as a means of protecting bondholders against the risk of nonpayment. This bond reserve is typically funded at the time of borrowing as part of the bond principal. A reserve amount equal to annual debt service is assumed for each utility that issues revenue bond debt.

System Reinvestment Policies

The purpose of system reinvestment funding is to provide for the ongoing rate funding for the replacement of system facilities. Each year, utility assets lose value, and as they lose value they are moving toward eventual replacement. That accumulating loss in value and future liability is typically measured for reporting purposes through annual depreciation expense. This is based on the original cost of the asset divided by its anticipated useful life. While this expense reflects the consumption of the existing asset and its original investment, the replacement of that asset will likely cost much more, after factoring in inflation and construction conditions. Therefore, the added annual replacement liability is often even greater than the annual depreciation expense. A prudent system reinvestment policy attempts to recover at least a portion of annual depreciation expense from rate funding. Providing a certain amount of rate-funded capital reinvestment ensures that the system does not become too heavily dependent on debt.

The following system reinvestment strategies are assumed for each utility:

- Water utility: The City's 2015 transfer to the Water Capital Fund represents about 50% of annual deprecation. In order to moderate the impact of rate increases in the early years of the forecast period, this financial plan assumes that 25% of depreciation is transferred to the Water Capital Fund in 2016, followed by 35% in 2017, 45% in 2018, and so forth, until 100% of depreciation is funded beginning in 2023. Reducing the target in 2016 frees up rate revenue to respond to a 15% increase in the cost of water purchased from the City of Everett. By gradually increasing the system reinvestment percentage, the City will be able to avoid a significant one-time increase in 2016.
- Sewer utility: The City currently transfers $2,000,000 per year to the Sewer Capital Projects Fund. This level is sufficient to cash-fund all planned capital expenditures identified in this Plan, and we do not recommend increasing the target at this time.

- Stormwater utility: The stormwater system reinvestment policy is not based on depreciation; 100% of depreciation on existing assets would be less than $80,000 per year. As mentioned previously, the stormwater utility has a small amount of fixed assets relative to its planned capital expenditures. We recommend a target greater than 100% of annual depreciation on fixed assets. This provides a larger capital revenue stream from annual rates which reduces the utility's reliance on debt funding of capital projects.

  The stormwater utility is budgeted to transfer $215,000 to capital in 2015, but we recommend only transferring $125,000 in 2015 to help build the operating reserve. In 2016, we increase the target to $225,000. Going forward, $25,000 per year is added to the figure until $500,000 per year is achieved in 2027. For example, the 2016 target is $225,000 and the 2017 target is $250,000. The target of $500,000 per year approximates the annual capital expenditures for the stormwater utility in the latter years of the Plan.

Debt Policies
Revenue bond covenants typically establish a minimum debt service coverage as a way to protect bondholders against the risk of nonpayment. City policy and the City's current bond covenants both require bonded debt service coverage of 1.25.

12.4.4 Financial Forecast

The Financial Forecast, or revenue requirement analysis, forecasts the amount of annual rate revenue needed throughout the short-term planning horizon. To be consistent with other chapters of this Plan, the short-term planning horizon is six years for sewer and stormwater (2016-2021) and eight years for water (2016-2023). The water financial forecast horizon extends two years beyond that of sewer and stormwater. The Department of Health has informed the City that they will shortly be moving to a 10-year planning period for water systems. As an interim measure, the City selected an 8-year horizon for the water plan.

The analysis incorporates operating revenues, O&M expenses, debt service payments, rate funded capital needs, and any other identified revenues or expenses related to utility operations, and determines the sufficiency of the current level of rates. Revenue needs are also impacted by debt covenants (typically applicable to revenue bonds) and specific fiscal policies and financial goals of each utility. For this analysis, two revenue sufficiency "tests" have been developed to reflect the financial goals and constraints of each utility: (1) cash needs must be met; and (2) debt coverage requirements must be realized. In order to operate successfully with respect to these goals, both tests of revenue sufficiency must be met.

Cash Test
The cash flow test identifies all known cash requirements for each utility in each year of the planning period. Capital needs are identified and a capital funding strategy is established. This may include the use of debt, cash reserves, outside assistance, and rate funding. Cash requirements to be funded from rates are determined. Cash requirements include O&M costs, debt service, system reinvestment funding or directly funded capital outlays, and any additions to specified reserve balances. The total annual cash needs of each utility are then compared to total operating revenues (under current rates) to forecast annual revenue surpluses or shortfalls.

Coverage Test
The coverage test is based on a commitment made by the City when issuing revenue bonds. For purposes of this analysis, revenue bond debt is assumed for any needed debt issuance. As

a security condition of issuance, the City is required per covenant to agree that the revenue bond debt would have a higher priority for payment (a senior lien) compared to most other utility expenditures; the only outlays with a higher lien are O&M expenses. Debt service coverage is expressed as a multiplier of the annual revenue bond debt service payment. For example, a 1.0 coverage factor would imply no additional cushion is required. A 1.25 coverage factor means revenues must be sufficient to pay O&M expenses, annual revenue bond debt service payments, plus an additional 25% of annual revenue bond debt service payments. The excess cash flow derived from the added coverage, if any, can be used for either rate-funded capital expenditures or building reserves. The existing coverage requirement policy on the City's outstanding revenue bonds is 1.25 times bonded debt. In determining the annual revenue requirement, both the cash and coverage sufficiency tests must be met – the test with the greatest deficiency drives the level of needed rate increase in any given year.

If either revenue sufficiency test reveals that revenues under existing rates are inadequate, then the financial forecast increases rates to the degree necessary to meet both debt service coverage and cash flow requirements.

Independent Growth Assumptions
The customer growth assumptions in the financial forecast are independent of the long-term population growth assumptions contained in other chapters of this Comprehensive Plan. The reason is that the meaning of the word "conservative" for the purpose of facilities planning is the opposite of "conservative" for the purpose of financial forecasting. In planning capital facilities, a conservative customer and demand forecast will tend to fall on the high side of the reasonable range, because underestimating demand could lead to a capacity shortfall, a more serious problem than would result from overestimated demand. For financial planning, the opposite is true: a conservative growth forecast will tend to fall on the low side of the reasonable range, because assuming too many customers could lead to a revenue shortfall and rate spike, a more serious problem than would result from assuming too few customers.

Customer Growth Assumptions through 2019
For the financial forecast, customer growth for the five years from 2015 through 2019 is assumed to be 500 new customers, which is based on the backlog in new plats that the City staff expects to be developed in the relatively short term. These new customers are all assumed to receive water, sewer, and stormwater service. The three utilities all have different numbers of existing customers—for example, there are over 5,600 water accounts at present, but only about 4,000 existing sewer accounts and about 4,600 stormwater accounts. For that reason, the percentage growth assumptions for the first five years will appear to be different—2.25% per year for sewer, 1.75% per year for water, and 2% per year for stormwater—but in reality, all of those projections are based on the development of the same 500 plats with water, sewer, and stormwater service. The different percentages are simply a function of a different starting point.

12.5 Financial Plan Results - Water

12.5.1 Water Capital Funding Strategy

The CIP developed for the water utility totals over $37 million ($47 million in inflated dollars) over the 20-year planning period (2016 to 2035). Capital expenditures for 2014 and 2015 are based on actual and estimated amounts, respectively. Capital expenditures in 2016 include two carryover projects identified by City staff in addition to the capital projects identified in this Plan. Costs are stated in 2015 dollars and are escalated to the year of planned spending at an annual inflation rate of 3.25% per year. Projects that did not have an identified trigger date in previous chapters of this Plan were assigned a construction year in the capital funding strategy, assuming the goal of a level schedule of expenditures throughout the forecast period.

Capitalized City labor and overhead are estimated to be approximately 10% of annual capital expenditures. This amount is added to the capital amounts identified by the Plan. This is based on the City's 2015 budgeted capitalized labor and overhead total, relative to total budgeted capital expenditures.

Table W 12-4 summarizes the expected annual capital expenditures.

Table W 12-4 Water CIP

Year	2015 $	Inflated $
2014	$ 618,055	$ 618,055
2015	$ 20,874	$ 20,874
2016	$ 3,353,934	$ 3,462,936
2017	$ 3,337,289	$ 3,557,738
2018	$ 3,524,385	$ 3,879,301
2019	$ 3,686,569	$ 4,189,697
2020	$ 3,613,044	$ 4,239,587
2021	$ 3,674,677	$ 4,452,045
2022	$ 3,623,041	$ 4,532,144
2023	$ 3,626,777	$ 4,684,263
Subtotal	**$ 29,078,645**	**$ 33,636,641**
2024-2035	$ 8,803,272	$ 13,700,093
Grand Total	**$ 37,881,917**	**$ 47,336,734**

A capital funding plan is developed to identify the total resources available to pay for the CIP and determine if new debt financing is required.

The SDC is projected to generate an average annual revenue stream of just over $350,000 from 2015 through 2023. This is based on a customer growth rate of 1.75% per year for the years 2015 to 2019, then an annual growth rate of 0.4% thereafter. The 1.75% factor is equivalent to roughly 500 new customers added to the water system over the next five years; this is higher than historical growth rates. The 0.4% annual growth factor assumed after 2019 is based on the average historical growth from 2010-2013. The SDC revenue projection assumes the current SDC of $4,335.

Table W 12-5 summarizes the capital funding strategy.

Table W 12-5 Capital Funding Strategy					
Year	**Capital Expenditures**	**Capital Expenditures Inflated**	**Revenue Bond Financing**	**Cash Funding**	**Total Financial Resources**
2014	$ 618,055	$ 618,055	$ -	$ 618,055	**$ 618,055**
2015	20,874	20,874	-	20,874	**20,874**
2016	3,353,934	3,462,936	-	3,462,936	**3,462,936**
2017	3,337,289	3,557,738	-	3,557,738	**3,557,738**
2018	3,524,385	3,879,301	1,734,178	2,145,123	**3,879,301**
2019	3,686,569	4,189,697	2,848,589	1,341,108	**4,189,697**
2020	3,613,044	4,239,587	2,802,741	1,436,846	**4,239,587**
2021	3,674,677	4,452,045	3,439,666	1,012,379	**4,452,045**
2022	3,623,041	4,532,144	3,382,805	1,149,339	**4,532,144**
2023	3,626,777	4,684,263	3,474,880	1,209,383	**4,684,263**
Subtotal	**$ 29,078,645**	**$ 33,636,641**	**$ 17,682,860**	**$ 15,953,781**	**$ 33,636,641**
2024-2035	8,803,272	13,700,093	1,606,666	12,093,427	**13,700,093**
Grand Total	**$ 37,881,917**	**$ 47,336,734**	**$ 19,289,525**	**$ 28,047,209**	**$ 47,336,734**

12.5.2 Water Financial Forecast

The water financial forecast projects the amount of operating and capital expenditures to determine the annual amount of revenue required. The objective of the financial forecast is to evaluate the sufficiency of the current level of rates in meeting the total revenue requirements of the system. In addition to annual operating costs, the revenue of the utility must also meet debt covenant requirements and minimum reserve level targets.

The financial forecast tables for the water utility cover 2014 through 2023. The first year reflects actual 2014 expenditures. The forecast from 2015 to 2023 is largely developed from the City's adopted 2015 annual budget document. A list of other key factors and assumptions used to forecast the utility's annual financial obligations include:

Revenue & Fund Balance Assumptions

- Adopted Rate Increases: The City adopted a 4.4% rate increase for 2015, which is incorporated into the baseline revenue figures in the forecast. No incremental rate increases are assumed for 2015 above what has already been adopted. Any necessary rate increases in 2016 and beyond are shown in **Table W 12-6**.
- Customer Growth and Demand: As previously discussed, customer account growth of 1.75% per year is assumed for the years 2015 through 2019, and then 0.4% per year thereafter. Annual water use per account is assumed to decline at 1% per year based on a review of historical data from 2010 to 2013. The net effect of the customer account growth and the decline in usage per account is a composite annual rate revenue increase of just over 1% through 2019 and essentially flat thereafter.
- Miscellaneous revenues are conservatively assumed to stay at their currently budgeted levels. Miscellaneous revenues include plan reviews, system inspections, meter rentals, and other charges for special services.
- Department of Corrections revenue is conservatively assumed to remain at actual 2014 levels.

- Interest earnings initially assume a rate of 0.11% applied to beginning of year cash balances based on existing Local Government Investment Pool rates, phasing towards 0.25% over the long term.

Expenditure Assumptions

- General operating expenses are escalated from the budgeted figures at 2.5% per year; labor costs increase at 2.5% per year; and benefits at 5.0% per year.
- State taxes are calculated based on prevailing tax rates.
- Existing debt service schedules were provided by the City and include two revenue bond issues and two Public Works Trust Fund Loans. These obligations represent approximately $626,000 in annual debt service principal and interest payments in 2015.
- Water Purchased for Resale is budgeted for $1.25 million in 2015. City staff directed us to assume a higher starting amount of $1.45 million in 2015 as well as a 15% cost increase in 2016. Inflationary increases are applied in each year thereafter. This is a significant increase because water purchase costs represent nearly half of the City's water utility operating expenditures.
- Future debt service has been added as outlined in the capital funding plan. The forecast assumes a revenue bond interest rate of 4% based on prevailing rates, as well as an issuance cost of 1% with a 20-year term. City policy dictates a minimum debt service coverage requirement of 1.25.

The City should review the proposed rates and rate assumptions annually to ensure that the rate projections developed remain adequate. Any significant changes should be incorporated into the financial plan and future rates should be adjusted as needed.

Table W 12-6 summarizes the annual revenue requirement for the 2014 to 2023 planning horizon based on the forecast of revenues, expenditures, fund balances, fiscal policies, and capital funding.

Table W 12-6 Financial Forecast

Revenue Requirements	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023
Assuming Existing Rates:										
Revenue										
Rate Revenues	$3,309,856	$3,590,617	$3,641,637	$3,693,464	$ 3,746,110	$ 3,799,591	$ 3,802,785	$ 3,806,065	$ 3,809,430	$ 3,812,880
Non-Rate Revenues	1,035,153	627,810	621,608	621,711	621,750	622,133	622,741	623,332	623,976	624,694
Total Revenue	**$4,345,010**	**$4,218,427**	**$4,263,245**	**$4,315,175**	**$ 4,367,860**	**$ 4,421,723**	**$ 4,425,526**	**$ 4,429,396**	**$ 4,433,405**	**$ 4,437,573**
Expenses										
Cash Operating Expenses	$3,340,146	$3,311,388	$3,573,003	$3,656,665	$ 3,742,314	$ 3,829,998	$ 3,909,403	$ 3,998,271	$ 4,093,012	$ 4,190,122
Existing Debt Service	631,849	625,978	659,785	690,859	622,809	619,864	616,816	501,632	499,239	361,330
New Debt Service	-	-	-	-	139,242	367,963	593,003	869,183	1,140,798	1,419,806
Rate-Funded Capital Replacement	286,803	292,984	146,596	229,475	327,059	442,411	577,316	729,727	902,709	1,152,654
Additions to Operating Reserve	-	-	-	-	-	-	-	-	-	-
Total Expenses	**$4,258,799**	**$4,230,350**	**$4,379,384**	**$4,577,000**	**$ 4,831,424**	**$ 5,260,237**	**$ 5,696,537**	**$ 6,098,813**	**$ 6,635,758**	**$ 7,123,911**
Cash Surplus / (Deficiency) Before Increases	$ 86,211	$ (11,923)	$ (116,139)	$ (261,825)	$ (463,565)	$ (838,513)	$ (1,271,012)	$ (1,669,417)	$(2,202,353)	$(2,686,338)
Annual Rate Adjustment			**7.50%**	**7.50%**	**7.50%**	**7.50%**	**7.50%**	**7.50%**	**7.50%**	**7.50%**
Cumulative Annual Rate Adjustment			**7.50%**	**15.56%**	**24.23%**	**33.55%**	**43.56%**	**54.33%**	**65.90%**	**78.35%**
After Rate Increases:										
Rate Revenues	$3,309,856	$3,590,617	$3,914,760	$4,268,259	$ 4,653,781	$ 5,074,236	$ 5,459,390	$ 5,873,905	$ 6,320,031	$ 6,800,186
Net Cash Flow	86,200	(11,900)	141,900	281,200	393,900	365,600	294,000	284,000	169,400	135,700
Debt Service Coverage - Revenue Bonds	2.51	2.28	2.20	2.55	2.43	2.14	1.95	1.78	1.81	1.73
Debt Service Coverage - All Debt	1.60	1.46	1.46	1.76	1.95	1.82	1.72	1.74	1.66	1.73

Annual rate increases of 7.5% are projected from 2016 to 2023 to cover projected O&M expenses, debt service payments, system reinvestment funding, and other stated financial policy objectives.

12.5.3 Water Funds and Reserve Balances

Table W 12-7 shows a summary of the projected ending water operating, capital and debt reserve balances through 2023. The operating reserve ends at 56 days of operating expenditures in 2023, but years 2015 through 2022 end at 60 days; the capital reserve ends at $1.3 million, which is above the minimum target of about $600,000; and the water specific debt reserve ends at over $1.8 million, which is enough to cover one year of annual revenue bond debt service.

Table W 12-7 Cash Balance Summary

Ending Reserves	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023
Operating	$ 1,377,132	$ 544,338	$ 585,738	$ 601,096	$ 615,175	$ 629,589	$ 640,886	$ 657,250	$ 672,824	$ 688,787
Capital	5,329,630	7,168,590	4,578,070	2,145,123	1,341,108	1,436,846	1,012,379	1,149,339	1,209,383	1,426,037
Debt	394,949	396,237	396,237	396,237	535,479	764,200	989,240	1,230,575	1,502,190	1,781,198
Total	**$ 7,101,710**	**$ 8,109,166**	**$ 5,560,046**	**$ 3,142,456**	**$ 2,491,762**	**$ 2,830,635**	**$ 2,642,505**	**$ 3,037,164**	**$ 3,384,397**	**$ 3,896,022**

12.5.4 Existing Water Rate Structure & Projected Schedule

The City's existing water rate structure is comprised of a monthly fixed charge per unit which includes a usage allowance of up to 400 cubic feet, plus a volume charge for usage that exceeds the allowance. A volume charge on excess consumption helps encourage water conservation by the utility's customers. The monthly flat fixed charge increases with the meter size.

The City defines a unit as any of the following:

- Each single family residence,
- Each unit in multiple-unit residential buildings,
- Each residential unit in a commercial building,
- Each mobile home in a mobile home park,
- Each occupied travel trailer or motor home.

For service outside the city limits, the charges are one hundred fifty percent of the standard in-city rate (MMC 13.04.320).

A low-income senior discount of 30% is available to single-family residences or other residences with a single water meter per unit primarily occupied by a senior citizen or senior citizens being fifty-five years of age or older having an annual household income of fifty percent or less of the area median income for Snohomish County, as published by the Washington State Office of Financial Management (MMC 13.04.322).

A 30% discount is also available to qualifying disabled persons. The low-income senior and disabled discount rates are available only upon application, which is required to be updated annually by the customer (MMC 13.04.322).

A review of the City's rate structure is currently underway and recommended alternatives will be presented to City staff and council.

Table W 12-8 presents the City's existing rate schedule under the adopted rates for 2015. No rate increases above adopted levels are necessary for 2015. The table then incorporates necessary rate increases starting in 2016 and continuing through 2023.

Table W 12-8 Projected Rate Schedule

Monthly Rate Schedule Water Utility	Actual 2014	Actual 2015	Projected 2016	Projected 2017	Projected 2018	Projected 2019	Projected 2020	Projected 2021	Projected 2022	Projected 2023
Annual Across the Board Increases (%)			7.5%	7.5%	7.5%	7.5%	7.5%	7.5%	7.5%	7.5%
Cumulative Rate Increases (%)			7.5%	15.6%	24.2%	33.5%	43.6%	54.3%	65.9%	78.3%
Inside City - Monthly Water Charges per Unit for up to 400 cubic feet										
3/4"x 5/8"	$21.95	$22.92	$24.64	$26.49	$28.47	$30.61	$32.90	$35.37	$38.03	$40.88
1"	$29.15	$30.43	$32.71	$35.17	$37.80	$40.64	$43.69	$46.96	$50.48	$54.27
1.5 "	$33.52	$34.99	$37.61	$40.44	$43.47	$46.73	$50.23	$54.00	$58.05	$62.40
2"	$40.86	$42.66	$45.86	$49.30	$53.00	$56.97	$61.24	$65.84	$70.78	$76.08
3"	$49.64	$51.82	$55.71	$59.88	$64.38	$69.20	$74.39	$79.97	$85.97	$92.42
4"	$58.18	$60.74	$65.30	$70.19	$75.46	$81.12	$87.20	$93.74	$100.77	$108.33
6"	$240.23	$250.80	$269.61	$289.83	$311.57	$334.94	$360.06	$387.06	$416.09	$447.30
8"	$313.05	$326.82	$351.33	$377.68	$406.01	$436.46	$469.19	$504.38	$542.21	$582.88
Stand-by Charge for Fire Protection	$21.95	$22.92	$24.64	$26.49	$28.47	$30.61	$32.90	$35.37	$38.03	$40.88
Volume Rate Over 400 cf, per 100 cf	$2.63	$2.75	$2.96	$3.18	$3.42	$3.67	$3.95	$4.24	$4.56	$4.90
Wholesale Water Rates, per 100 cf	$1.92	$1.92	$2.06	$2.22	$2.39	$2.56	$2.76	$2.96	$3.19	$3.42

Outside city rates are 1.50 times the stated inside city rates.
Rates for 2015 reflect adopted 4.4% increases; no additional rate increases needed in 2015.

12.5.5 Affordability of Water Rates

The Washington State Department of Health and the State Public Works Board have historically used an affordability index to prioritize low-cost loan awards. The typical threshold looks at whether a system's rates exceed 1.5% to 2.0% of the median household income for the demographic area. As a result, if monthly bills are less than 1.5% of the median household income for the demographic area, they are generally considered affordable.

According to Census.gov, the median household income for the City of Monroe in 2013 was $67,238. This figure was inflated to $68,045 at 2014 levels assuming the actual Consumer Price Index adjustment. **Table W 12-9** presents the City's estimated single family rate with the projected rate increases for the forecast period. The affordability mark (Monthly Bill*12 ÷ Median Income) averages 0.6% throughout the study period. As shown in the following table, the City's rates remain well within the affordability range throughout the planning horizon.

Table W 12-9 below presents the results of the affordability test.

Table W 12-9 Affordability Table				
Year	Inflation	Median HH Income	Projected Monthly Bill	% of Median HH Income
2014	2.50%	$ 68,045	$ 28.53	0.50%
2015	2.50%	$ 69,746	$ 29.80	0.51%
2016	2.50%	$ 71,490	$ 32.03	0.54%
2017	2.50%	$ 73,277	$ 34.43	0.56%
2018	2.50%	$ 75,109	$ 37.01	0.59%
2019	2.50%	$ 76,987	$ 39.79	0.62%
2020	2.50%	$ 78,911	$ 42.77	0.65%
2021	2.50%	$ 80,884	$ 45.98	0.68%
2022	2.50%	$ 82,906	$ 49.43	0.72%
2023	2.50%	$ 84,979	$ 53.14	0.75%

Note: Assumes single family 3/4", 6.5 ccf per month.

12.5.6 Conclusion for Water Financial Plan

The analysis indicates that the already adopted rates in 2015 do not need to be adjusted in 2015. Annual rate increases of 7.5% are projected for 2016 through 2023. The cumulative impact of these increases is just over 78% through 2023.

This evaluation also finds that the rates with projected rate increases would remain well within the defined affordability threshold.

12.6 Financial Plan Results - Sewer

12.6.1 Sewer Capital Funding Strategy

The CIP developed for the sewer utility totals over $33 million ($48 million in inflated dollars) over the 20-year planning period (2016 to 2035). Capital expenditures for 2014 and 2015 are based on City actual and City estimated amounts, respectively. Costs are stated in 2015 dollars and are escalated to the year of planned spending at an annual inflation rate of 3.25% per year. None of the sewer projects have an identified trigger date in previous chapters of this Plan, so they were all assigned a construction year in the capital funding strategy, assuming the goal of a level schedule of expenditures throughout the forecast period.

Capitalized City labor and overhead are estimated to be approximately 10% of the annual capital expenditures. This amount is added to the capital amounts identified by the Plan. This is based on the City's 2015 budgeted capitalized labor and overhead total, relative to total budgeted capital expenditures.

Table SS 12-4 summarizes the projected annual capital expenditures.

Table SS 12-4 Sewer CIP

Year	2015 $	Inflated $
2014	$ 2,192,090	$ 2,192,090
2015	$ 852,175	$ 852,175
2016	$ 1,761,380	$ 1,818,625
2017	$ 1,805,415	$ 1,924,674
2018	$ 1,772,389	$ 1,950,874
2019	$ 1,849,449	$ 2,101,855
2020	$ 1,810,919	$ 2,124,953
2021	$ 1,821,928	$ 2,207,352
Subtotal	**$ 13,865,745**	**$ 15,172,597**
2022-2035	$ 22,635,940	$ 35,509,052
Grand Total	**$ 36,501,685**	**$ 50,681,649**

A capital funding strategy is developed to identify the total resources available to pay for the CIP and determine if new debt financing is required.

The capital connection charge is projected to generate an average annual revenue stream of roughly $690,000 from 2015 through 2021. This is based on a customer growth rate of 2.25% per year for 2015 to 2019, then assuming an annual growth rate of 0.5% thereafter. The 2.25% factor is equivalent to roughly 500 new customers added to the sewer system over the next five years; this is higher than historical growth rates. The 0.5% annual growth factor assumed after 2019 is based on the average historical growth from 2010-2013. The SDC revenue projection assumes the current SDC of $6,777.

Table SS 12-5 summarizes the capital funding plan. Existing sewer reserves and rate revenue are sufficient to cash fund all planned capital. No future debt issues are projected.

Table SS 12-5 Capital Funding Strategy					
Year	**Capital Expenditures**	**Capital Expenditures Inflated**	**Revenue Bond Financing**	**Cash Funding**	**Total Financial Resources**
2014	$ 2,192,090	$ 2,192,090	$ -	$ 2,192,090	**$ 2,192,090**
2015	852,175	852,175	-	852,175	**852,175**
2016	1,761,380	1,818,625	-	1,818,625	**1,818,625**
2017	1,805,415	1,924,674	-	1,924,674	**1,924,674**
2018	1,772,389	1,950,874	-	1,950,874	**1,950,874**
2019	1,849,449	2,101,855	-	2,101,855	**2,101,855**
2020	1,810,919	2,124,953	-	2,124,953	**2,124,953**
2021	1,821,928	2,207,352	-	2,207,352	**2,207,352**
Subtotal	**$ 13,865,745**	**$ 15,172,597**	**$ -**	**$15,172,597**	**$ 15,172,597**
2022-2035	$ 22,635,940	$ 35,509,052	$ -	$35,509,052	**$ 35,509,052**
Grand Total	**$ 36,501,685**	**$ 50,681,649**	**$ -**	**$50,681,649**	**$ 50,681,649**

12.6.2 Sewer Financial Forecast

The sewer financial forecast projects the amount of operating and capital expenditures to determine the annual amount of revenue required. The objective of the financial forecast is to evaluate the sufficiency of the current level of rates in meeting the total revenue requirements of the system. In addition to annual operating costs, the revenue of the utility must also meet debt covenant requirements and minimum reserve level targets.

The financial forecast tables for the sewer utility cover 2014 through 2021. The first year reflects actual 2014 expenditures. The forecast from 2015 to 2021 is largely developed from the City's adopted 2015 annual budget document. A list of other key factors and assumptions used to forecast the utility's annual financial obligations include:

Revenue & Fund Balance Assumptions

- Adopted Rate Increases: The City adopted a 14% rate increase for 2015 which is incorporated into the baseline revenue figures in the forecast. No incremental rate increases are needed above the adopted 2015 levels in 2015, or throughout the six year planning period which extends through 2021.
- Customer Growth and Demand: As previously discussed, a customer account growth rate of 2.25% per year is assumed for 2015 to 2019, and then 0.5% per year is assumed thereafter. Metered water use per account for existing sewer customers is assumed to decline at 2.5% per year based on a review of historical data from 2010 to 2013. The net effect of the customer account growth and the decline in usage per account is a composite rate revenue increase of approximately 2% per year through 2019 and just under 0.25% per year thereafter.
- Miscellaneous revenues are conservatively assumed to stay at their currently budgeted levels. Miscellaneous revenues include lab test fees, plan reviews, Pcard rebate earnings, etc.
- Department of Corrections and septage revenue is conservatively assumed to remain at actual 2014 levels.

- Interest earnings initially assume a rate of 0.11% applied to beginning of year cash balances based on existing Local Government Investment Pool rates, phasing towards 0.25% over the long term.

Expenditure Assumptions

- General operating expenses are escalated from the budgeted figures at 2.5% per year; labor costs increase at 2.5% per year; and benefits at 5.0% per year.
- State taxes are calculated based on prevailing tax rates.
- Existing debt service schedules were provided by the City and include three revenue bond issues and two Department of Ecology loans. These obligations represent approximately $1.96 million in annual debt service principal and interest payments in 2015.
- No future debt issuances are projected for the sewer utility.

The City should review the proposed rates and rate assumptions annually to ensure that the rate projections developed remain adequate. Any significant changes should be incorporated into the financial plan and future rates should be adjusted as needed.

Table SS 12-6 summarizes the annual revenue requirement for the 2014 to 2021 planning horizon based on the forecast of revenues, expenditures, fund balances, fiscal policies, and capital funding.

Table SS 12-6 Financial Forecast

Revenue Requirements	2014	2015	2016	2017	2018	2019	2020	2021
Assuming Existing Rates:								
Revenue								
Rate Revenues	$5,644,891	$6,583,829	$6,710,167	$6,839,413	$6,971,635	$7,106,898	$7,121,268	$7,136,136
Non-Rate Revenues	971,226	959,931	942,917	942,939	942,967	942,993	943,020	943,040
Total Revenue	**$6,616,116**	**$7,543,760**	**$7,653,083**	**$7,782,352**	**$7,914,602**	**$8,049,890**	**$8,064,288**	**$8,079,176**
Expenses								
Cash Operating Expenses	$3,228,140	$3,030,788	$3,110,744	$3,193,230	$3,278,050	$3,365,275	$3,441,583	$3,531,047
Existing Debt Service	1,862,984	1,962,678	1,923,263	1,905,735	1,906,725	1,902,331	1,898,547	1,416,938
New Debt Service	-	-	-	-	-	-	-	-
Rate-Funded Capital Replacement	2,000,000	2,000,000	2,000,000	2,000,000	2,000,000	2,000,000	2,000,000	2,000,000
Additions to Operating Reserve	-	-	8,810	11,217	10,457	10,754	8,249	12,189
Total Expenses	**$7,091,124**	**$6,993,466**	**$7,042,817**	**$7,110,183**	**$7,195,232**	**$7,278,360**	**$7,348,379**	**$6,960,174**
Cash Surplus / (Deficiency)	$ (475,008)	$ 550,294	$ 610,267	$ 672,169	$ 719,369	$ 771,531	$ 715,909	$1,119,003
Annual Rate Adjustment			**0.00%**	**0.00%**	**0.00%**	**0.00%**	**0.00%**	**0.00%**
Cumulative Annual Rate Adjustment			**0.00%**	**0.00%**	**0.00%**	**0.00%**	**0.00%**	**0.00%**
After Rate Increases:								
Rate Revenues	$5,644,891	$6,583,829	$6,710,167	$6,839,413	$6,971,635	$7,106,898	$7,121,268	$7,136,136
Net Cash Flow	(475,000)	550,300	619,100	683,400	729,800	782,300	724,200	1,131,200
Debt Service Coverage - Revenue Bonds	2.40	2.99	3.10	3.17	3.20	3.25	3.22	3.17
Debt Service Coverage - All Debt	1.82	2.30	2.37	2.42	2.45	2.48	2.46	3.24

The City's sewer utility has had rate increases of 14% in both 2014 and 2015. The 14% rate increase for 2015 is already incorporated into the rate revenue assuming existing rates. This forecast shows that no additional rate increases above the adopted 2015 levels are needed throughout the remainder of the planning period.

12.6.3 Sewer Funds and Reserve Balances

Table SS 12-7 shows a summary of the projected ending sewer operating, capital and debt reserve balances through 2021. The operating reserve ends at 45 days of operating expenditures; the capital reserve ends at nearly $17 million; and the sewer specific debt reserve ends at just over $1 million, which is enough to cover one year of annual revenue bond debt service.

Table SS 12-7 Cash Balance Summary

Ending Fund Balances	2014	2015	2016	2017	2018	2019	2020	2021
Operating Reserve	$1,106,305	$ 373,659	$ 382,468	$ 393,686	$ 404,143	$ 414,897	$ 423,145	$ 435,335
Capital Reserve	4,511,574	8,184,419	9,855,361	11,505,659	13,200,841	14,821,645	15,658,273	16,818,731
Debt Reserve	1,490,657	1,495,521	1,495,521	1,495,521	1,495,521	1,495,521	1,495,521	1,013,770
Total	**$7,108,536**	**$ 10,053,599**	**$ 11,733,350**	**$ 13,394,865**	**$ 15,100,505**	**$ 16,732,062**	**$ 17,576,939**	**$ 18,267,836**

The Sewer Capital Fund is projected to generate surpluses each year during the forecast horizon, which presents the City with an opportunity for early retirement of outstanding sewer debt. As of 2013, outstanding sewer-related debt totaled $17.9 million. Early retirement of debt can reduce ongoing interest costs and increase the City's future borrowing capacity. With a significant asset like a wastewater treatment plant, the question is not *whether* large capital improvements will be required in the future, but *when*. Reducing indebtedness at this time can prepare the City for future borrowing that will surely be needed in order to keep the treatment plant current with regulatory requirements and adequate for future population growth.

12.6.4 Existing Sewer Rate Structure & Projected Schedule

The City's existing rate structure is comprised of a monthly fixed charge per unit which includes up to 1,000 cubic feet of usage and then a volume charge for usage above this allowance.

A unit is defined as follows:

- Each single family residence,
- Each unit in multiple residential buildings,
- Each residential unit in a commercial building,
- Each mobile home in a mobile home park,
- Each occupied travel trailer or motor home.

Monthly rates and charges for sanitary service provided outside of the city limits shall be two hundred percent of the appropriate in-city charge, except outside city public facilities shall be one hundred and fifty percent of the appropriate in-city charge (13.08.440).

A low-income, senior discount of 30% is available to single-family residences or other residences with a single water meter per unit primarily occupied by a senior citizen or senior citizens being fifty-five years of age or older having an annual household income of fifty percent or less of the area median income for Snohomish County, as published by the Washington State Office of Financial Management (MMC 13.08.430).

A 30% discount is also available to qualifying disabled persons. The low-income senior and disabled discount rates are available only upon application, which is required to be updated annually by the customer (MMC 13.04.322).

A review of the City's rate structure is currently underway and recommended alternatives will be presented to City staff and council.

Table SS 12-8 presents the City's existing rate schedule under the adopted rates for 2015. No rate increases above 2015 adopted levels are necessary for 2015 or for future years within the planning period.

Table SS 12-8 Projected Rate Schedule

Monthly Rate Schedule Sewer Utility	Actual 2014	Actual 2015	Projected 2016	Projected 2017	Projected 2018	Projected 2019	Projected 2020	Projected 2021
Annual Across the Board Increases (%)			0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Cumulative Rate Increases (%)			0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Inside City - Monthly Sanitary Sewer Charges per unit for up to 1,000 cubic feet								
Residential/Commercial	$82.90	$94.51	$94.51	$94.51	$94.51	$94.51	$94.51	$94.51
Over 1,000 cf, per 100 cf	$7.14	$8.14	$8.14	$8.14	$8.14	$8.14	$8.14	$8.14
Government Facilities	$82.90	$94.51	$94.51	$94.51	$94.51	$94.51	$94.51	$94.51
Over 1,000 cf, per 100 cf	$7.14	$8.14	$8.14	$8.14	$8.14	$8.14	$8.14	$8.14
Outside City - Monthly Sanitary Sewer Charges per unit for up to 1,000 cubic feet								
Residential/Commercial	$165.80	$189.02	$189.02	$189.02	$189.02	$189.02	$189.02	$189.02
Over 1,000 cf, per 100 cf	$14.27	$16.28	$16.28	$16.28	$16.28	$16.28	$16.28	$16.28
Government Facilities	$124.35	$141.77	$141.77	$141.77	$141.77	$141.77	$141.77	$141.77
Over 1,000 cf, per 100 cf	$10.70	$12.21	$12.21	$12.21	$12.21	$12.21	$12.21	$12.21

Rates for 2015 reflect adopted 14% increases; no additional rate increases needed in 2015.

12.6.5 Affordability of Sewer Rates

The Washington State Department of Health and the State Public Works Board have historically used an affordability index to prioritize low-cost loan awards. The typical threshold looks at whether a system's rates exceed 1.5% to 2.0% of the median household income for the demographic area. As a result, if monthly bills are less than 1.5% of the median household income for the demographic area, they are generally considered affordable.

According to Census.gov, the median household income for the City of Monroe in 2013 was $67,238. This figure was inflated to $68,045 at 2014 levels assuming the actual Consumer Price Index adjustment. **Table SS 12-9** presents the City's estimated single family rate with the projected rate increases for the forecast period. The affordability mark (Monthly Bill*12 ÷ Median Income) averages 1.5% throughout the study period. As shown in the following table, the City's rates are towards the high end of the affordability range, but improve throughout the study period as rates are held at their currently adopted levels.

Table SS 12-9 below presents the results of the affordability test.

Table SS 12-9 Affordability Table				
Year	**Inflation**	**Median HH Income**	**Projected Monthly Bill**	**% of Median HH Income**
2014	2.50%	$ 68,045	$82.90	1.46%
2015	2.50%	$ 69,746	$94.51	1.63%
2016	2.50%	$ 71,490	$94.51	1.59%
2017	2.50%	$ 73,277	$94.51	1.55%
2018	2.50%	$ 75,109	$94.51	1.51%
2019	2.50%	$ 76,987	$94.51	1.47%
2020	2.50%	$ 78,911	$94.51	1.44%
2021	2.50%	$ 80,884	$94.51	1.40%

Note: Assumes single family, 5.5 ccf per month.

12.6.6 Conclusion for Sewer Financial Plan

The analysis indicates rates can remain at their currently adopted 2015 levels throughout the study period. With the current level of reserves and rate revenue, the identified capital projects can be fully cash funded. No debt issues are projected at this time.

This evaluation also finds that the rates with projected rate increases approach the high-end threshold of affordability, but will improve throughout the study period since there are no projected rate increases at this time.

Because the Sewer Capital Fund is projected to generate surpluses each year during the forecast horizon, the City has an opportunity for early retirement of outstanding sewer debt.

12.7 Financial Plan Results - Stormwater

12.7.1 Stormwater Capital Funding Strategy

The CIP developed for the stormwater utility totals over $9 million ($13 million in inflated dollars) over the over the 20-year planning period (2016 to 2035). Capital expenditures for 2014 and 2015 are based on City actual and City estimated amounts respectively. Costs are stated in 2015 dollars and are escalated to the year of planned spending at an annual inflation rate of 3.25% per year. For Project SW4 (Lord's Lake), there were two alternatives identified in the capital plan. To be conservative, we assumed the more expensive of the two alternatives. Projects that did not have an identified trigger date in previous chapters of this Plan were assigned a construction year in the capital funding strategy, assuming the goal of a level schedule of expenditures throughout the forecast period.

Capitalized City labor and overhead are estimated to be approximately 22% of the annual capital expenditures. This amount is added to the capital amounts identified by the Plan. This is based on the City's 2015 budgeted capitalized labor and overhead total, relative to total budgeted capital expenditures.

Table SW 12-4 summarizes the expected annual capital expenditures.

Table SW 12-4 Stormwater CIP

Year	2015 $	Inflated $
2014	$ 1,533,862	$ 1,533,862
2015	$ 1,364,388	$ 1,364,388
2016	$ 716,114	$ 739,387
2017	$ 1,144,929	$ 1,220,559
2018	$ 685,301	$ 754,313
2019	$ 436,245	$ 495,782
2020	$ 496,286	$ 582,348
2021	$ 380,588	$ 461,100
Subtotal	**$ 6,757,713**	**$ 7,151,739**
2022-2035	$ 5,328,227	$ 8,273,742
Grand Total	**$ 12,085,940**	**$ 15,425,481**

A capital funding strategy is developed to identify the total resources available to pay for the CIP and determine if new debt financing is required. The stormwater utility does not have a capital connection charge at this time.

Table SW 12-5 summarizes the capital funding strategy.

Table SW 12-5 Capital Funding Strategy					
Year	**Capital Expenditures**	**Capital Expenditures Inflated**	**Revenue Bond Financing**	**Cash Funding**	**Total Financial Resources**
2014	$ 1,533,862	$ 1,533,862	$ -	$ 1,533,862	**$ 1,533,862**
2015	1,364,388	1,364,388	-	1,364,388	**1,364,388**
2016	716,114	739,387	86,268	653,119	**739,387**
2017	1,144,929	1,220,559	952,062	268,497	**1,220,559**
2018	685,301	754,313	501,981	252,332	**754,313**
2019	436,245	495,782	215,995	279,787	**495,782**
2020	496,286	582,348	247,634	334,714	**582,348**
2021	380,588	461,100	101,193	359,907	**461,100**
Subtotal	**$ 6,757,713**	**$ 7,151,739**	**$ 2,105,133**	**$ 5,046,606**	**$ 7,151,739**
2022-2035	5,328,227	8,273,742	1,178,854	7,094,888	**8,273,742**
Grand Total	**$ 12,085,940**	**$ 15,425,481**	**$ 3,283,987**	**$ 12,141,494**	**$ 15,425,481**

12.7.2 Stormwater Financial Forecast

The stormwater financial forecast projects the amount of operating and capital expenditures to determine the annual amount of revenue required. The objective of the financial forecast is to evaluate the sufficiency of the current level of rates in meeting the total revenue requirements of the system. In addition to annual operating costs, the revenue of the utility must also meet debt covenant requirements and minimum reserve level targets.

The financial forecast tables for the stormwater utility cover 2014 through 2021. The first year reflects actual 2014 expenditures. The forecast from 2015 to 2021 is largely developed from the City's adopted 2015 annual budget document. A list of other key factors and assumptions used to forecast the utility's annual financial obligations include:

Revenue & Fund Balance Assumptions

- Adopted Rate Increases: The City did not adopt a rate increase for the stormwater utility in 2015. No incremental rate increases are needed above the currently adopted levels in 2015. Any necessary rate increases in 2016 and beyond are shown in **Table SW 12-6**.
- Customer Growth: A customer account growth rate of 2% per year is assumed for 2015 to 2019, and then 0.35% per year is assumed thereafter. The 2% factor is equivalent to roughly 500 new customers added to the stormwater system over the next five years; this is higher than historical growth rates. The 0.35% annual growth factor assumed after 2019 is based on the average historical growth from 2010-2013.
- The single miscellaneous revenue projected on an annual basis is plan review revenue, which is conservatively assumed to remain at the currently budgeted level.
- Interest earnings initially assume a rate of 0.11% applied to beginning of year cash balances based on existing Local Government Investment Pool rates, phasing towards 0.25% over the long term.

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Expenditure Assumptions

- General operating expenses are escalated from the budgeted figures at 2.5% per year; labor costs increase at 2.5% per year; and benefits at 5.0% per year.
- State taxes are calculated based on prevailing tax rates.
- The stormwater utility has a single outstanding revenue bond issue which represents just over $100,000 in annual debt service principal and interest payments in 2015.
- Future debt service has been added as outlined in the capital funding plan. The forecast assumes a revenue bond interest rate of 4% based on prevailing rates, as well as an issuance cost of 1% with a 20-year term. City policy dictates a minimum debt service coverage requirement of 1.25.

The City should review the proposed rates and rate assumptions annually to ensure that the projected rates remain adequate. Any significant changes should be incorporated into the financial plan and future rates should be adjusted as needed.

Table SW 12-6 summarizes the annual revenue requirement for the 2014 to 2021 planning horizon based on the forecast of revenues, expenditures, fund balances, fiscal policies, and capital funding.

Annual rate increases of 4% are projected from 2016 to 2021 to cover projected O&M expenses, debt service payments, system reinvestment funding, and other stated financial policy objectives.

Table SW 12-6 Financial Forecast

	2014	2015	2016	2017	2018	2019	2020	2021
Assuming Existing Rates:								
Revenue								
Rate Revenues	$ 1,526,647	$ 1,557,313	$ 1,588,459	$ 1,620,228	$ 1,652,633	$ 1,685,686	$ 1,691,502	$ 1,697,338
Non-Rate Revenues	71,259	4,197	3,139	3,167	3,370	3,483	3,538	3,599
Total Revenue	**$ 1,597,906**	**$ 1,561,510**	**$ 1,591,599**	**$ 1,623,395**	**$ 1,656,003**	**$ 1,689,168**	**$ 1,695,040**	**$ 1,700,937**
Expenses								
Cash Operating Expenses	$ 1,290,590	$ 1,235,631	$ 1,271,557	$ 1,308,660	$ 1,346,959	$ 1,386,499	$ 1,426,906	$ 1,468,636
Existing Debt Service	104,745	104,574	104,835	104,929	104,749	104,794	104,632	104,830
New Debt Service	-	-	6,927	83,370	123,676	141,019	160,902	169,027
Rate-Funded Capital Replacement	515,000	125,000	225,000	250,000	275,000	300,000	325,000	350,000
Additions to Operating Reserve	-	-	-	-	-	-	-	-
Total Expenses	**$ 1,910,334**	**$ 1,465,205**	**$ 1,608,318**	**$ 1,746,959**	**$ 1,850,384**	**$ 1,932,312**	**$ 2,017,440**	**$ 2,092,493**
Cash Surplus / (Deficiency)	$ (312,428)	$ 96,305	$ (16,720)	$ (123,564)	$ (194,381)	$ (243,144)	$ (322,400)	$ (391,556)
Annual Rate Adjustment			**4.00%**	**4.00%**	**4.00%**	**4.00%**	**4.00%**	**4.00%**
Cumulative Annual Rate Adjustment			**4.00%**	**8.16%**	**12.49%**	**16.99%**	**21.67%**	**26.53%**
After Rate Increases:								
Rate Revenues	$ 1,526,647	$ 1,557,313	$ 1,651,998	$ 1,752,439	$ 1,858,987	$ 1,972,014	$ 2,057,971	$ 2,147,674
Net Cash Flow	(312,400)	96,300	45,900	6,700	8,900	38,900	38,600	52,000
Debt Service Coverage - Revenue Bonds	2.95	3.14	3.44	2.37	2.25	2.38	2.37	2.47
Debt Service Coverage - All Debt	2.95	3.14	3.44	2.37	2.25	2.38	2.37	2.47

12.7.3 Stormwater Funds and Reserve Balances

Table SW 12-7 shows a summary of the projected ending stormwater operating, capital and debt reserve balances through 2021. The operating reserve ends at 45 days of operating expenditures; the capital reserve ends at nearly $400,000, which is above the minimum target of about $111,000; and the stormwater share of the debt reserve ends at over $275,000, which is enough to cover one year of annual revenue bond debt service.

Table SW 12-7 Cash Balance Summary

Ending Fund Balances	2014	2015	2016	2017	2018	2019	2020	2021
Operating Reserve	$ 56,522	$ 152,338	$ 156,339	$ 161,342	$ 166,063	$ 170,938	$ 175,439	$ 181,065
Capital Reserve	1,499,729	653,119	268,497	252,332	279,787	334,714	359,907	397,300
Debt Reserve	103,056	103,392	110,319	186,763	227,068	244,411	264,294	272,419
Total	**$ 1,659,307**	**$ 908,849**	**$ 535,155**	**$ 600,436**	**$ 672,919**	**$ 750,064**	**$ 799,641**	**$ 850,784**

12.7.4 Existing Stormwater Rate Structure & Projected Schedule

The City's existing rate structure is comprised of a monthly fixed charge per equivalent residential unit (ERU). An ERU is defined as being equal to two thousand five hundred square feet of impervious ground cover (13.32.020).

A low-income, senior discount of 30% is available to single-family residences or other residences with a single water meter per unit primarily occupied by a senior citizen or senior citizens being fifty-five years of age or older having an annual household income of fifty percent or less of the area median income for Snohomish County, as published by the Washington State Office of Financial Management (MMC 13.32.120).

A 30% discount is also available to qualifying disabled persons. The discount rates provided for herein are available only upon application, which is required to be updated annually by the customer (MMC 13.32.120).

A review of the City's rate structure is currently underway and, if applicable, recommended alternatives will be presented to City staff and council.

Table SW 12-8 presents the City's existing rate schedule. Annual rate increases of 4% are needed starting in 2016 and continuing through 2021. The cumulative effect of these annual increases is a cumulative impact of 26.5% over six years. The average dollar impact over this same time period is less than $0.50 per month.

Table SW 12-8 Projected Rate Schedule

Monthly Rate Schedule Stormwater Utility	Actual 2014	Actual 2015	Projected 2016	Projected 2017	Projected 2018	Projected 2019	Projected 2020	Projected 2021
Annual Across the Board Increases (%)			4.0%	4.0%	4.0%	4.0%	4.0%	4.0%
Cumulative Rate Increases (%)			4.0%	8.2%	12.5%	17.0%	21.7%	26.5%
Monthly Rate Increase ($)	0.0%	$0.00	$0.42	$0.44	$0.45	$0.47	$0.49	$0.51
Rate per ERU - Regular	$10.50	$10.50	$10.92	$11.36	$11.81	$12.28	$12.77	$13.29
Rate per ERU - Senior / Low-Income	$7.34	$7.34	$7.63	$7.94	$8.26	$8.59	$8.93	$9.29

12.7.5 Affordability of Stormwater Rates

The Washington State Department of Health and the State Public Works Board have historically used an affordability index to prioritize low-cost loan awards. The typical threshold looks at whether a system's rates exceed 1.5% to 2.0% of the median household income for the demographic area. As a result, if monthly bills are less than 1.5% of the median household income for the demographic area, they are generally considered affordable.

According to Census.gov, the median household income for the City of Monroe in 2013 was $67,238. This figure was inflated to $68,045 at 2014 levels assuming the actual Consumer Price Index adjustment. **Table SW 12-9** presents the City's estimated single family rate with the projected rate increases for the forecast period. The affordability mark (Monthly Bill*12 ÷ Median Income) averages 0.2% throughout the study period. As shown in the following table, the City's rates remain well within the affordability range throughout the planning horizon.

Table SW 12-9 below presents the results of the affordability test.

Table SW 12-9 Affordability Table

Year	Inflation	Median HH Income	Projected Monthly Bill	% of Median HH Income
2014		$ 68,045	$10.50	0.19%
2015	2.50%	$ 69,746	$10.50	0.18%
2016	2.50%	$ 71,490	$10.92	0.18%
2017	2.50%	$ 73,277	$11.36	0.19%
2018	2.50%	$ 75,109	$11.81	0.19%
2019	2.50%	$ 76,987	$12.28	0.19%
2020	2.50%	$ 78,911	$12.77	0.19%
2021	2.50%	$ 80,884	$13.29	0.20%

12.7.6 Conclusion for Stormwater Financial Plan

Annual rate increases of 4% are projected from 2016 to 2021 to cover projected O&M expenses, debt service payments, system reinvestment funding, and other stated financial policy objectives. This evaluation finds that the rates with projected rate increases would remain well within the defined threshold of affordability.

12.8 Overall Conclusion and Combined Affordability Test

City Council has already adopted rates for 2015. No incremental rate increases in 2015 are forecasted in any of the utilities. Adopted rates in 2015 are already incorporated into the revenue forecast in each utility. Any necessary rate increases are assumed to start in 2016. Projected annual rate increases for each utility are described below.

- For the water utility, 7.5% annual increases are projected from 2016 through 2023
- For the sewer utility, the currently adopted rates in 2015 generate sufficient revenue to pay for all identified capital expenditures in this Plan without new debt. No rate increases are projected at this time for the 2016 through 2021 financial forecast.
- For the stormwater utility, 4% annual increases are projected from 2016 through 2021

The following table summarizes a combined affordability test for a combined water, sewer, and stormwater charge. To reflect the combined nature of this test, the combined threshold looks at whether the charge exceeds 4.5% to 6.0% of the median household income for the demographic area. The combined affordability mark averages 2.3% throughout the study period and remains well within the affordability range throughout the planning horizon.

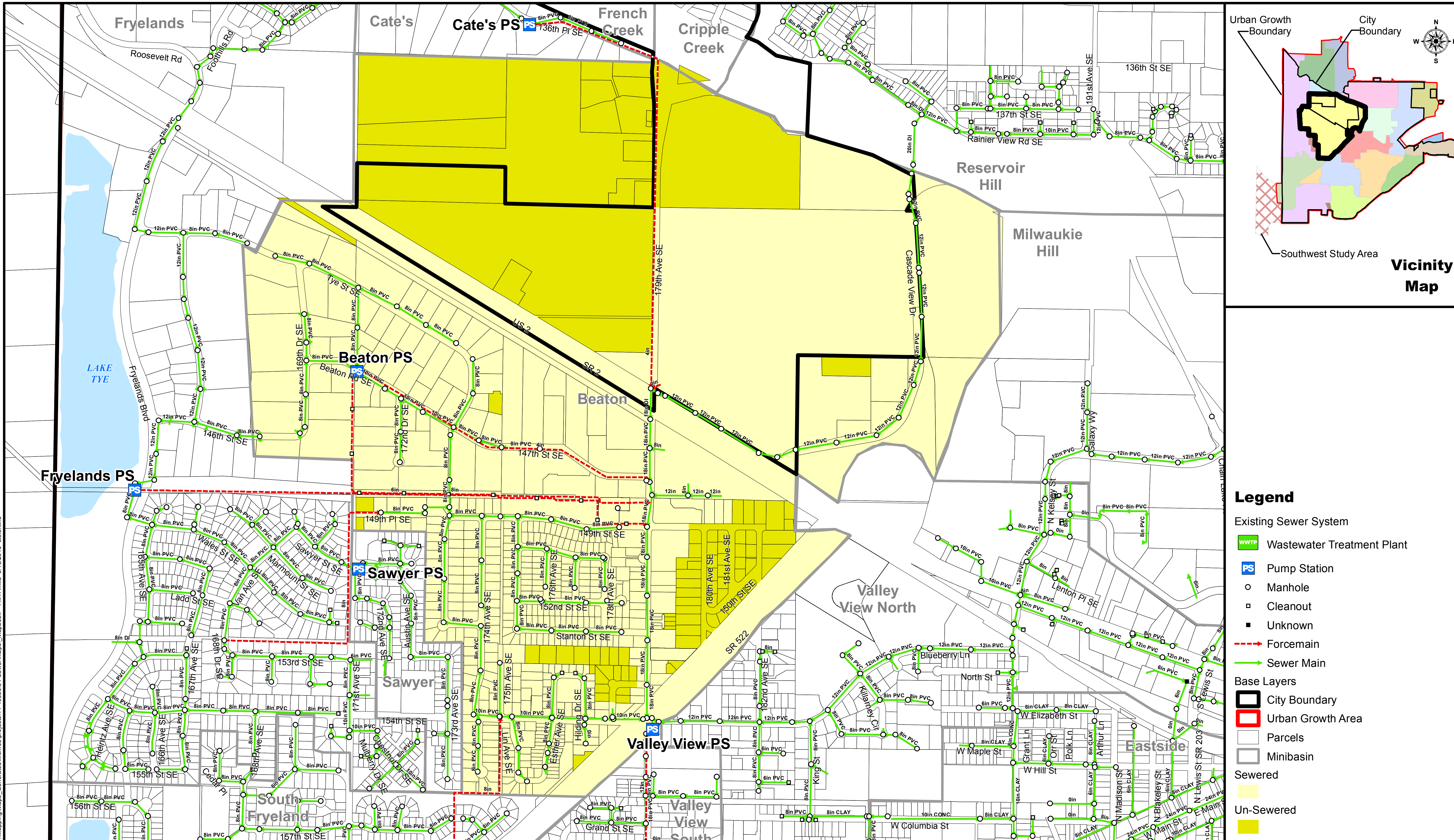
Table Combined Utilities 12-9 Affordability Table				
Year	**Inflation**	**Median HH Income**	**Projected Monthly Bill**	**% of Median HH Income**
2014		$ 68,045	$121.93	2.15%
2015	2.50%	$ 69,746	$134.81	2.32%
2016	2.50%	$ 71,490	$137.46	2.31%
2017	2.50%	$ 73,277	$140.30	2.30%
2018	2.50%	$ 75,109	$143.34	2.29%
2019	2.50%	$ 76,987	$146.58	2.28%
2020	2.50%	$ 78,911	$150.06	2.28%
2021	2.50%	$ 80,884	$153.78	2.28%

APPENDICES

Sanitary Sewer System Appendices

Appendix SS-A

Mini-Basin Maps

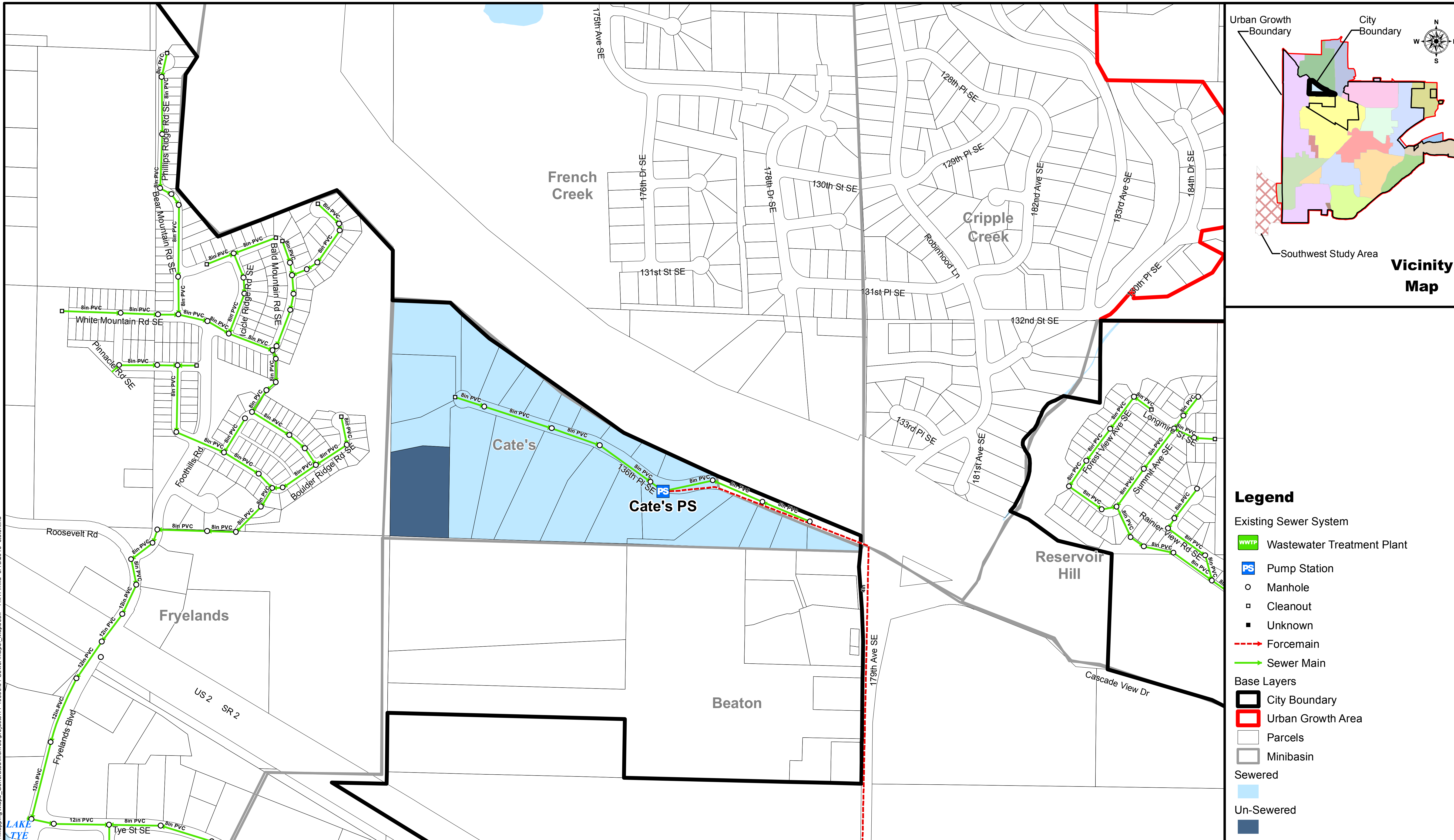


Sewer System & Mini-Basins: City of Monroe 2014
Snohomish County base data 2013
Data sources supplied may not reflect current or actual conditions. This map is a geographic representation based on information available. It does not represent survey data. No warranty is made concerning the accuracy, currency, or completeness of data depicted on this map.
BHC Consultants LLC., assumes no responsibility for the validity of any information presented herein, nor any responsibility for the use or misuse of the data.

0 800 1,600 Feet

Beaton Mini-Basin
Mapbook
Utility Systems Plan - Sewer
City of Monroe, Washington
March 2015

Figure
SS-A.1



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Sewer System & Mini-Basins: City of Monroe 2014
Snohomish County base data 2013
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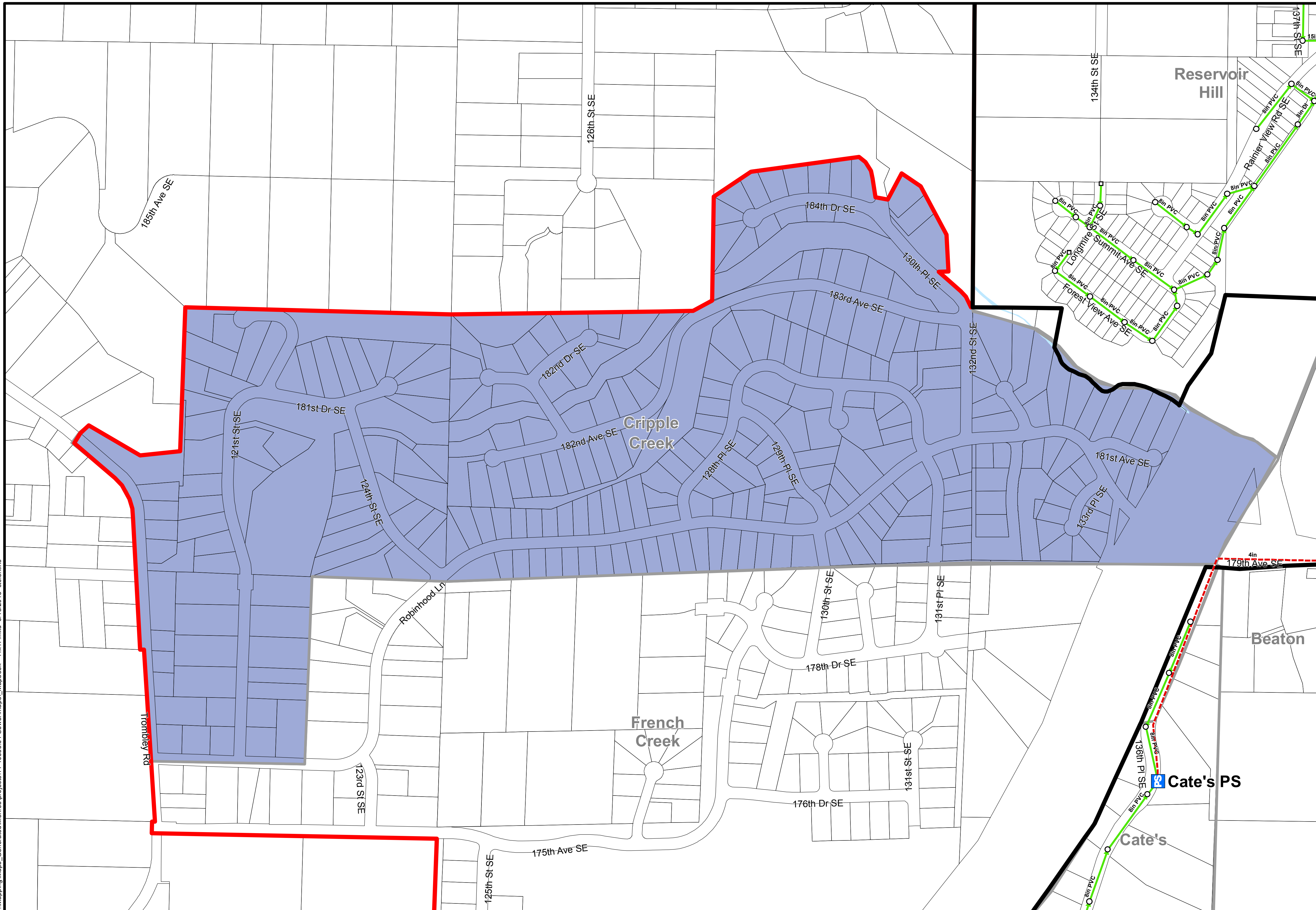
N W E S

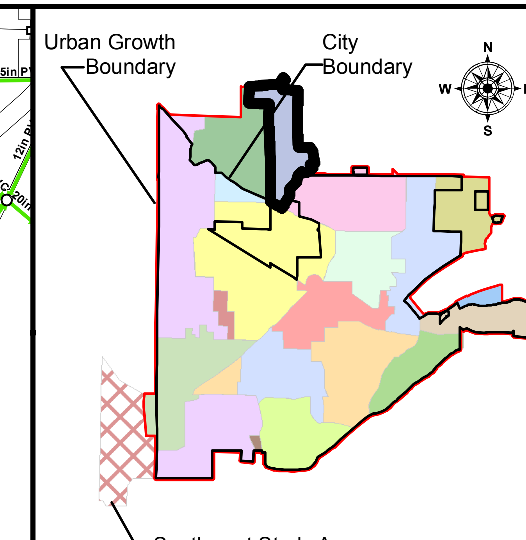
0 500 1,000 Feet

MONROE WASHINGTON

Cate's Mini-Basin
Mapbook
Utility Systems Plan - Sewer
City of Monroe, Washington
March 2015

Figure
SS-A.2





Vicinity Map

Legend

Existing Sewer System

- WWTP Wastewater Treatment Plant
- PS Pump Station
- Manhole
- Cleanout
- Unknown
- Forcemain
- Sewer Main

Base Layers

- City Boundary
- Urban Growth Area
- Parcels
- Minibasin

Un-Sewered

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Sewer System & Mini-Basins: City of Monroe 2014
Snohomish County base data 2013
Data sources supplied may not reflect current or actual conditions. This map is a geographic representation based on information available. It does not represent survey data. No warranty is made concerning the accuracy, currency, or completeness of data depicted on this map.
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N E S W

0 500 1,000 Feet

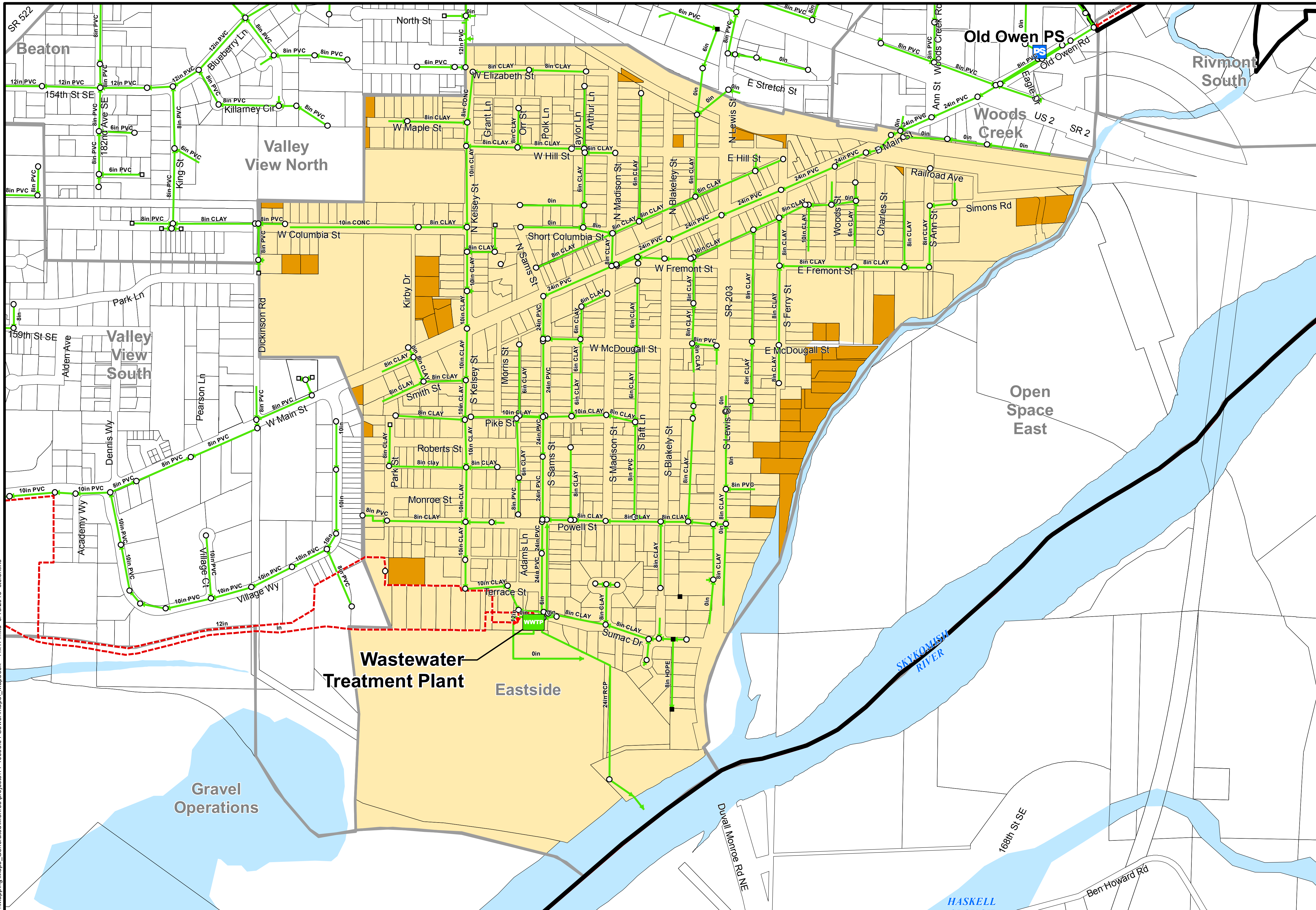
MONROE WASHINGTON

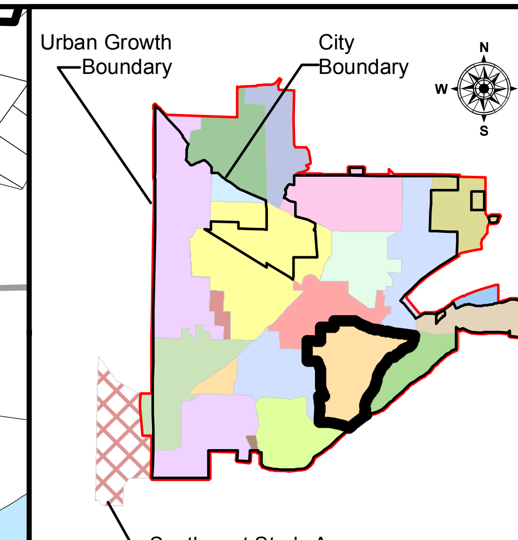
Cripple Creek Mini-Basin

Mapbook
Utility Systems Plan - Sewer
City of Monroe, Washington
March 2015

Figure

SS-A.3





Vicinity Map

Legend

Existing Sewer System

- WWTP Wastewater Treatment Plant
- PS Pump Station
- Manhole
- Cleanout
- Unknown
- Forcemain
- Sewer Main

Base Layers

- City Boundary
- Urban Growth Area
- Parcels
- Minibasin

Sewered

Un-Sewered

BHC CONSULTANTS

Sewer System & Mini-Basins: City of Monroe 2014
Snohomish County base data 2013
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0 600 1,200 Feet

MONROE WASHINGTON

Eastside Mini-Basin
Mapbook
Utility Systems Plan - Sewer
City of Monroe, Washington
March 2015

Figure
SS-A.4

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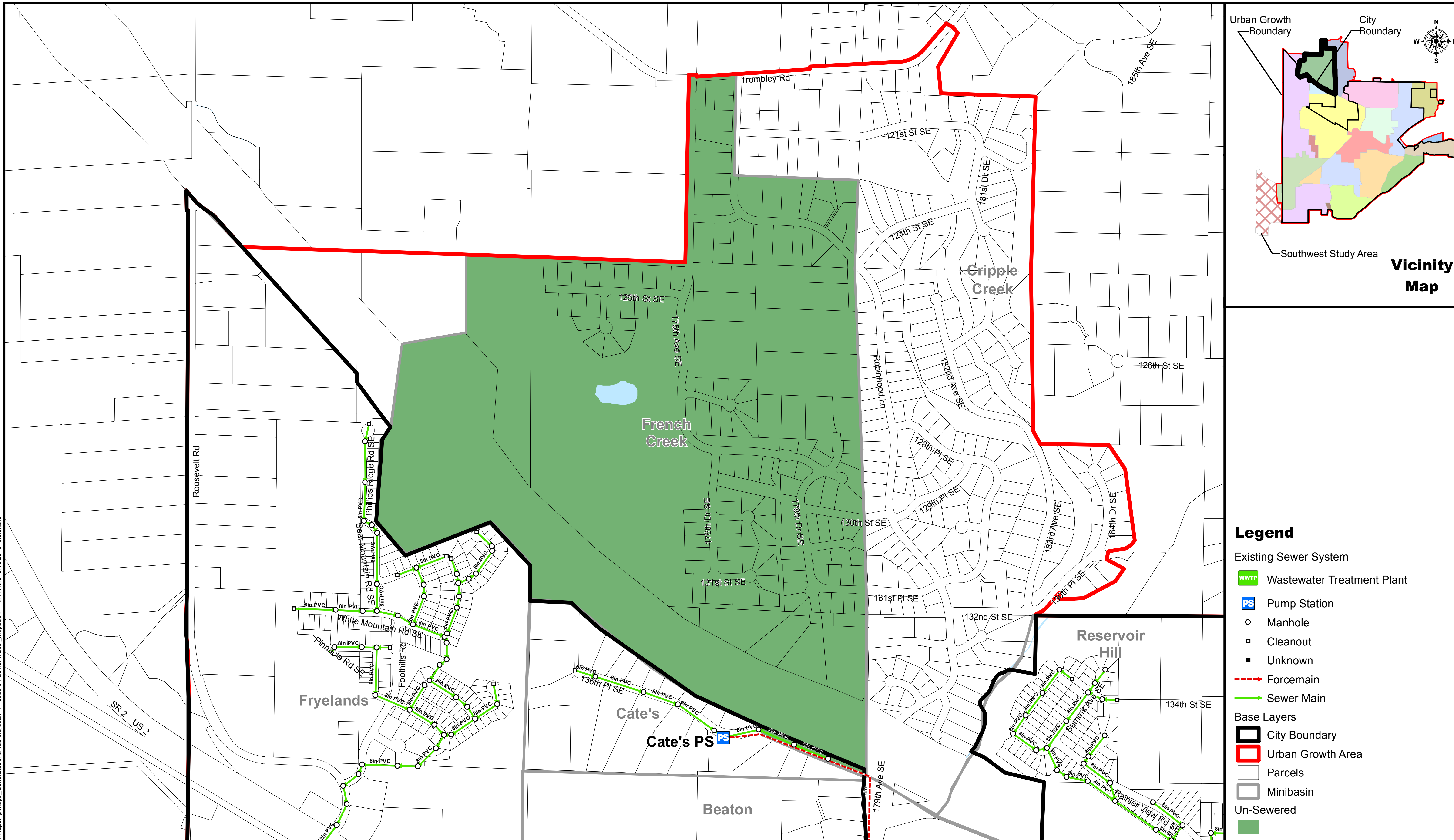

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Sewer System & Mini-Basins: City of Monroe 2014
Snohomish County base data 2013
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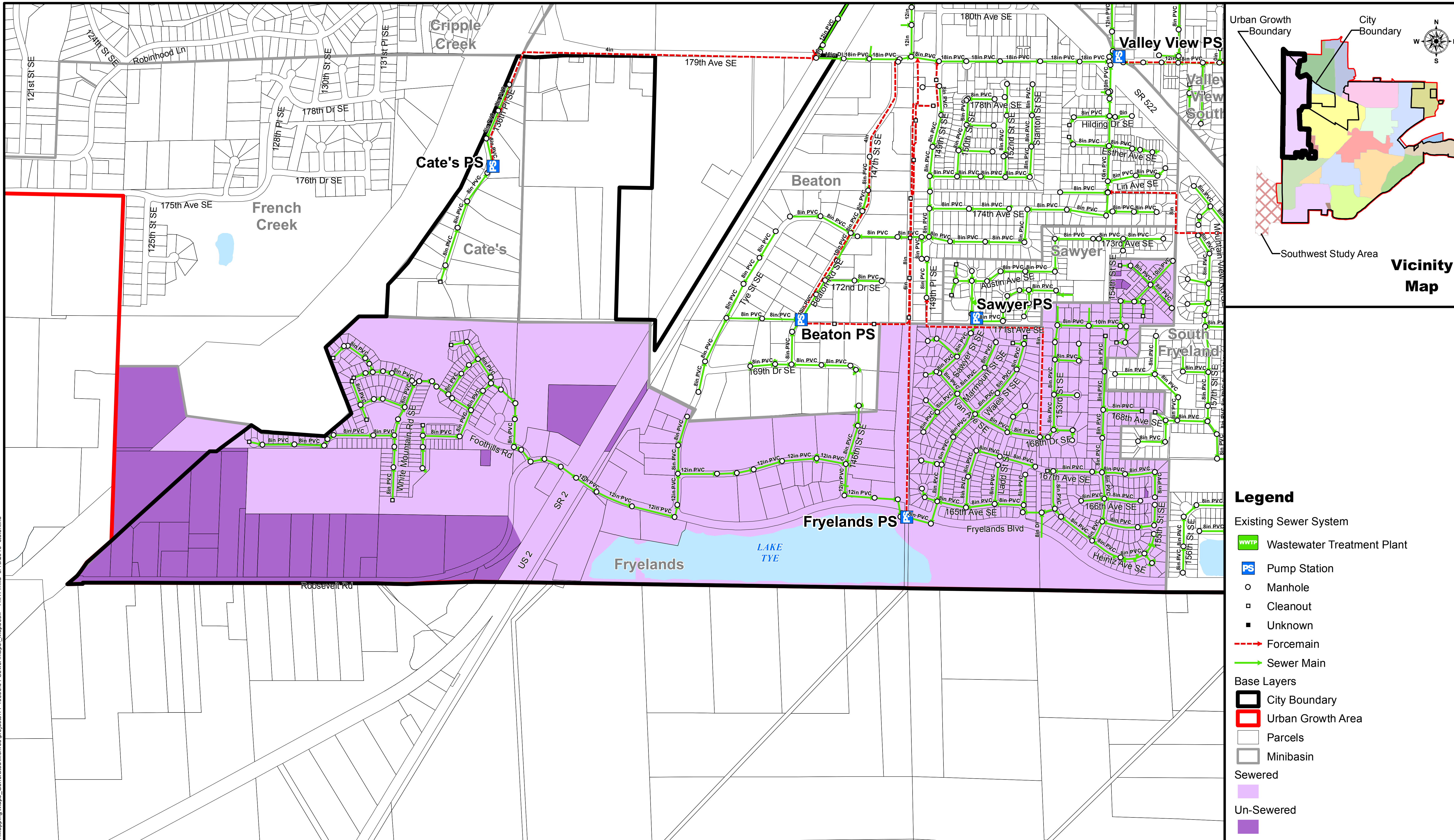
N W E S

0 700 1,400 Feet

MONROE WASHINGTON

French Creek Mini-Basin
Mapbook
Utility Systems Plan - Sewer
City of Monroe, Washington
March 2015

Figure
SS-A.5



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Sewer System & Mini-Basins: City of Monroe 2014
Snohomish County base data 2013
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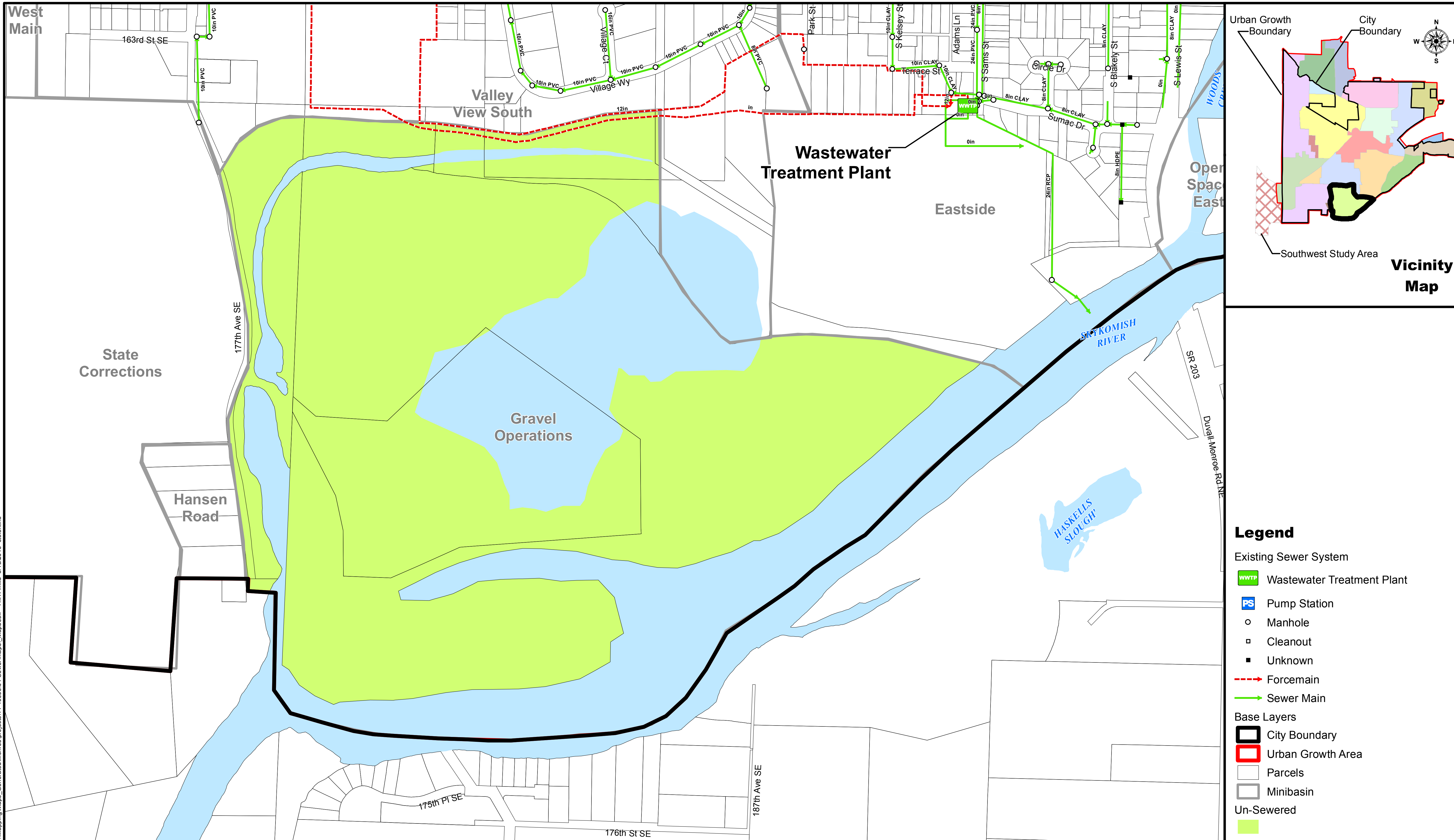
0 900 1,800 Feet

MONROE WASHINGTON

Fryelands Mini-Basin
Mapbook
Utility Systems Plan - Sewer
City of Monroe, Washington
March 2015

Figure
SS-A.6



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Sewer System & Mini-Basins: City of Monroe 2014
Snohomish County base data 2013
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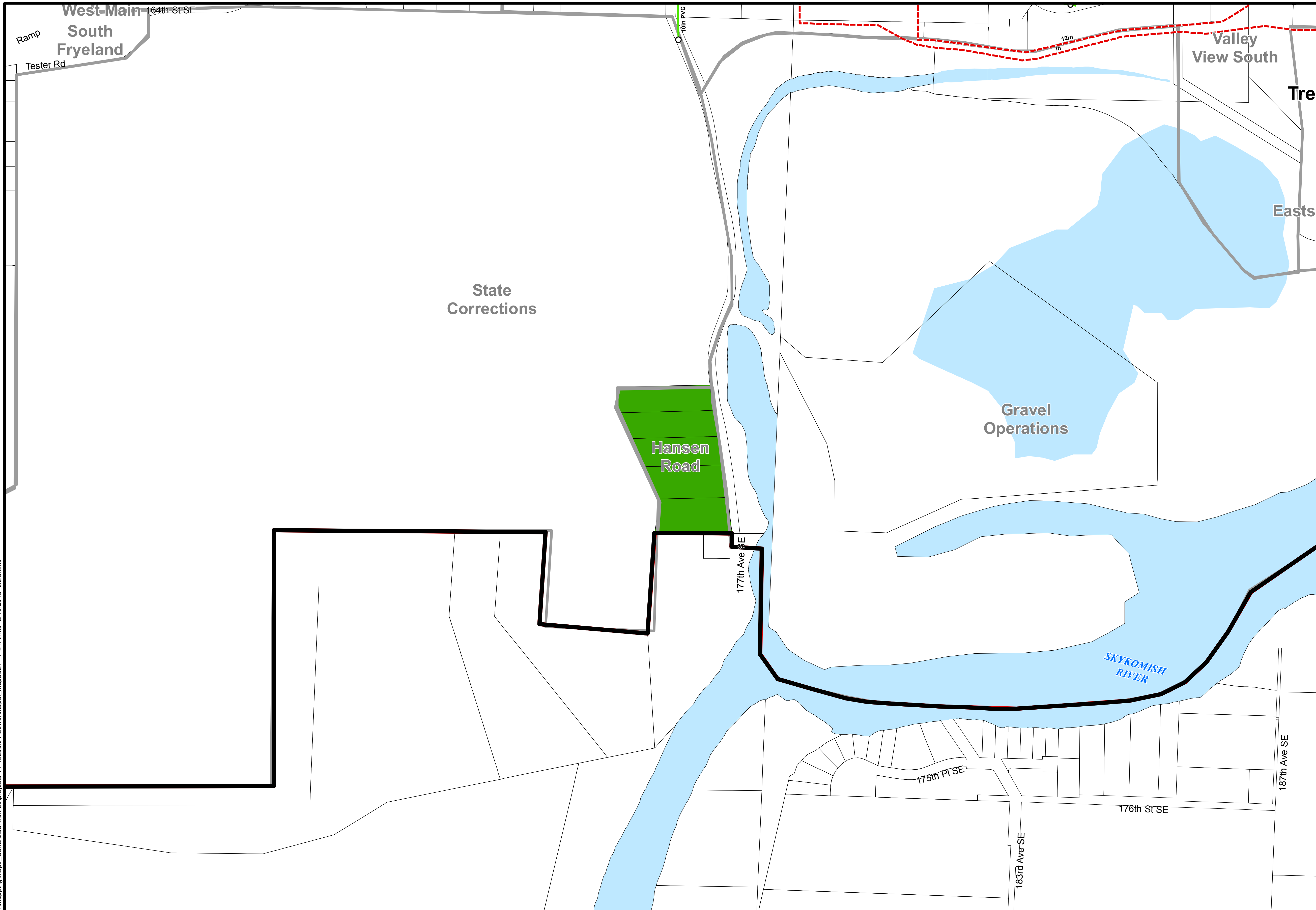
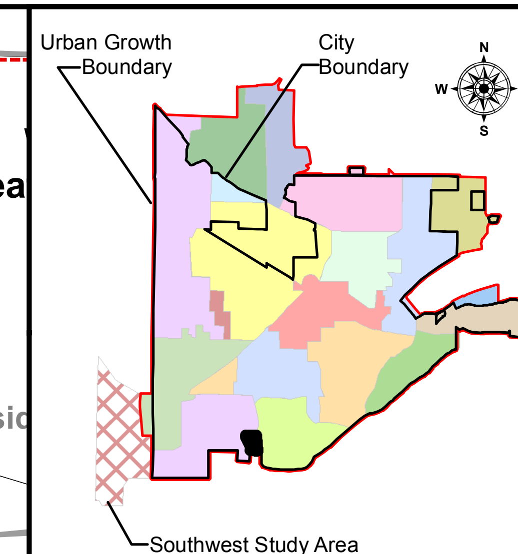
0 500 1,000 Feet

MONROE WASHINGTON

Gravel Operations Mini-Basin
Mapbook
Utility Systems Plan - Sewer
City of Monroe, Washington
March 2015

Figure
SS-A.7





Vicinity Map

Legend

Existing Sewer System

- WWTP Wastewater Treatment Plant
- PS Pump Station
- Manhole
- Cleanout
- Unknown
- Forcemain
- Sewer Main

Base Layers

- City Boundary
- Urban Growth Area
- Parcels
- Minibasin

Un-Sewered

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Sewer System & Mini-Basins: City of Monroe 2014
Snohomish County base data 2013
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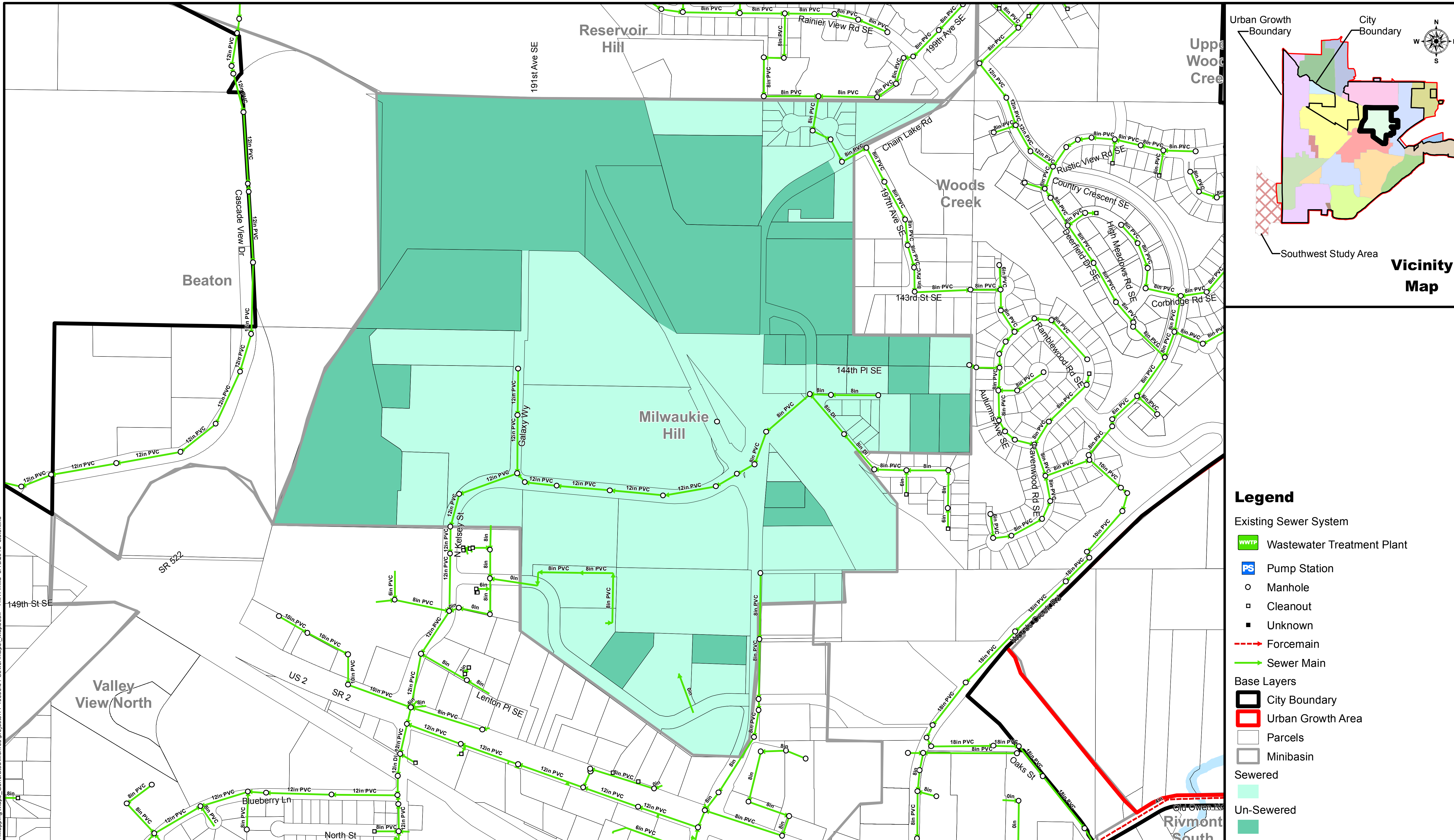
N W E S

0 500 1,000 Feet

MONROE WASHINGTON

Hansen Road Mini-Basin
Mapbook
Utility Systems Plan - Sewer
City of Monroe, Washington
March 2015

Figure
SS-A.8



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Sewer System & Mini-Basins: City of Monroe 2014
Snohomish County base data 2013
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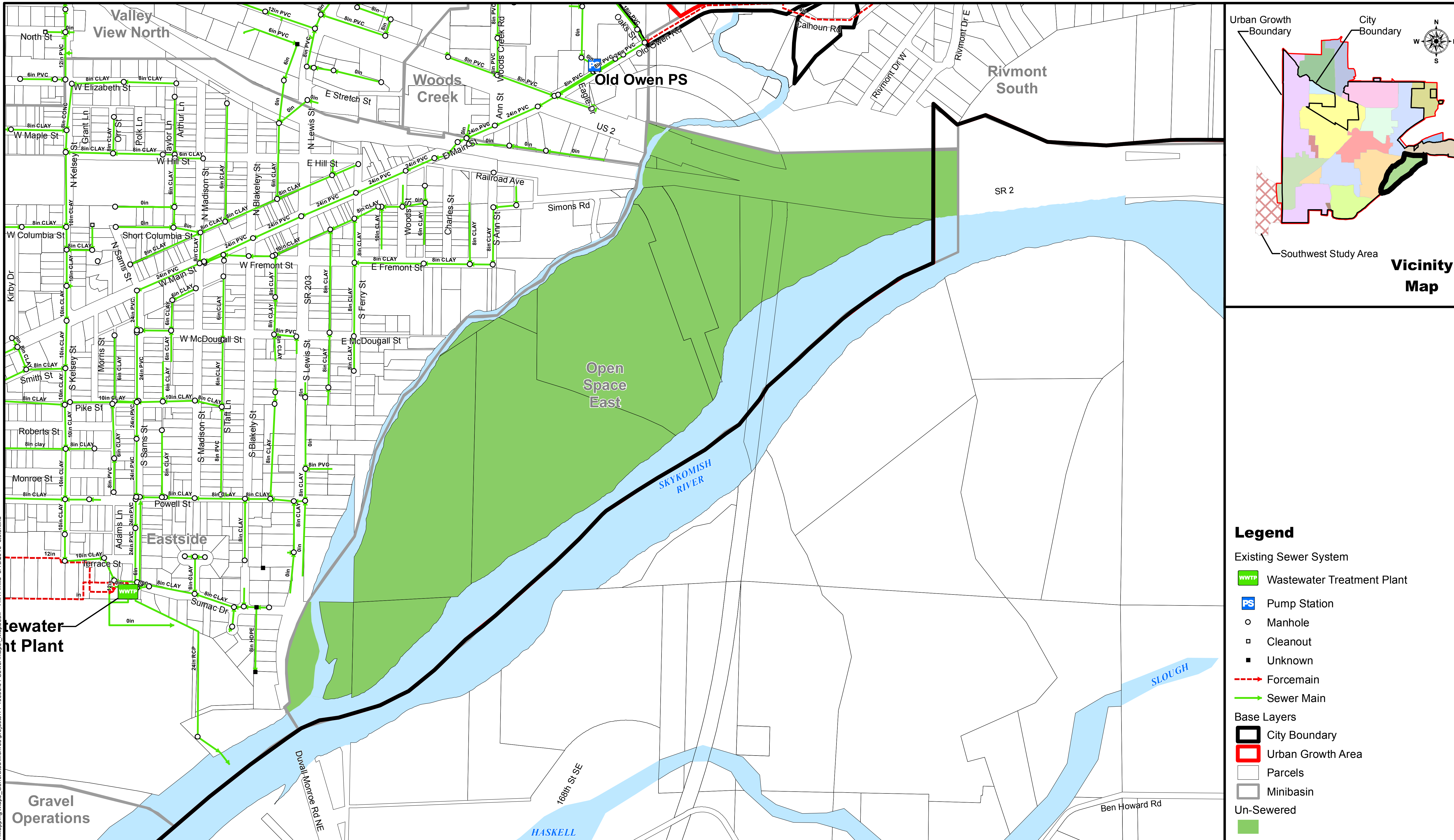
0 500 1,000 Feet

MONROE WASHINGTON

Milwaukie Hill Mini-Basin
Mapbook
Utility Systems Plan - Sewer
City of Monroe, Washington
March 2015

Figure
SS-A.9



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Sewer System & Mini-Basins: City of Monroe 2014
Snohomish County base data 2013
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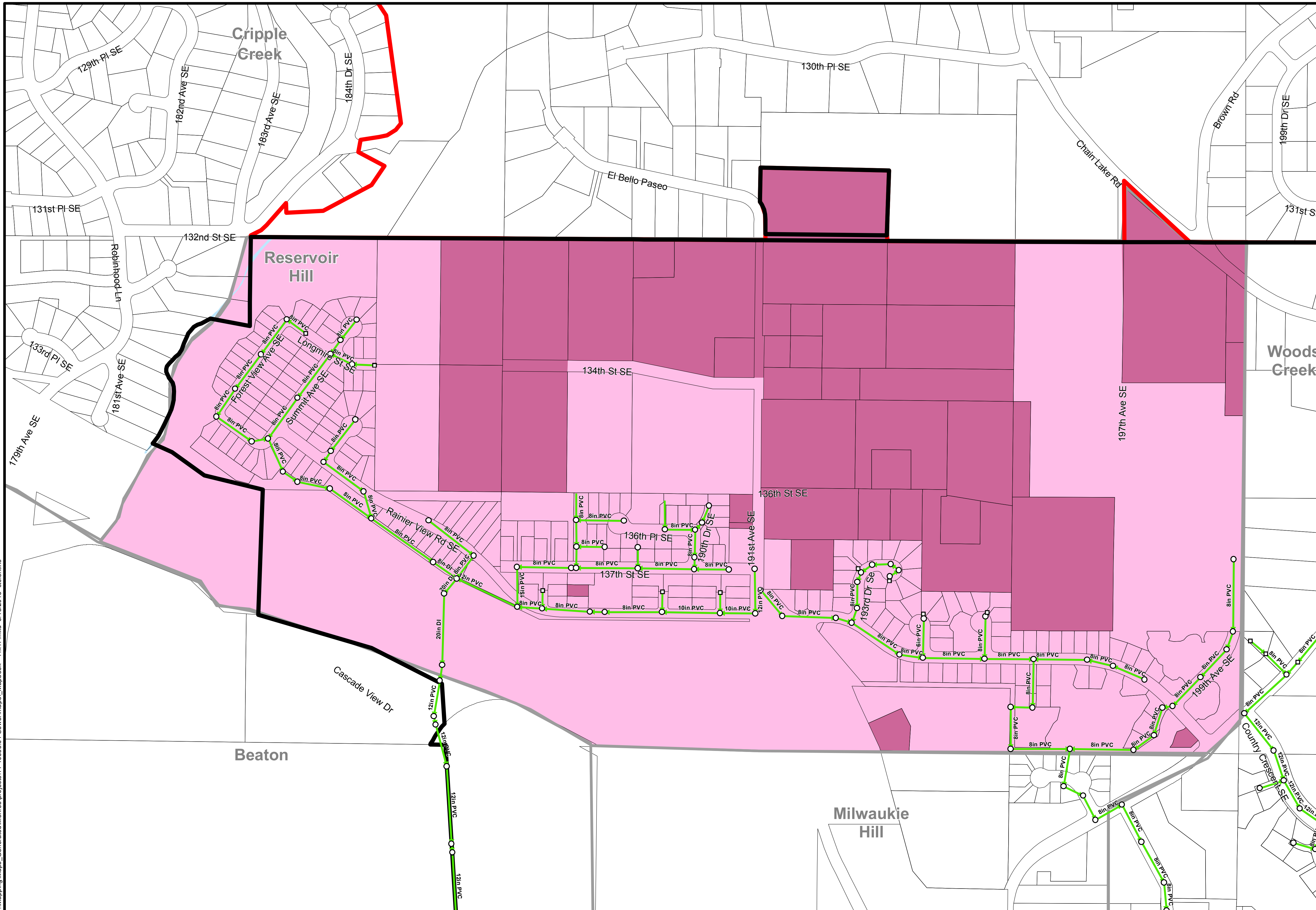
N W E S

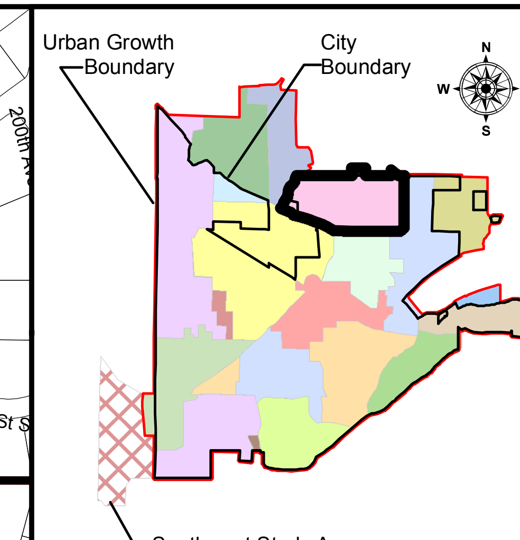
0 600 1,200 Feet

MONROE WASHINGTON

Open Space East Mini-Basin
Mapbook
Utility Systems Plan - Sewer
City of Monroe, Washington
March 2015

Figure
SS-A.10





Vicinity Map

Legend

Existing Sewer System

- WWTP Wastewater Treatment Plant
- PS Pump Station
- Manhole
- Cleanout
- Unknown
- Forcemain
- Sewer Main

Base Layers

- City Boundary
- Urban Growth Area
- Parcels
- Minibasin

Sewered

Un-Sewered

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Sewer System & Mini-Basins: City of Monroe 2014
Snohomish County base data 2013
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N W E S

0 500 1,000 Feet

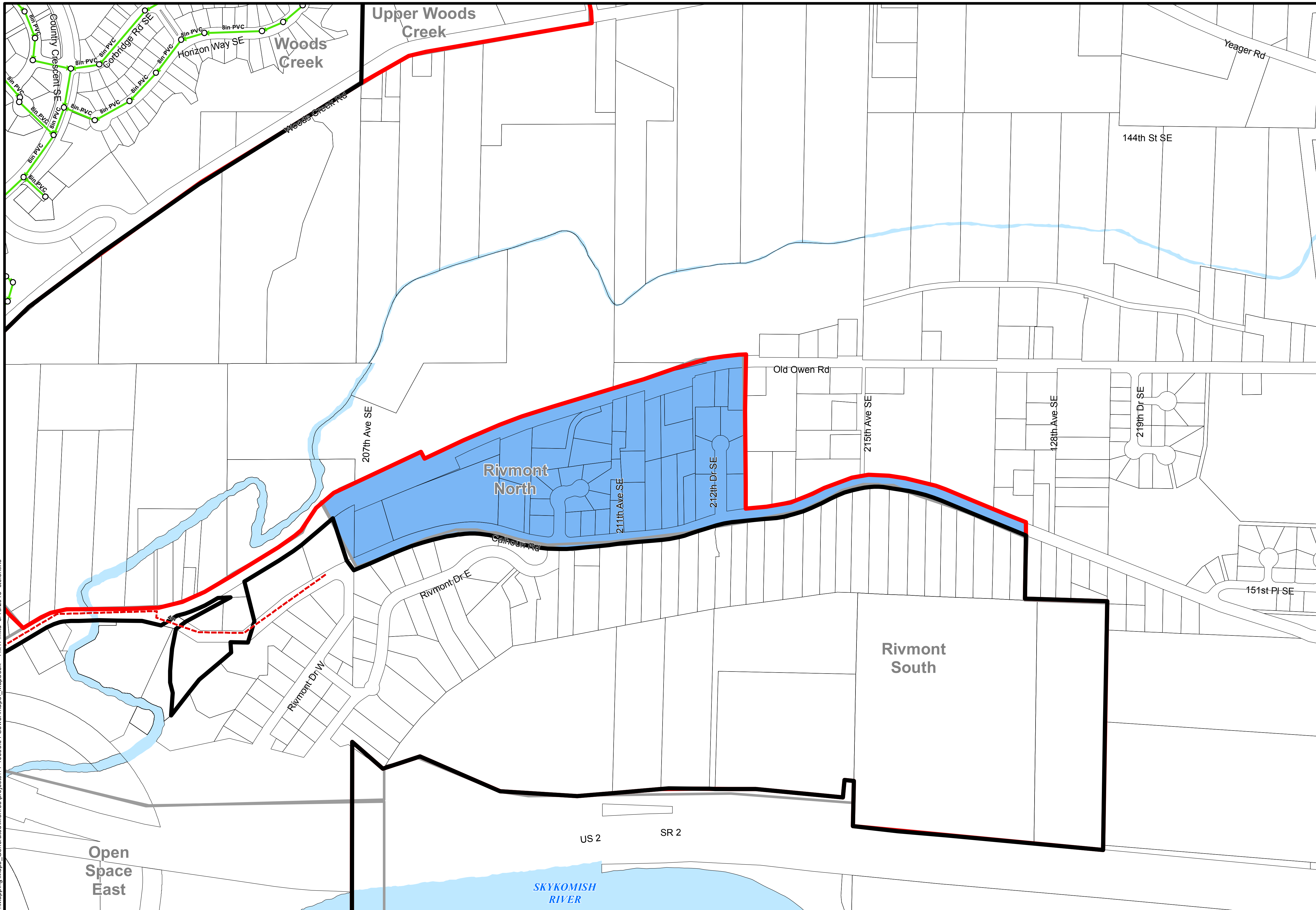
MONROE WASHINGTON

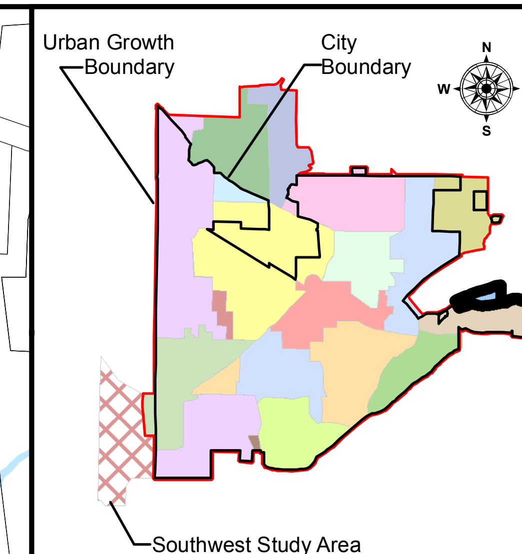
Reservoir Hill Mini-Basin

Mapbook
Utility Systems Plan - Sewer
City of Monroe, Washington
March 2015

Figure

SS-A.11





Vicinity Map

Legend

Existing Sewer System

- Wastewater Treatment Plant
- Pump Station
- Manhole
- Cleanout
- Unknown
- Forcemain
- Sewer Main

Base Layers

- City Boundary
- Urban Growth Area
- Parcels
- Minibasin

Un-Sewered

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Sewer System & Mini-Basins: City of Monroe 2014
Snohomish County base data 2013
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0 500 1,000 Feet

MONROE WASHINGTON

Rivmont North Mini-Basin
Mapbook
Utility Systems Plan - Sewer
City of Monroe, Washington
March 2015

Figure
SS-A.12

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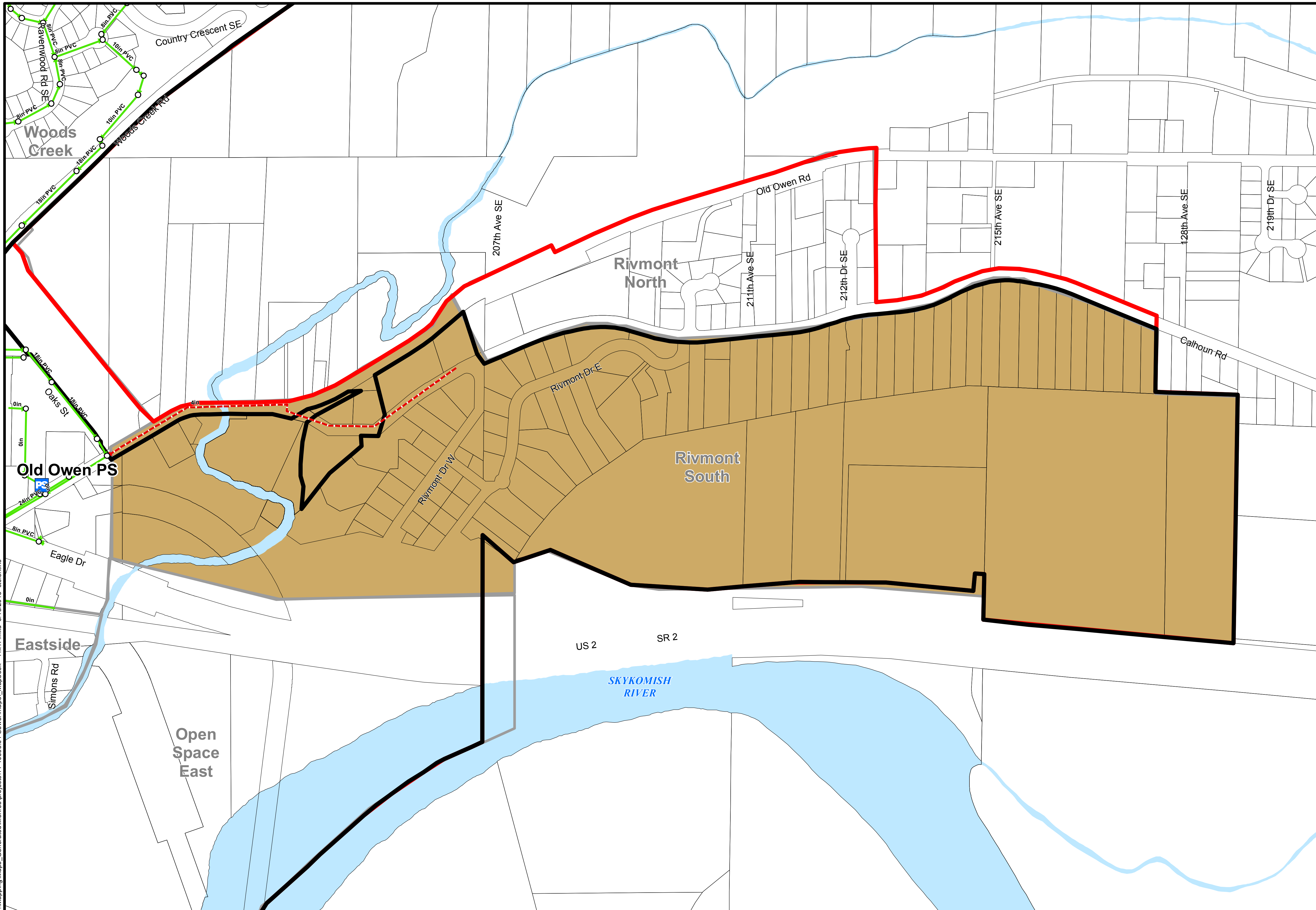

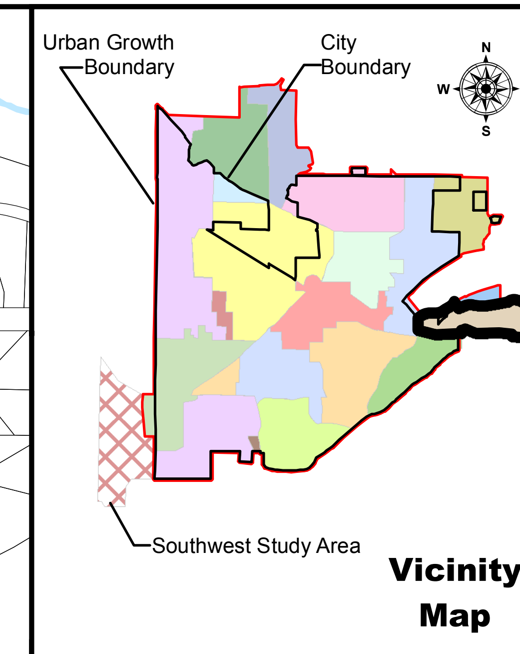

Vicinity Map

Legend

Existing Sewer System

- WWTP Wastewater Treatment Plant
- PS Pump Station
- Manhole
- Cleanout
- Unknown
- Forcemain
- Sewer Main

Base Layers

- City Boundary
- Urban Growth Area
- Parcels
- Minibasin

Un-Sewered

Sewer System & Mini-Basins: City of Monroe 2014
Snohomish County base data 2013
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0 500 1,000 Feet

BHC CONSULTANTS

MONROE WASHINGTON

Rivmont South Mini-Basin
Mapbook
Utility Systems Plan - Sewer
City of Monroe, Washington
March 2015

Figure
SS-A.13

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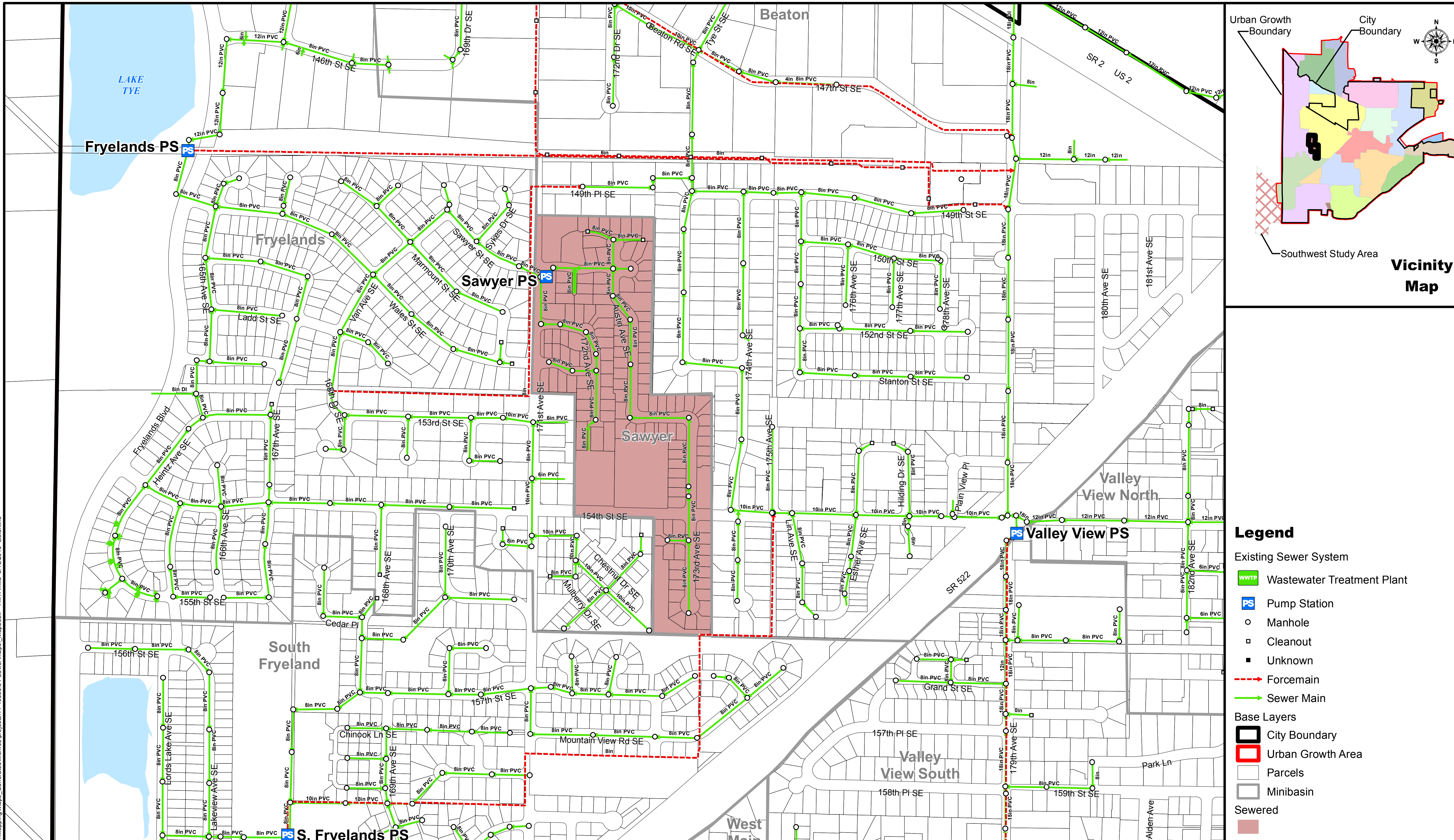

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Sewer System & Mini-Basins: City of Monroe 2014
Snohomish County base data 2013
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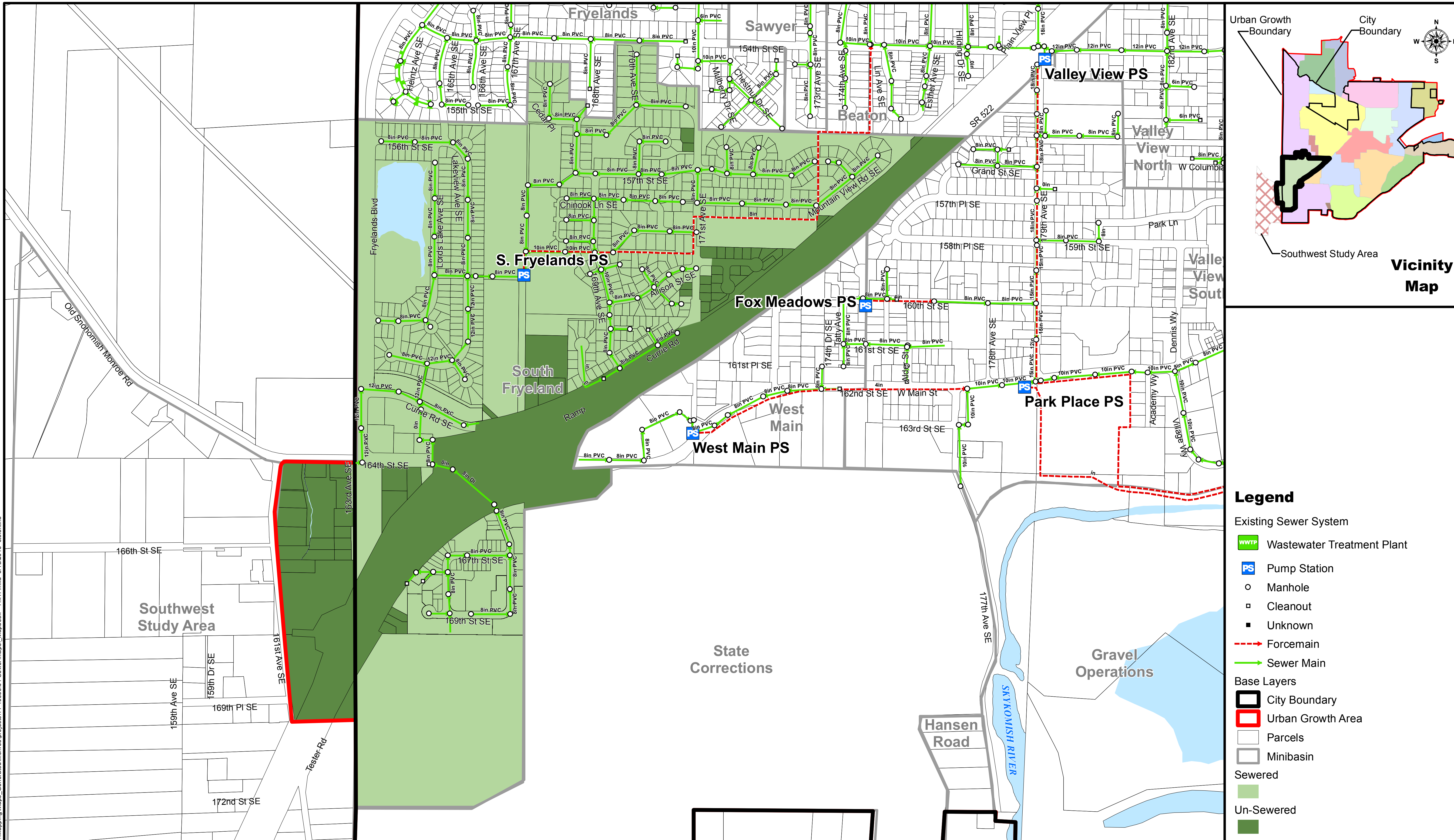
0 500 1,000 Feet

MONROE WASHINGTON

Sawyer Mini-Basin
Mapbook
Utility Systems Plan - Sewer
City of Monroe, Washington
March 2015

Figure
SS-A.14



Sewer System & Mini-Basins: City of Monroe 2014
Snohomish County base data 2013
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0 700 1,400 Feet

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MONROE WASHINGTON

South Fryeland Mini-Basin
Mapbook
Utility Systems Plan - Sewer
City of Monroe, Washington
March 2015

Figure
SS-A.15

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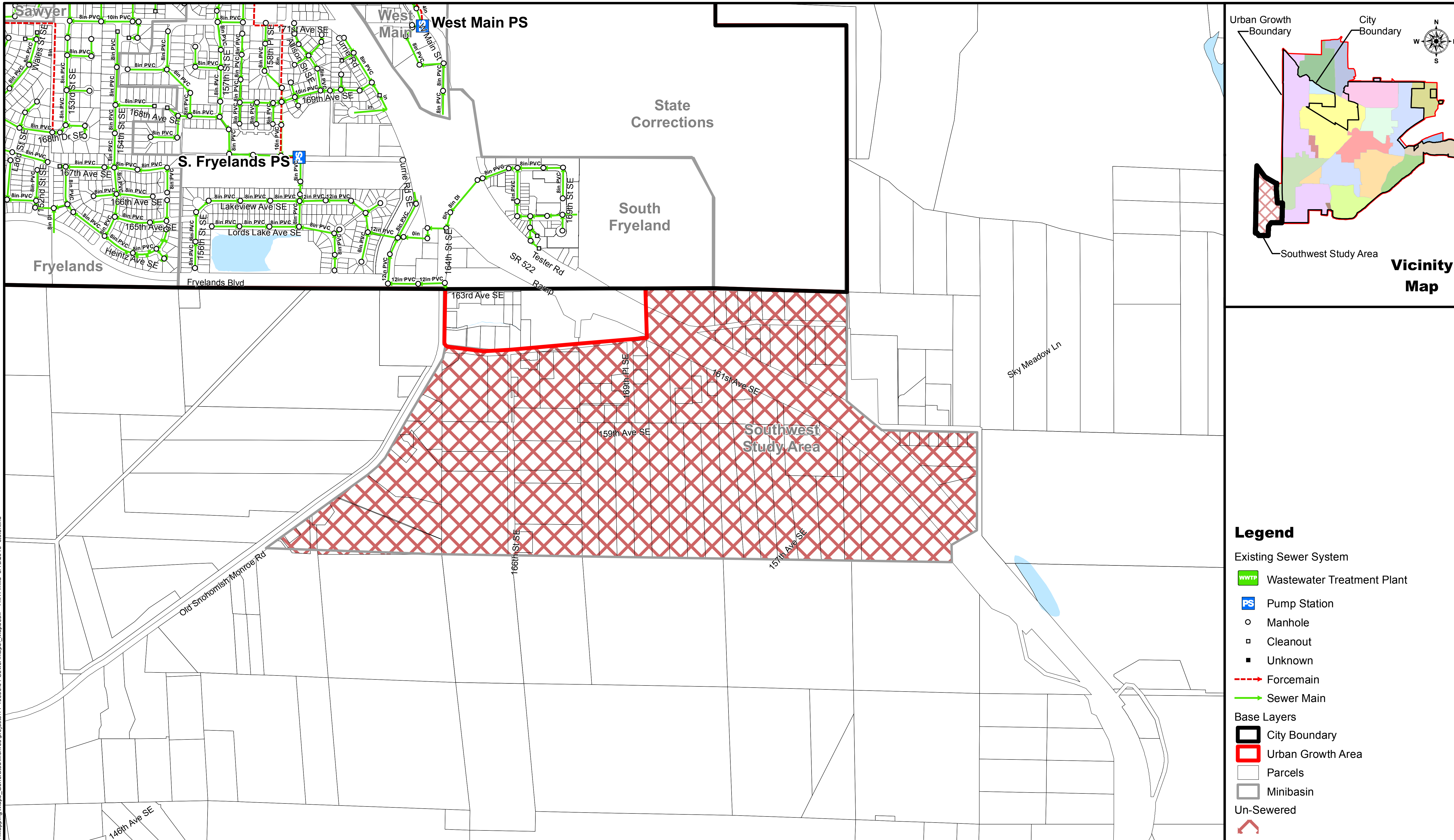

BHC CONSULTANTS

Sewer System & Mini-Basins: City of Monroe 2014
Snohomish County base data 2013
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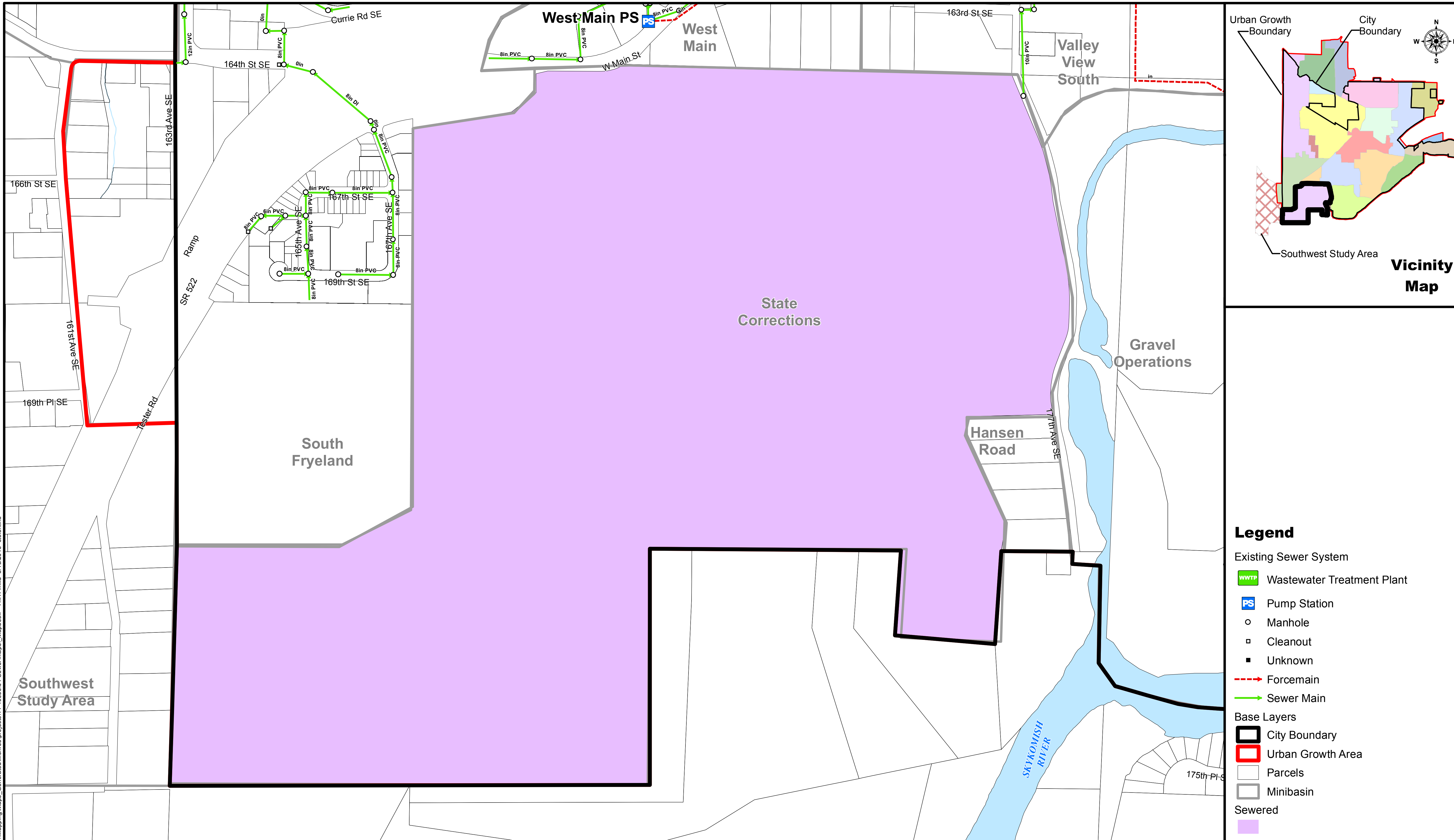
0 900 1,800 Feet

MONROE WASHINGTON

Southwest Study Area Mini-Basin
Mapbook
Utility Systems Plan - Sewer
City of Monroe, Washington
March 2015

Figure
SS-A.16



Sewer System & Mini-Basins: City of Monroe 2014
Snohomish County base data 2013
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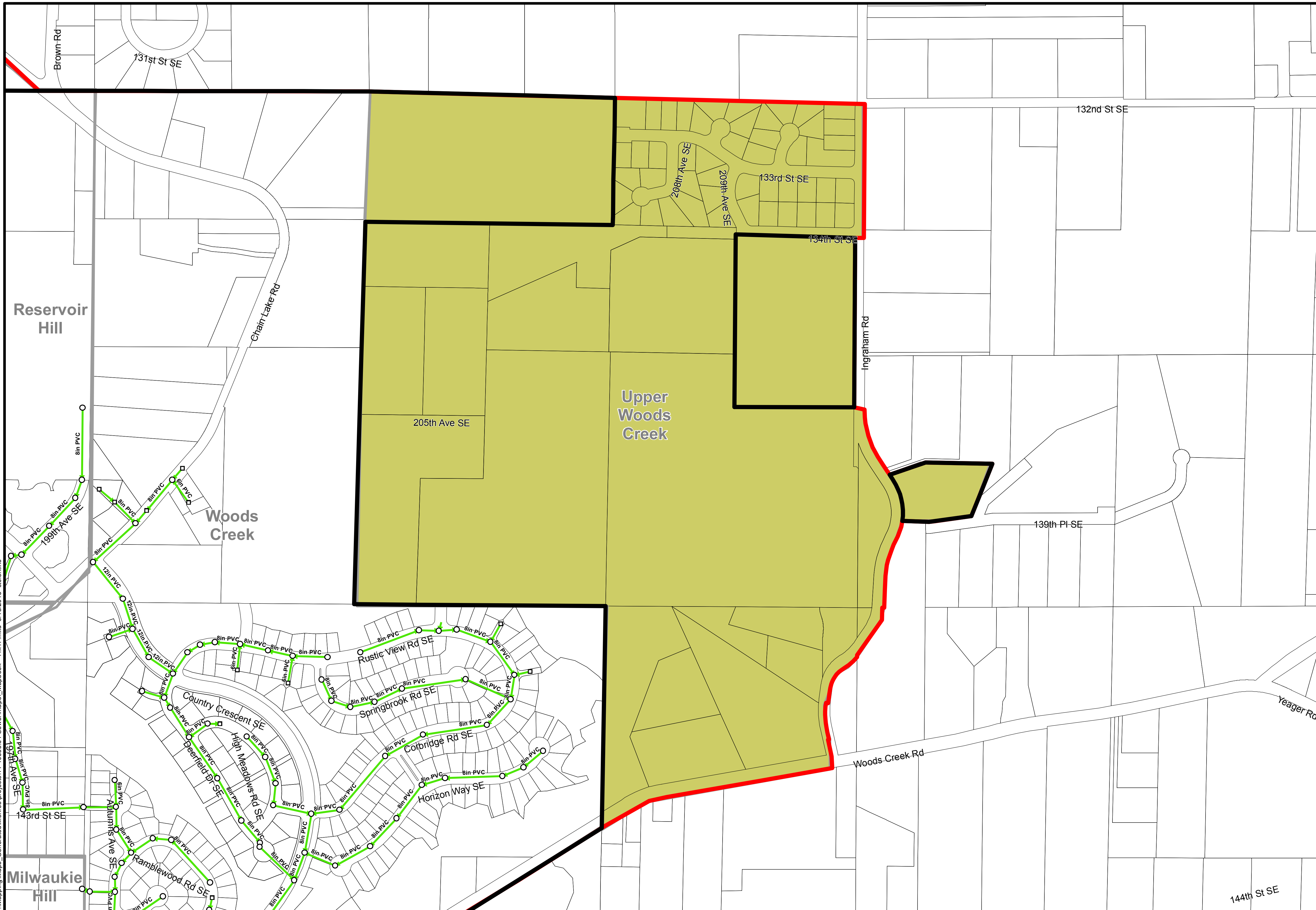
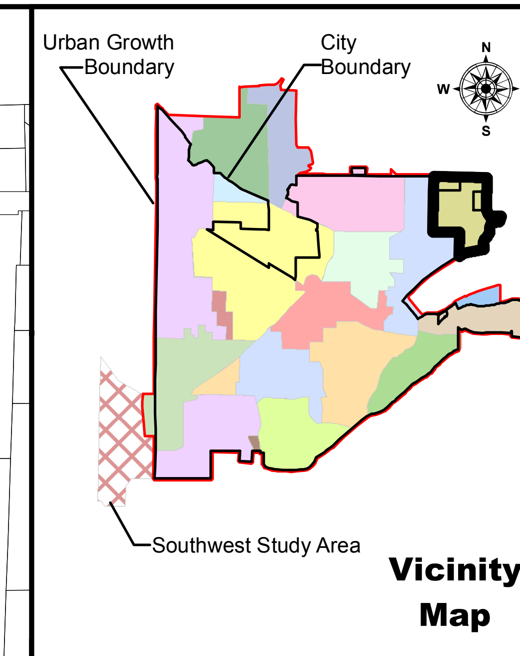
MONROE WASHINGTON

State Corrections Mini-Basin
Mapbook
Utility Systems Plan - Sewer
City of Monroe, Washington
March 2015

Figure
SS-A.17





Vicinity Map

Legend

Existing Sewer System

- WWTP Wastewater Treatment Plant
- PS Pump Station
- Manhole
- Cleanout
- Unknown
- Forcemain
- Sewer Main

Base Layers

- City Boundary
- Urban Growth Area
- Parcels
- Minibasin

Un-Sewered

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Sewer System & Mini-Basins: City of Monroe 2014
Snohomish County base data 2013
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0 500 1,000 Feet

MONROE WASHINGTON

Upper Woods Creek Mini-Basin
Mapbook
Utility Systems Plan - Sewer
City of Monroe, Washington
March 2015

Figure

SS-A.18

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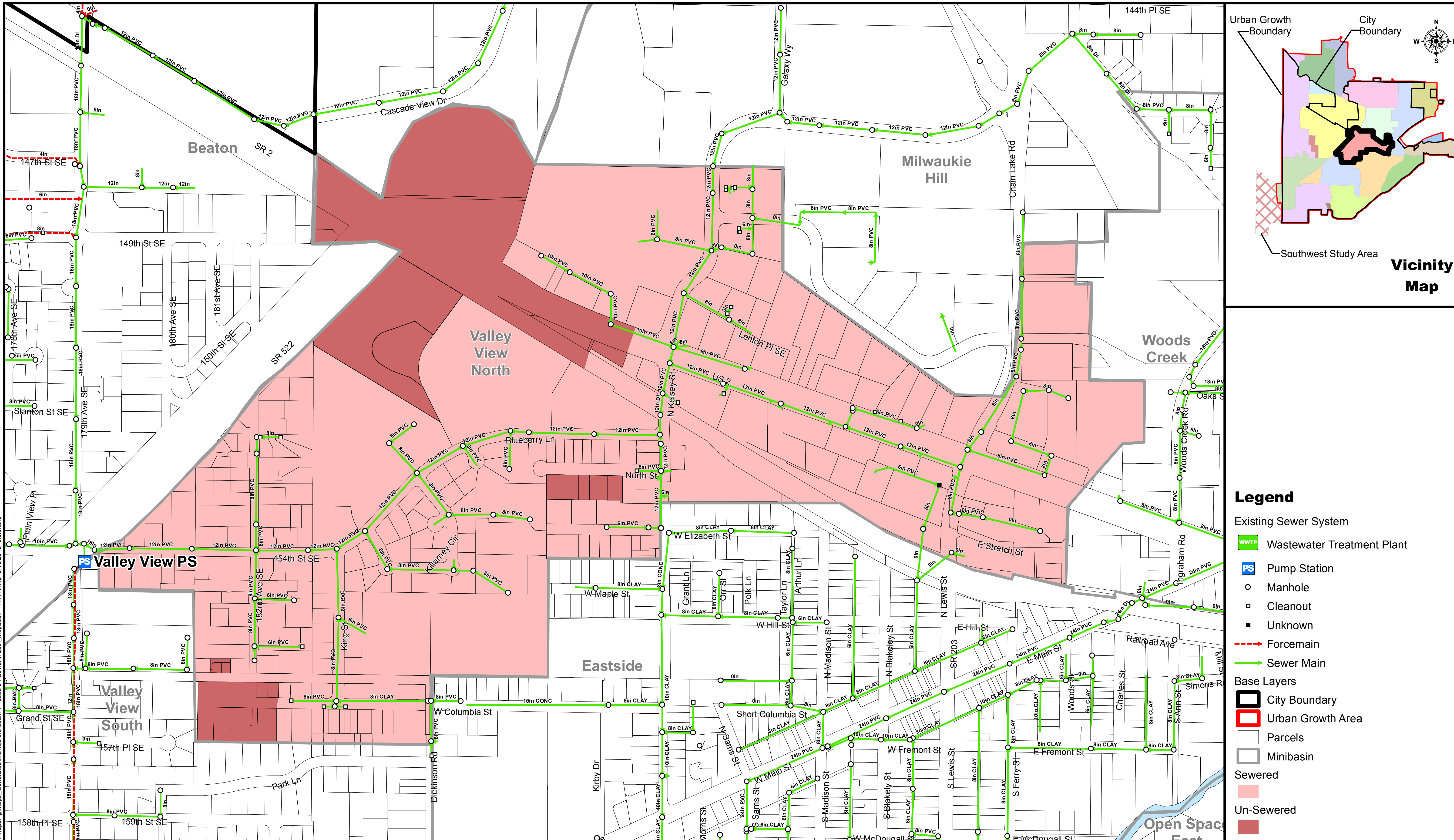

Sewer System & Mini-Basins: City of Monroe 2014
Snohomish County base data 2013
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0 500 1,000 Feet

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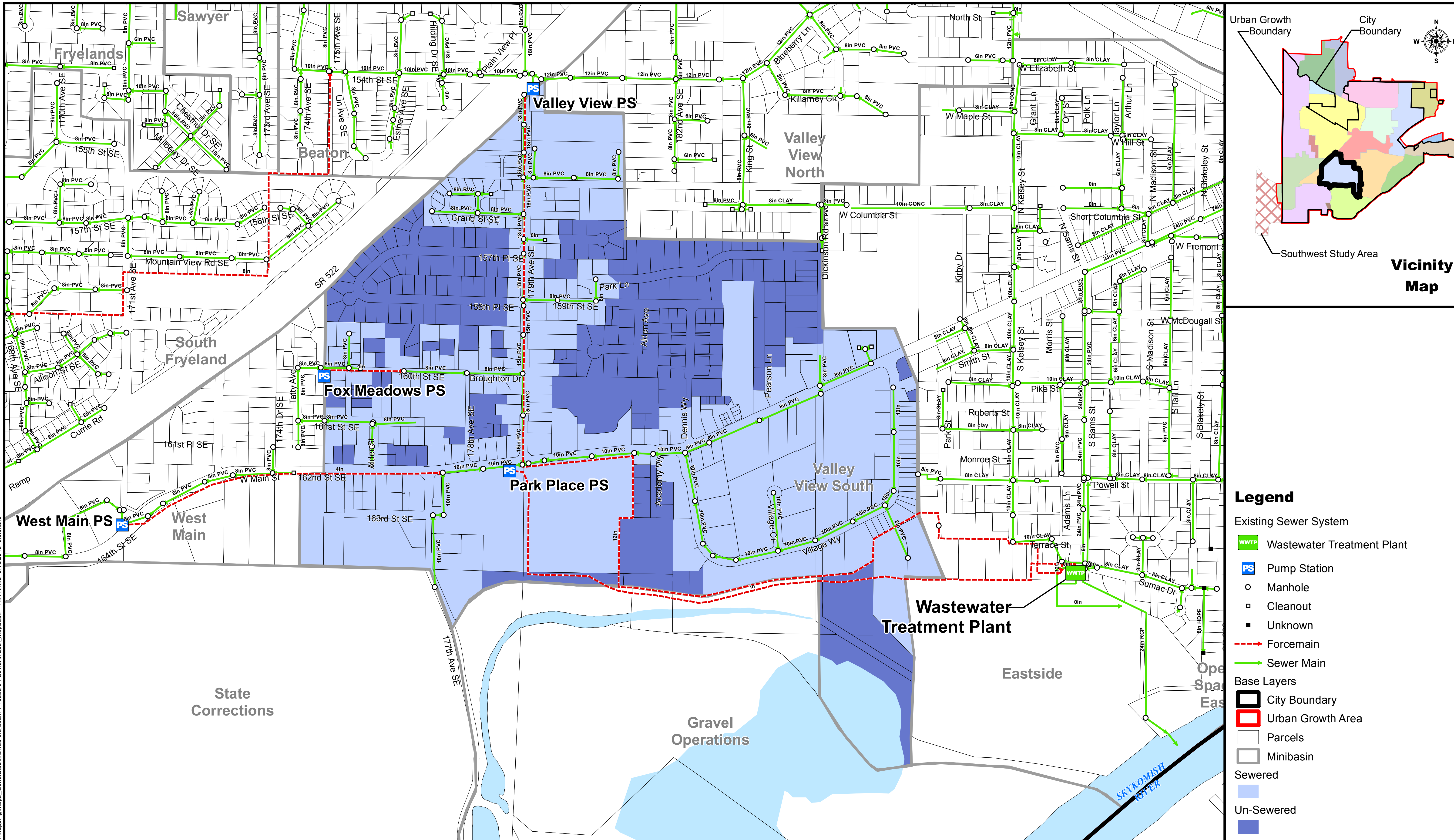
MONROE WASHINGTON

Valley View North Mini-Basin
Mapbook
Utility Systems Plan - Sewer
City of Monroe, Washington
March 2015

Figure
SS-A.19



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Sewer System & Mini-Basins: City of Monroe 2014
Snohomish County base data 2013
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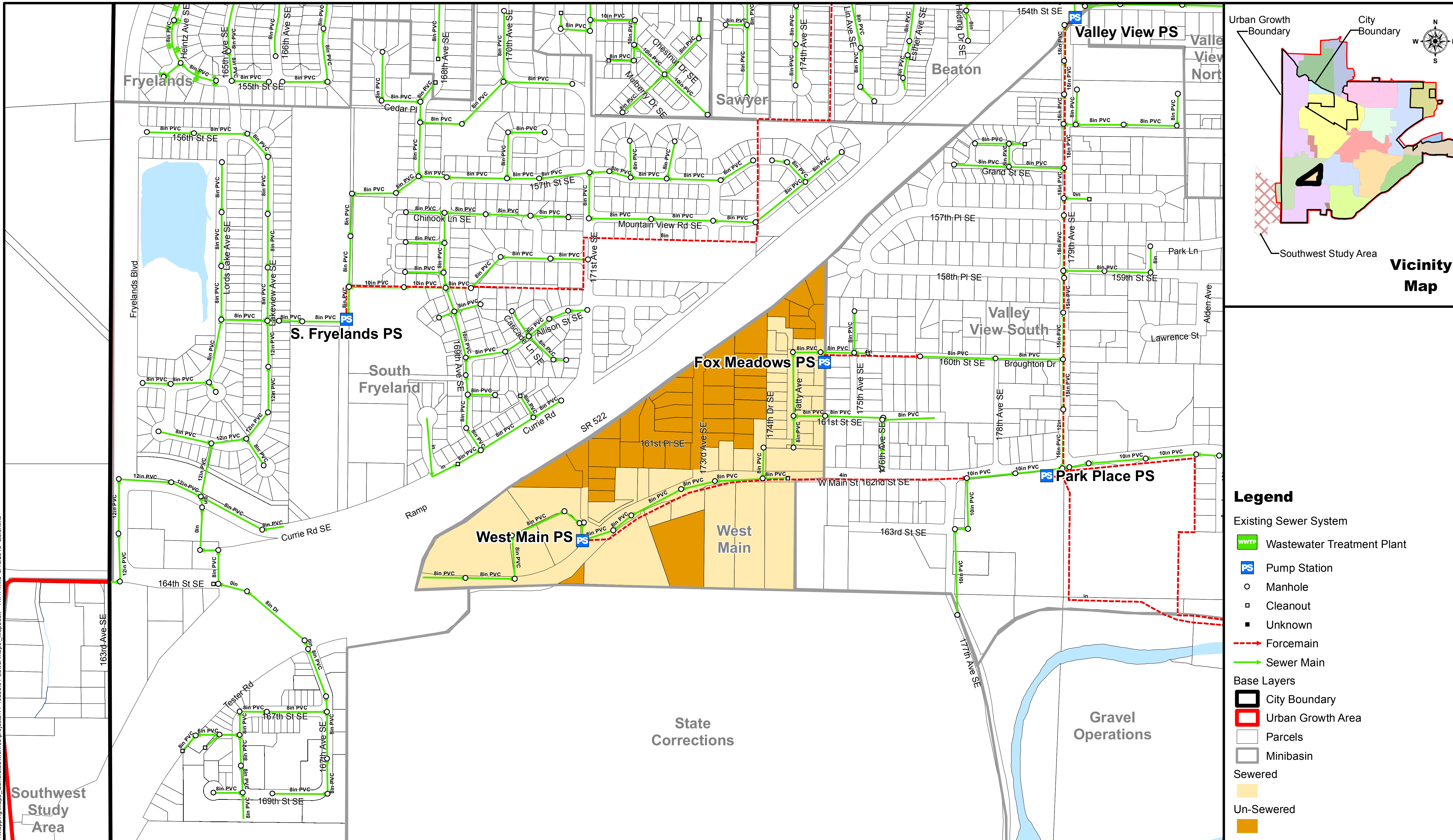
N W E S

0 600 1,200 Feet

MONROE WASHINGTON

Valley View South Mini-Basin
Mapbook
Utility Systems Plan - Sewer
City of Monroe, Washington
March 2015

Figure
SS-A.20



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Sewer System & Mini-Basins: City of Monroe 2014
Snohomish County base data 2013
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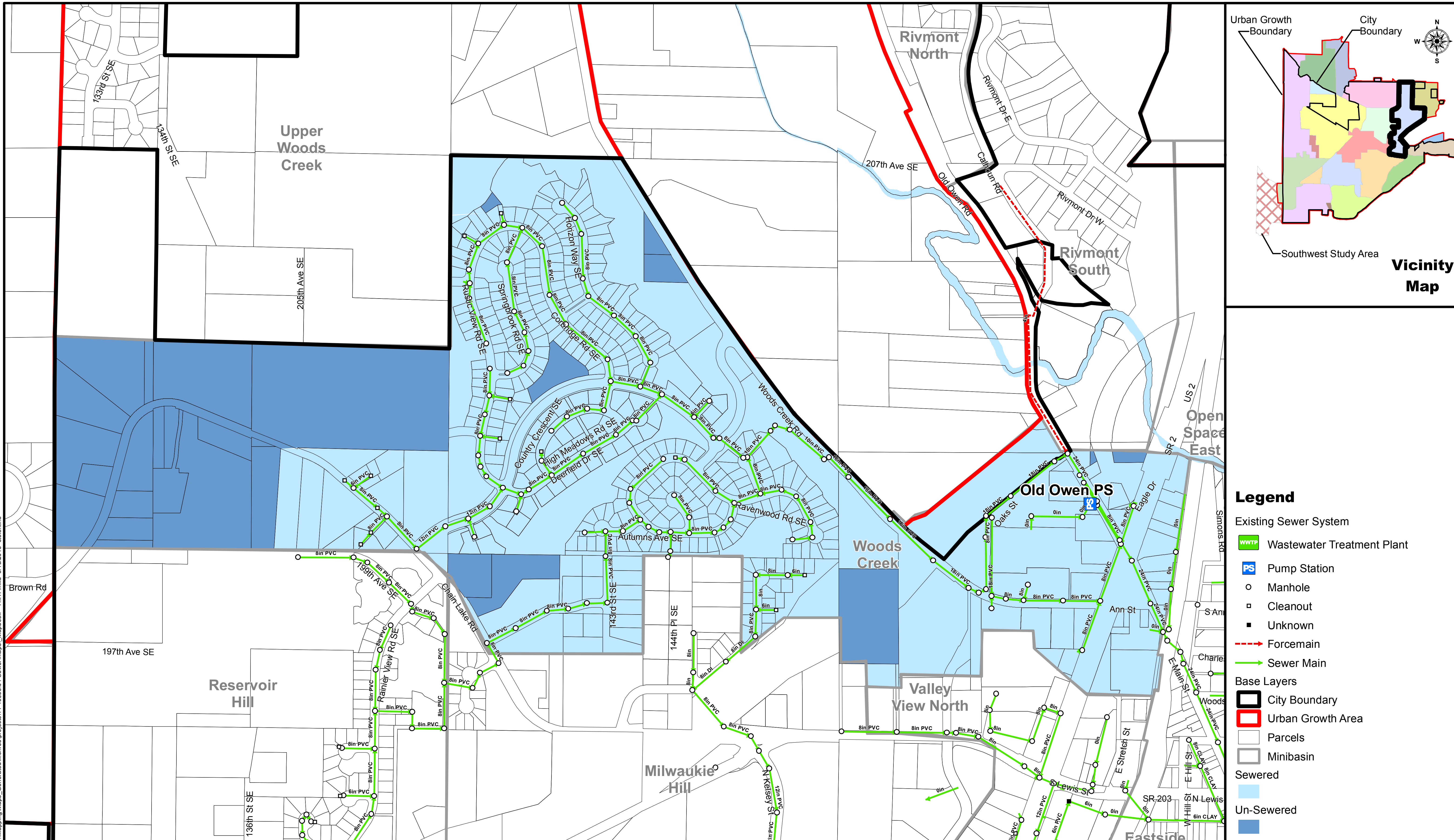
0 500 1,000 Feet

MONROE WASHINGTON

West Main Mini-Basin
Mapbook
Utility Systems Plan - Sewer
City of Monroe, Washington
March 2015

Figure
SS-A.21



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Sewer System & Mini-Basins: City of Monroe 2014
Snohomish County base data 2013
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N E S W

0 600 1,200 Feet

MONROE WASHINGTON

Woods Creek Mini-Basin
Mapbook
Utility Systems Plan - Sewer
City of Monroe, Washington
March 2015

Figure

SS-A.22

Appendix SS-B

Sewer Model

City of Monroe
General Sewer Plan
Hydraulic Model
Prepared by: Preston Love
Reviewed by: Adam Schuyler/Peter Cunningham
13 February 2015
S:\Projects\Monroe\2015 Utility Plans\Sewer Model\[Hydraulic Sewer Model 2014 - DRAFT - QAQC.xlsm

LEGEND

Abbr.	Basin
B	Beaton
C	Cate's
E	Eastside
F	Fyelands
MH	Milwaukee Hill
RH	Reservoir Hill
S	Sawyer
SF	South Fryeland
SC	State Corrections
VN	Valley View North
VS	Valley View South
WM	West Main
WC	Woods Creek

C_{DIP} = 130
$C_{CONC/RCP}$ = 100
C_{PVC} = 140
C_{CLAY} = 110

Assumptions:
1) Manning's 'n' values: All 0.013 (ORANGE BOOK). However, actual values are: 0.01 (PVC pipe), 0.014 (clay), 0.012 (DI), 0.015 (concrete)
2) Where no pipe type is given, PVC is assumed
3) hL equal to one pipe diameter above upstream crown minus downstream crown

	OK for 2015 Flow at d/D = 1?	OK for 2015 Flow at d/D = 2?	OK for 2021 Flow at d/D = 1?	OK for 2021 Flow at d/D = 2?	OK for B/O Flow at d/D = 1?	OK for B/O Flow at d/D = 2?
DEFICIENT	11	3	12	3	22	5

PIPE ID	MH UP	MH DOWN	DIA. (IN)	PIPE MATERIAL	IE IN	IE OUT	LENGTH (ft)	Slope "S"	Manning's "n"	100% Capacity (gpm)	200% Capacity (gpm)	2015 Peak Hour Flow (gpm)	OK for 2015 Flow at d/D = 1?	OK for 2015 Flow at d/D = 2?	Projected 2021 Peak Hour Flow (gpm)	OK for 2021 Flow at d/D = 1?	OK for 2021 Flow at d/D = 2?	Projected B/O Peak Hour Flow (gpm)	OK for B/O Flow at d/D = 1?	OK for B/O Flow at d/D = 2?
1	B002	B001	18	PVC	32.28	32.20	47.33	0.0017	0.013	1943	12555	1,929	OKAY	OKAY	2,112	DEFICIENT	OKAY	3,492	DEFICIENT	OKAY
1	VN001	B001	12	PVC	33.21	33.03	69.14	0.0026	0.013	818	3007	459	OKAY	OKAY	499	OKAY	OKAY	919	DEFICIENT	OKAY
1	B003	B002	10	PVC	32.68	32.48	35.31	0.0057	0.013	742	2492	527	OKAY	OKAY	545	OKAY	OKAY	681	OKAY	OKAY
1	B003-B	B002	18	PVC	32.75	32.38	295.43	0.0013	0.013	1673	5110	1,391	OKAY	OKAY	1,555	OKAY	OKAY	2,794	DEFICIENT	OKAY
1	B004	B003	18	PVC	33.21	32.75	400.81	0.0011	0.013	1601	4445	1,380	OKAY	OKAY	1,544	OKAY	OKAY	2,778	DEFICIENT	OKAY
1	B032	B003	10	PVC	33.27	32.92	264.45	0.0013	0.013	359	903	524	DEFICIENT	OKAY	542	DEFICIENT	OKAY	677	DEFICIENT	OKAY
1	B005	B004	18	PVC	33.96	33.63	400.24	0.0008	0.013	1357	4286	1,369	DEFICIENT	OKAY	1,532	DEFICIENT	OKAY	2,762	DEFICIENT	OKAY
1	B006	B005	18	PVC	34.43	33.96	342.49	0.0014	0.013	1751	4853	1,358	OKAY	OKAY	1,521	OKAY	OKAY	2,746	DEFICIENT	OKAY
1	B-007A	B007	18	PVC	34.79	34.43	243.97	0.0015	0.013	1816	5651	1,022	OKAY	OKAY	1,163	OKAY	OKAY	2,250	DEFICIENT	OKAY
1	B007	B006	18	PVC	34.95	34.43	273.46	0.0019	0.013	2061	5555	1,347	OKAY	OKAY	1,509	OKAY	OKAY	2,730	DEFICIENT	OKAY
1	B008	B007-A	18	PVC	34.91	34.79	42.60	0.0028	0.013	2509	13471	319	OKAY	OKAY	410	OKAY	OKAY	1,187	OKAY	OKAY
1	B009	B008	18	PVC	35.05	34.91	119.35	0.0012	0.013	1619	7770	305	OKAY	OKAY	394	OKAY	OKAY	1,165	OKAY	OKAY
1	B010	B009	18	PVC	35.40	35.15	302.51	0.0008	0.013	1359	4867	290	OKAY	OKAY	379	OKAY	OKAY	1,144	OKAY	OKAY
1	B011	B010	18	PVC	35.80	35.40	258.58	0.0016	0.013	1861	5541	277	OKAY	OKAY	364	OKAY	OKAY	1,124	OKAY	OKAY
1	B012	B011	18	DI	35.77	35.41	276.93	0.0013	0.013	1704	4900	263	OKAY	OKAY	349	OKAY	OKAY	1,103	OKAY	OKAY
1	B013	B012	8	PVC	37.39	32.05	74.96	0.0712	0.013	1451	2388	179	OKAY	OKAY	222	OKAY	OKAY	486	OKAY	OKAY
1	B014	B013	12	PVC	36.87	36.54	71.56	0.0046	0.013	1089	3149	175	OKAY	OKAY	218	OKAY	OKAY	480	OKAY	OKAY
1	B015	B014	12	PVC	39.00	36.87	309.26	0.0069	0.013	1330	2267	172	OKAY	OKAY	214	OKAY	OKAY	474	OKAY	OKAY
1	B016	B015	12	PVC	40.03	39.00	271.19	0.0038	0.013	988	1926	168	OKAY	OKAY	209	OKAY	OKAY	468	OKAY	OKAY
1	B017	B016	12	PVC	41.63	40.03	399.25	0.0040	0.013	1015	1786	164	OKAY	OKAY	205	OKAY	OKAY	463	OKAY	OKAY
1	B018	B017	12	PVC	42.27	41.63	169.66	0.0038	0.013	985	2212	160	OKAY	OKAY	201	OKAY	OKAY	457	OKAY	OKAY
1	B019	B018	12	PVC	43.03	42.27	178.28	0.0043	0.013	1047	2237	156	OKAY	OKAY	196	OKAY	OKAY	451	OKAY	OKAY
1	B020	B019	12	PVC	44.80	43.03	369.99	0.0048	0.013	1109	1926	150	OKAY	OKAY	190	OKAY	OKAY	442	OKAY	OKAY
1	B021	B020	12	PVC	46.23	44.80	366.34	0.0039	0.013	1002	1804	148	OKAY	OKAY	189	OKAY	OKAY	440	OKAY	OKAY
1	B022	B021	12	PVC	48.26	46.23	251.79	0.0081	0.013	1439	2490	147	OKAY	OKAY	187	OKAY	OKAY	437	OKAY	OKAY
1	B023	B022	12	PVC	48.41	48.26	322.97	0.0005	0.013	345	1289	145	OKAY	OKAY	184	OKAY	OKAY	434	DEFICIENT	OKAY
1	B024	B023	12	PVC	49.87	48.41	219.52	0.0067	0.013	1307	2396	142	OKAY	OKAY	182	OKAY	OKAY	431	OKAY	OKAY
1	B025	B024	12	PVC	59.41	49.87	399.75	0.0239	0.013	2477	3804	137	OKAY	OKAY	177	OKAY	OKAY	423	OKAY	OKAY
1	B026	B025	12	PVC	62.14	59.41	381.56	0.0072	0.013	1356	2225	133	OKAY	OKAY	172	OKAY	OKAY	417	OKAY	OKAY
1	B027	B026	12	PVC	65.80	62.14	44.69	0.0819	0.013	4588	7999	128	OKAY	OKAY	167	OKAY	OKAY	410	OKAY	OKAY
1	B028	B027	12	PVC	68.80	65.80	401.04	0.0075	0.013	1387	2249	124	OKAY	OKAY	162	OKAY	OKAY	403	OKAY	OKAY
1	B029	B028	12	PVC	75.65	68.80	223.03	0.0307	0.013	2810	4447	119	OKAY	OKAY	157	OKAY	OKAY	396	OKAY	OKAY
1	B030	B029	12	PVC	80.92	75.65	43.94	0.1199	0.013	5552	9477	115	OKAY	OKAY	152	OKAY	OKAY	390	OKAY	OKAY
1	B031	B030	12	PVC	109.98	80.92	187.88	0.1547	0.013	6305	10082	110	OKAY	OKAY	147	OKAY	OKAY	383	OKAY	OKAY
1	RH100	B031	20	DI	118.52	109.98	81.18	0.1052	0.013	20304	31496	106	OKAY	OKAY	143	OKAY	OKAY	376	OKAY	OKAY
1	B033	B032	10	PVC	34.50	33.27	72.64	0.0169	0.013	1283	2452	518	OKAY	OKAY	536	OKAY	OKAY	669	OKAY	OKAY
1	B034	B033	10	PVC	35.31	34.50	178.64	0.0045	0.013	664	1333	513	OKAY	OKAY	530	OKAY	OKAY	661	OKAY	OKAY
1	B035	B034	10	PVC	36.15	35.31	298.38	0.0028	0.013	523	1020	500	OKAY	OKAY	517	OKAY	OKAY	642	DEFICIENT	OKAY
1	B036	B035	10	PVC	37.80	36.15	358.81	0.0046	0.013	669	1143	484	OKAY	OKAY	500	OKAY	OKAY	619	OKAY	OKAY
1	B037	B036	10	PVC	37.92	37.80	105.71	0.0011	0.013	332	1319	472	DEFICIENT	OKAY	487	DEFICIENT	OKAY	601	DEFICIENT	OKAY
1	B049	B048	8	PVC	22.99	20.40	357.49	0.0072	0.013	463	737	27	OKAY	OKAY	29	OKAY	OKAY	41	OKAY	OKAY
1	B061	B060	10	PVC	22.07	20.47	170.86	0.0094	0.013	954	1688	223	OKAY	OKAY	235	OKAY	OKAY	328	OKAY	OKAY
1	B064A	B061	10	PVC	22.87	22.07	227.96	0.0035	0.013	584	1165	209	OKAY	OKAY	220	OKAY	OKAY	306	OKAY	OKAY
1	B073	B064	8	PVC	24.08	23.80	76.42	0.0037	0.013	329	871	149	OKAY	OKAY	155	OKAY	OKAY	217	OKAY	OKAY
1	B074	B073	8	PVC	25.61	0.00	402.40	0.0636	0.013	1372	2138	145	OKAY	OKAY	151	OKAY	OKAY	211	OKAY	OKAY
1	B075	B074	8	PVC	26.46	25.61	243.18	0.0035	0.013	321	601	141	OKAY	OKAY	147	OKAY	OKAY	206	OKAY	OKAY

City of Monroe
General Sewer Plan
Hydraulic Model
Prepared by: Preston Love
Reviewed by: Adam Schuyler/Peter Cunningham
13 February 2015
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LEGEND

Abbr.	Basin
B	Beaton
C	Cate's
E	Eastside
F	Fyelands
MH	Milwaukee Hill
RH	Reservoir Hill
S	Sawyer
SF	South Fryeland
SC	State Corrections
VN	Valley View North
VS	Valley View South
WM	West Main
WC	Woods Creek

C_{DIP} = 130
$C_{CONC/RCP}$ = 100
C_{PVC} = 140
C_{CLAY} = 110

Assumptions:
1) Manning's 'n' values: All 0.013 (ORANGE BOOK). However, actual values are: 0.01 (PVC pipe), 0.014 (clay), 0.012 (DI), 0.015 (concrete)
2) Where no pipe type is given, PVC is assumed
3) hL equal to one pipe diameter above upstream crown minus downstream crown

OK for 2015 Flow at d/D = 1?	OK for 2015 Flow at d/D = 2?	OK for 2021 Flow at d/D = 1?	OK for 2021 Flow at d/D = 2?	OK for B/O Flow at d/D = 1?	OK for B/O Flow at d/D = 2?
DEFICIENT	DEFICIENT	DEFICIENT	DEFICIENT	DEFICIENT	DEFICIENT
11	3	12	3	22	5

PIPE ID	MH UP	MH DOWN	DIA. (IN)	PIPE MATERIAL	IE IN	IE OUT	LENGTH (ft)	Slope "S"	Manning's "n"	100% Capacity (gpm)	200% Capacity (gpm)	2015 Peak Hour Flow (gpm)	OK for 2015 Flow at d/D = 1?	OK for 2015 Flow at d/D = 2?	Projected 2021 Peak Hour Flow (gpm)	OK for 2021 Flow at d/D = 1?	OK for 2021 Flow at d/D = 2?	Projected B/O Peak Hour Flow (gpm)	OK for B/O Flow at d/D = 1?	OK for B/O Flow at d/D = 2?
1	B079	B075	8	PVC	26.86	26.46	74.45	0.0054	0.013	399	942	130	OKAY	OKAY	135	OKAY	OKAY	189	OKAY	OKAY
1	B080	B079	8	PVC	27.98	26.86	289.57	0.0039	0.013	338	597	82	OKAY	OKAY	86	OKAY	OKAY	120	OKAY	OKAY
1	B081	B080	8	PVC	28.67	27.98	167.95	0.0041	0.013	349	691	64	OKAY	OKAY	67	OKAY	OKAY	94	OKAY	OKAY
1	B082	B081	8	PVC	29.39	28.67	154.52	0.0047	0.013	371	731	61	OKAY	OKAY	64	OKAY	OKAY	89	OKAY	OKAY
1	B001	Valley View PS	18	PVC	32.10	32.03	98.14	0.0007	0.013	1262	8435	2,410	DEFICIENT	OKAY	2,633	DEFICIENT	OKAY	4,444	DEFICIENT	OKAY
1	VN002	B115	12	PVC	34.36	33.21	197.00	0.0058	0.013	1225	2362	455	OKAY	OKAY	494	OKAY	OKAY	909	OKAY	OKAY
1	B054	B120	8	PVC	21.27	19.95	329.01	0.0040	0.013	344	590	30	OKAY	OKAY	33	OKAY	OKAY	45	OKAY	OKAY
1	B064	B122	10	PVC	23.80	0.00	310.97	0.0765	0.013	2727	4268	202	OKAY	OKAY	213	OKAY	OKAY	296	OKAY	OKAY
1	B048	B123	8	PVC	20.40	0.00	360.99	0.0565	0.013	1293	2012	35	OKAY	OKAY	38	OKAY	OKAY	53	OKAY	OKAY
1	B060	Beaton PS	10	PVC	20.47	14.12	293.89	0.0216	0.013	1449	2261	229	OKAY	OKAY	243	OKAY	OKAY	338	OKAY	OKAY
1	B054A	Beaton PS	8	PVC	20.33	18.85	153.19	0.0097	0.013	534	931	35	OKAY	OKAY	38	OKAY	OKAY	52	OKAY	OKAY
1	B048A	Beaton PS	8	PVC	20.40	18.85	32.47	0.0477	0.013	1188	2190	47	OKAY	OKAY	51	OKAY	OKAY	70	OKAY	OKAY
1	E001	WWTP	30	RCP	52.00	51.50	65.00	0.0077	0.013	16188	40941	5,000	OKAY	OKAY	5,457	OKAY	OKAY	8,904	OKAY	OKAY
1	E002	E001	20	DI	45.77	39.08	48.00	0.1394	0.013	23371	37553	967	OKAY	OKAY	1,072	OKAY	OKAY	1,864	OKAY	OKAY
1	E003	E002	18	CLAY	46.25	45.87	79.52	0.0048	0.013	3268	8186	810	OKAY	OKAY	909	OKAY	OKAY	1,652	OKAY	OKAY
1	E004	E003	16	CLAY	46.70	46.30	83.00	0.0048	0.013	2397	5616	810	OKAY	OKAY	909	OKAY	OKAY	1,652	OKAY	OKAY
1	E005	E004	8	CLAY	59.61	47.15	406.46	0.0307	0.013	952	1148	50	OKAY	OKAY	52	OKAY	OKAY	64	OKAY	OKAY
1	E014	E013	24	PVC	46.30	45.9	362.48	0.0011	0.013	3382	11158	751	OKAY	OKAY	848	OKAY	OKAY	1,576	OKAY	OKAY
1	E015	E014	24	PVC	46.60	46.4	193.87	0.0010	0.013	3269	14930	745	OKAY	OKAY	842	OKAY	OKAY	1,569	OKAY	OKAY
1	E016	E015	24	PVC	47.09	46.7	14.87	0.0262	0.013	16484	62559	690	OKAY	OKAY	786	OKAY	OKAY	1,498	OKAY	OKAY
1	E135	E015	8	PVC	47.18	47.1	31.66	0.0025	0.013	273	1233	46	OKAY	OKAY	47	OKAY	OKAY	60	OKAY	OKAY
1	E017	E016	24	PVC	48.13	47.74	390.39	0.0010	0.013	3217	10695	690	OKAY	OKAY	786	OKAY	OKAY	1,498	OKAY	OKAY
1	E018	E017	24	PVC	48.49	48.23	247.33	0.0011	0.013	3300	13280	687	OKAY	OKAY	782	OKAY	OKAY	1,493	OKAY	OKAY
1	E019	E018	24	PVC	49.05	48.59	468.36	0.0010	0.013	3190	9845	618	OKAY	OKAY	707	OKAY	OKAY	1,383	OKAY	OKAY
1	E084	E018	10	CLAY	55.69	54.64	175.11	0.0060	0.013	763	1140	17	OKAY	OKAY	18	OKAY	OKAY	22	OKAY	OKAY
1	E085	E018	10	CLAY	56.95	50.69	149.24	0.0419	0.013	2019	2545	48	OKAY	OKAY	54	OKAY	OKAY	83	OKAY	OKAY
1	E020	E019	24	PVC	50.21	50.12	15.00	0.0060	0.013	7885	57915	618	OKAY	OKAY	707	OKAY	OKAY	1,383	OKAY	OKAY
1	E021	E020	24	PVC	52.95	51.97	264.86	0.0037	0.013	6192	14861	608	OKAY	OKAY	698	OKAY	OKAY	1,372	OKAY	OKAY
1	E022	E021	24	PVC	52.65	52.22	461.28	0.0009	0.013	3108	9861	604	OKAY	OKAY	693	OKAY	OKAY	1,365	OKAY	OKAY
1	E053	E054	24	CLAY	52.79	52.75	31.22	0.0013	0.013	3644	30223	544	OKAY	OKAY	625	OKAY	OKAY	1,256	OKAY	OKAY
1	E072-B	E023	8	PVC	53.96	53.86	9.02	0.0111	0.013	573	2466	132	OKAY	OKAY	144	OKAY	OKAY	211	OKAY	OKAY
1	E026	E027	10	CONC	55.54	55.13	145.72	0.0028	0.013	523	914	31	OKAY	OKAY	32	OKAY	OKAY	41	OKAY	OKAY
1	E038	E040	8	PVC	56.30	55.32	185.72	0.0053	0.013	395	727	19	OKAY	OKAY	22	OKAY	OKAY	34	OKAY	OKAY
1	E041	E040	8	CLAY	55.42	55.02	180.73	0.0022	0.013	256	458	28	OKAY	OKAY	32	OKAY	OKAY	53	OKAY	OKAY
1	E044	E041	8	CLAY	56.40	55.47	380.86	0.0024	0.013	269	381	16	OKAY	OKAY	19	OKAY	OKAY	32	OKAY	OKAY
1	E045	E044	8	CLAY	58.03	56.45	403.27	0.0039	0.013	340	444	5	OKAY	OKAY	6	OKAY	OKAY	11	OKAY	OKAY
1	E046	E045	8	CLAY	58.61	58.28	190.30	0.0017	0.013	226	430	3	OKAY	OKAY	4	OKAY	OKAY	7	OKAY	OKAY
1	E030	E047	24	DI	57.75	56.69	116.86	0.0091	0.013	9695	21786	373	OKAY	OKAY	436	OKAY	OKAY	967	OKAY	OKAY
1	E047	E048	24	PVC	56.69	56.6	83.21	0.0011	0.013	3348	22940	374	OKAY	OKAY	437	OKAY	OKAY	970	OKAY	OKAY
1	E048	E049	24	PVC	57.34	57.04	210.55	0.0014	0.013	3842	14626	376	OKAY	OKAY	439	OKAY	OKAY	973	OKAY	OKAY
1	E049	E050	24	PVC	57.04	56.57	365.00	0.0013	0.013	3653	11290	381	OKAY	OKAY	445	OKAY	OKAY	982	OKAY	OKAY
1	E050	E051	24	PVC	56.57	56.01	400.00	0.0014	0.013	3809	10955	387	OKAY	OKAY	452	OKAY	OKAY	996	OKAY	OKAY
1	E051	E052	24	PVC	55.17	54.83	356.40	0.0010	0.013	3144	11107	397	OKAY	OKAY	464	OKAY	OKAY	1,016	OKAY	OKAY
1	E052	E053	24	PVC	55.57	53.23	363.04	0.0064	0.013	8173	15356	405	OKAY	OKAY	473	OKAY	OKAY	1,032	OKAY	OKAY
1	E056	E054	10	CLAY	55.17	54.90	136.68	0.0020	0.013	438	976	132	OKAY	OKAY	144	OKAY	OKAY	211	OKAY	OKAY
1	E057	E056	10	CLAY	55.86	55.17	169.98	0.0041	0.013	628	1033	123	OKAY	OKAY	134	OKAY	OKAY	195	OKAY	OKAY

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2) Where no pipe type is given, PVC is assumed
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	OK for 2015 Flow at d/D = 1?	OK for 2015 Flow at d/D = 2?	OK for 2021 Flow at d/D = 1?	OK for 2021 Flow at d/D = 2?	OK for B/O Flow at d/D = 1?	OK for B/O Flow at d/D = 2?
DEFICIENT	11	3	12	3	22	5

PIPE ID	MH UP	MH DOWN	DIA. (IN)	PIPE MATERIAL	IE IN	IE OUT	LENGTH (ft)	Slope "S"	Manning's "n"	100% Capacity (gpm)	200% Capacity (gpm)	2015 Peak Hour Flow (gpm)	OK for 2015 Flow at d/D = 1?	OK for 2015 Flow at d/D = 2?	Projected 2021 Peak Hour Flow (gpm)	OK for 2021 Flow at d/D = 1?	OK for 2021 Flow at d/D = 2?	Projected B/O Peak Hour Flow (gpm)	OK for B/O Flow at d/D = 1?	OK for B/O Flow at d/D = 2?
1	E058	E057	10	CLAY	56.21	55.86	160.47	0.0022	0.013	460	929	119	OKAY	OKAY	129	OKAY	OKAY	189	OKAY	OKAY
1	E059	E058	10	CLAY	56.73	56.36	20.34	0.0182	0.013	1330	2864	119	OKAY	OKAY	129	OKAY	OKAY	189	OKAY	OKAY
1	E060	E059	10	CLAY	58.26	56.93	407.71	0.0033	0.013	563	778	100	OKAY	OKAY	109	OKAY	OKAY	162	OKAY	OKAY
1	E061	E060	10	CLAY	59.32	59.24	176.74	0.0005	0.013	210	767	84	OKAY	OKAY	92	OKAY	OKAY	138	OKAY	OKAY
1	E063	E062	8	CLAY	59.67	59.42	22.52	0.0111	0.013	573	1301	9	OKAY	OKAY	10	OKAY	OKAY	15	OKAY	OKAY
1	E062	E061	8	CLAY	59.67	59.42	179.41	0.0014	0.013	203	424	11	OKAY	OKAY	12	OKAY	OKAY	18	OKAY	OKAY
1	E072	E061	8	CLAY	60.40	59.82	296.56	0.0020	0.013	240	381	71	OKAY	OKAY	77	OKAY	OKAY	114	OKAY	OKAY
1	E064	E063	8	CLAY	61.38	59.52	140.39	0.0132	0.013	626	837	8	OKAY	OKAY	9	OKAY	OKAY	13	OKAY	OKAY
1	E087	E086	8	CLAY	64.06	63.46	154.19	0.0039	0.013	339	548	22	OKAY	OKAY	23	OKAY	OKAY	30	OKAY	OKAY
1	E085-A	E084	8	CLAY	62.24	60.40	461.54	0.0040	0.013	343	438	36	OKAY	OKAY	38	OKAY	OKAY	53	OKAY	OKAY
1	E083	E084	10	CLAY	56.46	55.69	216.10	0.0036	0.013	588	932	15	OKAY	OKAY	16	OKAY	OKAY	20	OKAY	OKAY
1	E051-A	E098	8	CLAY	55.53	54.05	226.62	0.0065	0.013	439	592	41	OKAY	OKAY	47	OKAY	OKAY	74	OKAY	OKAY
1	E098	E049	10	CLAY	54.05	50.59	306.88	0.0113	0.013	1047	1314	43	OKAY	OKAY	48	OKAY	OKAY	76	OKAY	OKAY
1	E105	E106	10	CLAY	49.51	48.62	338.80	0.0026	0.013	505	760	109	OKAY	OKAY	114	OKAY	OKAY	150	OKAY	OKAY
1	E106	E109	10	CLAY	48.62	48.50	233.98	0.0005	0.013	223	674	130	OKAY	OKAY	136	OKAY	OKAY	177	OKAY	OKAY
1	E109-A	E105	10	CLAY	50.40	49.51	296.14	0.0030	0.013	540	818	99	OKAY	OKAY	103	OKAY	OKAY	136	OKAY	OKAY
1	E109	E110	10	CLAY	48.50	47.54	179.99	0.0053	0.013	720	1094	134	OKAY	OKAY	139	OKAY	OKAY	182	OKAY	OKAY
1	E110	E111	10	CLAY	47.54	46.78	263.60	0.0029	0.013	529	835	145	OKAY	OKAY	151	OKAY	OKAY	197	OKAY	OKAY
1	E111	E109	10	CLAY	51.02	50.40	261.68	0.0024	0.013	480	797	92	OKAY	OKAY	96	OKAY	OKAY	127	OKAY	OKAY
1	E111-A	E109-A	10	CLAY	46.78	46.18	165.95	0.0036	0.013	593	1012	157	OKAY	OKAY	163	OKAY	OKAY	211	OKAY	OKAY
1	E115	E111	10	CLAY	51.57	51.02	303.09	0.0018	0.013	420	717	89	OKAY	OKAY	94	OKAY	OKAY	124	OKAY	OKAY
1	E116	E115	10	CLAY	51.92	51.57	233.13	0.0015	0.013	382	759	82	OKAY	OKAY	85	OKAY	OKAY	113	OKAY	OKAY
1	E117	E116	10	CLAY	52.44	51.92	242.98	0.0021	0.013	456	799	77	OKAY	OKAY	81	OKAY	OKAY	107	OKAY	OKAY
1	E117-A	E116	8	CLAY	58.28	57.68	169.73	0.0035	0.013	323	520	24	OKAY	OKAY	25	OKAY	OKAY	32	OKAY	OKAY
1	E119	E120	8	CLAY	57.68	56.30	339.47	0.0041	0.013	347	463	33	OKAY	OKAY	35	OKAY	OKAY	44	OKAY	OKAY
1	E120-A	E117-A	8	CLAY	56.25	55.70	197.60	0.0028	0.013	287	469	40	OKAY	OKAY	42	OKAY	OKAY	53	OKAY	OKAY
1	E120	E117	10	CLAY	53.37	52.44	154.30	0.0060	0.013	765	1178	72	OKAY	OKAY	75	OKAY	OKAY	99	OKAY	OKAY
1	E121	E122	8	CLAY	55.77	55.29	21.60	0.0222	0.013	811	1502	40	OKAY	OKAY	42	OKAY	OKAY	53	OKAY	OKAY
1	E122-A	E120-A	10	CLAY	55.39	48.02	147.95	0.0498	0.013	2200	2766	46	OKAY	OKAY	47	OKAY	OKAY	60	OKAY	OKAY
1	E122	E120	8	CLAY	55.13	53.73	501.41	0.0028	0.013	287	377	63	OKAY	OKAY	66	OKAY	OKAY	87	OKAY	OKAY
1	F001	Fryelands PS	12	CLAY	13.67	13.57	58.333	0.0017	0.013	664	2494	300	OKAY	OKAY	319	OKAY	OKAY	436	OKAY	OKAY
1	F002	F001	12	PVC	14.23	13.77	175.08	0.0026	0.013	822	2042	300	OKAY	OKAY	319	OKAY	OKAY	436	OKAY	OKAY
1	F003	F002	12	PVC	15.16	14.23	234.78	0.0040	0.013	1009	2026	293	OKAY	OKAY	311	OKAY	OKAY	426	OKAY	OKAY
1	F004	F003	12	PVC	15.93	15.16	301.69	0.0026	0.013	810	1688	285	OKAY	OKAY	303	OKAY	OKAY	417	OKAY	OKAY
1	F005	F004	12	PVC	17.02	15.93	319.00	0.0034	0.013	937	1792	277	OKAY	OKAY	295	OKAY	OKAY	407	OKAY	OKAY
1	F006	F005	12	PVC	18.00	17.02	300.92	0.0033	0.013	915	1796	253	OKAY	OKAY	271	OKAY	OKAY	378	OKAY	OKAY
1	F007	F006	12	PVC	19.07	18.00	348.56	0.0031	0.013	888	1700	245	OKAY	OKAY	263	OKAY	OKAY	369	OKAY	OKAY
1	F008	F007	12	PVC	20.05	19.07	300.30	0.0033	0.013	916	1798	237	OKAY	OKAY	254	OKAY	OKAY	359	OKAY	OKAY
1	F009	F008	12	PVC	20.68	20.05	170.68	0.0037	0.013	974	2197	230	OKAY	OKAY	246	OKAY	OKAY	349	OKAY	OKAY
1	F010	F009	12	PVC	21.38	20.68	201.33	0.0035	0.013	945	2056	222	OKAY	OKAY	238	OKAY	OKAY	340	OKAY	OKAY
1	F011	F010	12	PVC	22.41	21.38	394.67	0.0026	0.013	819	1573	214	OKAY	OKAY	230	OKAY	OKAY	330	OKAY	OKAY
1	F012	F011	12	PVC	23.95	22.41	310.68	0.0050	0.013	1129	2020	190	OKAY	OKAY	206	OKAY	OKAY	301	OKAY	OKAY
1	F013	F012	12	PVC	24.67	23.95	127.03	0.0057	0.013	1207	2654	182	OKAY	OKAY	198	OKAY	OKAY	292	OKAY	OKAY
1	F014	F013	12	PVC	25.94	24.57	443.38	0.0031	0.013	891	1606	175	OKAY	OKAY	189	OKAY	OKAY	282	OKAY	OKAY
1	F015	F014	12	PVC	27.18	25.94	385.51	0.0032	0.013	909	1680	167	OKAY	OKAY	181	OKAY	OKAY	272	OKAY	OKAY
1	F017	F015	12	PVC	28.03	27.18	250.94	0.0034	0.013	933	1910	156	OKAY	OKAY	170	OKAY	OKAY	259	OKAY	OKAY

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Prepared by: Preston Love
Reviewed by: Adam Schuyler/Peter Cunningham
13 February 2015
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LEGEND

Abbr.	Basin
B	Beaton
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E	Eastside
F	Fyelands
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RH	Reservoir Hill
S	Sawyer
SF	South Fryeland
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VN	Valley View North
VS	Valley View South
WM	West Main
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C_{DIP} = 130
$C_{CONC/RCP}$ = 100
C_{PVC} = 140
C_{CLAY} = 110

Assumptions:
1) Manning's 'n' values: All 0.013 (ORANGE BOOK). However, actual values are: 0.01 (PVC pipe), 0.014 (clay), 0.012 (DI), 0.015 (concrete)
2) Where no pipe type is given, PVC is assumed
3) hL equal to one pipe diameter above upstream crown minus downstream crown

OK for 2015 Flow at d/D = 1?	OK for 2015 Flow at d/D = 2?	OK for 2021 Flow at d/D = 1?	OK for 2021 Flow at d/D = 2?	OK for B/O Flow at d/D = 1?	OK for B/O Flow at d/D = 2?
DEFICIENT	DEFICIENT	DEFICIENT	DEFICIENT	DEFICIENT	DEFICIENT
11	3	12	3	22	5

PIPE ID	MH UP	MH DOWN	DIA. (IN)	PIPE MATERIAL	IE IN	IE OUT	LENGTH (ft)	Slope "S"	Manning's "n"	100% Capacity (gpm)	200% Capacity (gpm)	2015 Peak Hour Flow (gpm)	OK for 2015 Flow at d/D = 1?	OK for 2015 Flow at d/D = 2?	Projected 2021 Peak Hour Flow (gpm)	OK for 2021 Flow at d/D = 1?	OK for 2021 Flow at d/D = 2?	Projected B/O Peak Hour Flow (gpm)	OK for B/O Flow at d/D = 1?	OK for B/O Flow at d/D = 2?
1	F018	F017	12	PVC	28.71	28.13	191.54	0.0030	0.013	882	2030	156	OKAY	OKAY	170	OKAY	OKAY	259	OKAY	OKAY
1	F019	F018	12	PVC	29.26	28.71	181.42	0.0030	0.013	883	2069	154	OKAY	OKAY	168	OKAY	OKAY	257	OKAY	OKAY
1	F078-B	F077	8	PVC	15.25	14.49	232.58	0.0033	0.013	311	595	389	DEFICIENT	OKAY	419	DEFICIENT	OKAY	607	DEFICIENT	DEFICIENT
1	F077	Fryelands PS	8	PVC	14.50	13.48	254.49	0.0040	0.013	344	621	389	DEFICIENT	OKAY	419	DEFICIENT	OKAY	607	DEFICIENT	OKAY
1	F081	F078	8	PVC	17.03	15.25	375.29	0.0047	0.013	374	615	228	OKAY	OKAY	243	OKAY	OKAY	338	OKAY	OKAY
1	F114	F078	8	PVC	16.39	15.25	294.35	0.0039	0.013	338	596	151	OKAY	OKAY	165	OKAY	OKAY	253	OKAY	OKAY
1	F083	F081	8	PVC	17.13	17.03	299.30	0.0003	0.013	99	371	219	DEFICIENT	OKAY	233	DEFICIENT	OKAY	322	DEFICIENT	OKAY
1	F084	F083	8	PVC	21.07	0.00	321.67	0.0655	0.013	1392	2178	215	OKAY	OKAY	230	OKAY	OKAY	317	OKAY	OKAY
1	F090	F084	8	PVC	23.32	21.07	370.25	0.0061	0.013	424	682	96	OKAY	OKAY	105	OKAY	OKAY	161	OKAY	OKAY
1	F149	F084	8	PVC	23.58	21.07	275.89	0.0091	0.013	519	837	106	OKAY	OKAY	110	OKAY	OKAY	135	OKAY	OKAY
1	F093	F090	8	PVC	25.04	23.32	332.99	0.0052	0.013	391	648	87	OKAY	OKAY	95	OKAY	OKAY	145	OKAY	OKAY
1	F094	F093	8	PVC	25.90	25.50	79.18	0.0051	0.013	386	911	84	OKAY	OKAY	91	OKAY	OKAY	140	OKAY	OKAY
1	F095	F094	8	PVC	26.33	25.90	90.98	0.0047	0.013	374	858	80	OKAY	OKAY	88	OKAY	OKAY	134	OKAY	OKAY
1	F098	F095	8	PVC	28.05	26.33	355.59	0.0048	0.013	378	625	71	OKAY	OKAY	77	OKAY	OKAY	118	OKAY	OKAY
1	F100	F098	8	PVC	29.75	28.05	350.65	0.0048	0.013	379	627	65	OKAY	OKAY	71	OKAY	OKAY	108	OKAY	OKAY
1	F103	F100	8	PVC	30.31	29.75	178.15	0.0031	0.013	305	634	55	OKAY	OKAY	60	OKAY	OKAY	92	OKAY	OKAY
1	F104	F103	10	PVC	31.16	30.81	172.20	0.0020	0.013	444	1139	52	OKAY	OKAY	57	OKAY	OKAY	87	OKAY	OKAY
1	F105	F104	8	PVC	31.97	31.16	314.81	0.0026	0.013	276	515	44	OKAY	OKAY	49	OKAY	OKAY	74	OKAY	OKAY
1	F106	F105	10	PVC	32.81	31.97	318.98	0.0026	0.013	506	984	37	OKAY	OKAY	40	OKAY	OKAY	62	OKAY	OKAY
1	F110	F106	10	PVC	33.43	32.81	249.67	0.0025	0.013	491	1041	23	OKAY	OKAY	25	OKAY	OKAY	38	OKAY	OKAY
1	F111	F110	10	PVC	33.84	33.43	138.57	0.0030	0.013	536	1315	19	OKAY	OKAY	21	OKAY	OKAY	32	OKAY	OKAY
1	F111-B	F111	10	PVC	34.52	33.04	238.33	0.0062	0.013	777	1372	13	OKAY	OKAY	14	OKAY	OKAY	22	OKAY	OKAY
1	F119	F114	8	PVC	17.97	16.39	290.76	0.0054	0.013	401	675	135	OKAY	OKAY	148	OKAY	OKAY	226	OKAY	OKAY
1	F121	F119	8	PVC	19.53	17.97	292.44	0.0053	0.013	397	669	129	OKAY	OKAY	141	OKAY	OKAY	216	OKAY	OKAY
1	F123	F121	8	PVC	19.95	19.53	71.89	0.0058	0.013	416	970	123	OKAY	OKAY	134	OKAY	OKAY	205	OKAY	OKAY
1	F124	F123	8	PVC	21.37	19.95	186.80	0.0076	0.013	474	823	120	OKAY	OKAY	131	OKAY	OKAY	200	OKAY	OKAY
1	F126	F125	8	PVC	23.48	21.90	397.39	0.0040	0.013	343	570	107	OKAY	OKAY	117	OKAY	OKAY	178	OKAY	OKAY
1	F152	F151	8	PVC	27.94	26.45	276.42	0.0054	0.013	399	678	68	OKAY	OKAY	69	OKAY	OKAY	72	OKAY	OKAY
1	F151	F150	8	PVC	26.45	25.20	242.39	0.0052	0.013	390	683	78	OKAY	OKAY	79	OKAY	OKAY	87	OKAY	OKAY
1	F150	F149	8	PVC	25.20	23.58	275.37	0.0059	0.013	417	701	87	OKAY	OKAY	90	OKAY	OKAY	103	OKAY	OKAY
1	VS018	VS013	10	PVC	43.62	42.89	150.48	0.0049	0.013	687	1424	147	OKAY	OKAY	165	OKAY	OKAY	315	OKAY	OKAY
1	RH002	RH001	8	PVC	183.59	182.42	139.71	0.0084	0.013	498	899	44	OKAY	OKAY	59	OKAY	OKAY	158	OKAY	OKAY
1	RH003	RH002	8	PVC	187.78	183.82	111.78	0.0354	0.013	1023	1671	43	OKAY	OKAY	58	OKAY	OKAY	153	OKAY	OKAY
1	RH004	RH003	8	PVC	202.71	188.01	196.20	0.0749	0.013	1488	2359	42	OKAY	OKAY	56	OKAY	OKAY	149	OKAY	OKAY
1	RH011	RH004	8	PVC	212.74	211.23	305.33	0.0049	0.013	382	646	32	OKAY	OKAY	43	OKAY	OKAY	114	OKAY	OKAY
1	RH013	RH011	8	PVC	228.93	219.90	216.12	0.0418	0.013	1111	1746	30	OKAY	OKAY	40	OKAY	OKAY	106	OKAY	OKAY
1	RH014	RH013	8	PVC	224.60	224.07	112.36	0.0047	0.013	373	802	29	OKAY	OKAY	39	OKAY	OKAY	102	OKAY	OKAY
1	RH016	RH014	8	PVC	227.15	224.69	251.54	0.0098	0.013	538	872	28	OKAY	OKAY	37	OKAY	OKAY	98	OKAY	OKAY
1	RH104	RH103	8	PVC	187.33	184.65	129.52	0.0207	0.013	782	1295	17	OKAY	OKAY	23	OKAY	OKAY	60	OKAY	OKAY
1	RH105	RH103	15	PVC	208.87	184.65	206.97	0.1170	0.013	9944	15733	35	OKAY	OKAY	48	OKAY	OKAY	126	OKAY	OKAY
1	RH101	RH100	20	DI	142.60	118.52	367.20	0.0656	0.013	16031	22970	106	OKAY	OKAY	142	OKAY	OKAY	376	OKAY	OKAY
1	RH102	RH101	20	DI	171.24	142.60	103.07	0.2779	0.013	32999	49852	106	OKAY	OKAY	142	OKAY	OKAY	376	OKAY	OKAY
1	RH103	RH102	12	PVC	184.65	171.24	345.91	0.0388	0.013	3157	4871	53	OKAY	OKAY	72	OKAY	OKAY	190	OKAY	OKAY
1	RH106	RH102	8	DI	174.23	171.24	148.33	0.0202	0.013	772	1173	44	OKAY	OKAY	59	OKAY	OKAY	156	OKAY	OKAY
1	RH107	RH106	8	PVC	191.12	174.23	389.97	0.0433	0.013	1132	1749	42	OKAY	OKAY	57	OKAY	OKAY	151	OKAY	OKAY
1	RH108	RH107	8	PVC	202.43	191.12	265.34	0.0426	0.013	1123	1751	31	OKAY	OKAY	42	OKAY	OKAY	110	OKAY	OKAY

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2) Where no pipe type is given, PVC is assumed
3) hL equal to one pipe diameter above upstream crown minus downstream crown

	OK for 2015 Flow at d/D = 1?	OK for 2015 Flow at d/D = 2?	OK for 2021 Flow at d/D = 1?	OK for 2021 Flow at d/D = 2?	OK for B/O Flow at d/D = 1?	OK for B/O Flow at d/D = 2?
DEFICIENT	11	3	12	3	22	5

PIPE ID	MH UP	MH DOWN	DIA. (IN)	PIPE MATERIAL	IE IN	IE OUT	LENGTH (ft)	Slope "S"	Manning's "n"	100% Capacity (gpm)	200% Capacity (gpm)	2015 Peak Hour Flow (gpm)	OK for 2015 Flow at d/D = 1?	OK for 2015 Flow at d/D = 2?	Projected 2021 Peak Hour Flow (gpm)	OK for 2021 Flow at d/D = 1?	OK for 2021 Flow at d/D = 2?	Projected B/O Peak Hour Flow (gpm)	OK for B/O Flow at d/D = 1?	OK for B/O Flow at d/D = 2?
1	RH109	RH108	8	PVC	204.70	202.43	170.04	0.0133	0.013	628	1042	30	OKAY	OKAY	40	OKAY	OKAY	105	OKAY	OKAY
1	RH110	RH109	8	PVC	205.56	204.70	90.29	0.0095	0.013	531	1030	28	OKAY	OKAY	38	OKAY	OKAY	101	OKAY	OKAY
1	RH111	RH110	8	PVC	207.01	205.56	188.23	0.0077	0.013	477	826	27	OKAY	OKAY	36	OKAY	OKAY	96	OKAY	OKAY
1	S001	Sawyer PS	8	PVC	23.38	22.88	88.58	0.0056	0.013	409	900	43	OKAY	OKAY	43	OKAY	OKAY	44	OKAY	OKAY
1	S002	S001	8	PVC	24.56	23.39	334.13	0.0035	0.013	322	561	40	OKAY	OKAY	40	OKAY	OKAY	41	OKAY	OKAY
1	S016	Sawyer PS	8	PVC	24.59	23.38	262.79	0.0046	0.013	369	646	22	OKAY	OKAY	22	OKAY	OKAY	23	OKAY	OKAY
1	SF001	South Fryelands PS	8	PVC	19.10	0.00	18.35	1.0408	0.013	5547	9729	466	OKAY	OKAY	482	OKAY	OKAY	593	OKAY	OKAY
1	SF002	SF001	8	PVC	20.26	19.10	258.16	0.0045	0.013	364	643	267	OKAY	OKAY	278	OKAY	OKAY	349	OKAY	OKAY
1	SF116	SF001	8	PVC	20.25	19.10	195.00	0.0059	0.013	418	746	193	OKAY	OKAY	198	OKAY	OKAY	237	OKAY	OKAY
1	SF003	SF002	8	PVC	20.66	20.26	129.82	0.0031	0.013	302	697	263	OKAY	OKAY	274	OKAY	OKAY	344	DEFICIENT	OKAY
1	SF004	SF003	8	PVC	20.88	20.66	64.73	0.0034	0.013	317	919	259	OKAY	OKAY	269	OKAY	OKAY	339	DEFICIENT	OKAY
1	SF005	SF004	12	PVC	25.49	20.88	258.95	0.0178	0.013	2139	3421	197	OKAY	OKAY	207	OKAY	OKAY	265	OKAY	OKAY
1	SF006	SF005	12	PVC	26.15	25.49	251.99	0.0026	0.013	820	1798	193	OKAY	OKAY	202	OKAY	OKAY	260	OKAY	OKAY
1	SF009	SF007	12	PVC	27.22	26.68	197.53	0.0027	0.013	838	1969	181	OKAY	OKAY	190	OKAY	OKAY	246	OKAY	OKAY
1	SF011	SF009	12	PVC	28.10	27.22	304.67	0.0029	0.013	862	1735	173	OKAY	OKAY	182	OKAY	OKAY	236	OKAY	OKAY
1	SF015	SF011	12	PVC	29.16	28.10	184.16	0.0058	0.013	1216	2393	156	OKAY	OKAY	165	OKAY	OKAY	215	OKAY	OKAY
1	SF016	SF015	12	PVC	32.04	29.16	294.65	0.0098	0.013	1585	2614	151	OKAY	OKAY	160	OKAY	OKAY	208	OKAY	OKAY
1	SF017	SF016	12	PVC	44.22	32.04	305.73	0.0398	0.013	3200	4962	146	OKAY	OKAY	154	OKAY	OKAY	201	OKAY	OKAY
1	SF018	SF017	12	PVC	52.13	44.22	269.04	0.0294	0.013	2749	4303	145	OKAY	OKAY	153	OKAY	OKAY	199	OKAY	OKAY
1	SF049	SF048-B	8	PVC	22.35	21.28	238.88	0.0045	0.013	364	653	99	OKAY	OKAY	101	OKAY	OKAY	120	OKAY	OKAY
1	SF048-B	SF048	8	PVC	21.28	20.25	282.71	0.0036	0.013	328	588	105	OKAY	OKAY	107	OKAY	OKAY	127	OKAY	OKAY
1	SF051	SF050	8	PVC	24.07	23.44	156.87	0.0040	0.013	345	700	91	OKAY	OKAY	93	OKAY	OKAY	110	OKAY	OKAY
1	SF061	SF051	8	PVC	24.89	24.07	157.00	0.0052	0.013	393	753	75	OKAY	OKAY	77	OKAY	OKAY	91	OKAY	OKAY
1	SF062	SF061	8	PVC	26.23	24.89	338.42	0.0040	0.013	342	585	73	OKAY	OKAY	75	OKAY	OKAY	89	OKAY	OKAY
1	SF063	SF062	8	PVC	27.00	26.23	180.30	0.0043	0.013	355	686	68	OKAY	OKAY	69	OKAY	OKAY	82	OKAY	OKAY
1	SF064	SF063	8	PVC	28.43	27.00	283.56	0.0050	0.013	386	659	66	OKAY	OKAY	67	OKAY	OKAY	80	OKAY	OKAY
1	SF081	SF080	10	PVC	25.82	24.82	233.48	0.0043	0.013	645	1224	80	OKAY	OKAY	83	OKAY	OKAY	100	OKAY	OKAY
1	SF096	SF081	10	PVC	26.30	25.82	141.92	0.0034	0.013	573	1337	51	OKAY	OKAY	53	OKAY	OKAY	65	OKAY	OKAY
1	SF099	SF096	10	PVC	27.37	26.30	266.36	0.0040	0.013	625	1163	45	OKAY	OKAY	47	OKAY	OKAY	58	OKAY	OKAY
1	SF100	SF099	10	PVC	28.01	27.47	98.59	0.0055	0.013	730	1668	25	OKAY	OKAY	26	OKAY	OKAY	33	OKAY	OKAY
1	SF050	SF115	8	PVC	23.44	22.35	246.69	0.0044	0.013	361	645	93	OKAY	OKAY	95	OKAY	OKAY	113	OKAY	OKAY
1	SF080	SF116	10	PVC	24.82	20.25	309.14	0.0148	0.013	1199	1886	82	OKAY	OKAY	85	OKAY	OKAY	103	OKAY	OKAY
1	VN003	VN002	12	PVC	36.14	34.36	348.53	0.0051	0.013	1146	1993	451	OKAY	OKAY	490	OKAY	OKAY	898	OKAY	OKAY
1	VN004	VN003	12	PVC	37.98	36.14	358.66	0.0051	0.013	1148	1986	448	OKAY	OKAY	486	OKAY	OKAY	888	OKAY	OKAY
1	VN013	VN004	12	PVC	39.50	38.47	290.81	0.0035	0.013	954	1855	400	OKAY	OKAY	433	OKAY	OKAY	755	OKAY	OKAY
1	VN014	VN013	12	PVC	40.47	39.60	160.86	0.0054	0.013	1179	2444	393	OKAY	OKAY	424	OKAY	OKAY	734	OKAY	OKAY
1	VN022	VN014	12	PVC	41.47	40.57	188.06	0.0048	0.013	1109	2265	375	OKAY	OKAY	405	OKAY	OKAY	685	OKAY	OKAY
1	VN027	VN022	12	PVC	43.74	41.48	435.82	0.0052	0.013	1154	1925	355	OKAY	OKAY	382	OKAY	OKAY	628	OKAY	OKAY
1	VN031	VN027	12	PVC	45.33	43.74	299.03	0.0053	0.013	1169	2084	340	OKAY	OKAY	365	OKAY	OKAY	584	OKAY	OKAY
1	VN032	VN031	12	PVC	46.83	45.33	278.51	0.0054	0.013	1177	2125	331	OKAY	OKAY	355	OKAY	OKAY	559	OKAY	OKAY
1	VN033	VN032	12	PVC	47.43	46.83	102.12	0.0059	0.013	1229	2871	320	OKAY	OKAY	343	OKAY	OKAY	529	OKAY	OKAY
1	VN034	VN033	12	PVC	49.39	47.53	362.88	0.0051	0.013	1148	1981	312	OKAY	OKAY	334	OKAY	OKAY	505	OKAY	OKAY
1	VN035	VN034	12	PVC	51.06	49.49	367.84	0.0043	0.013	1047	1856	303	OKAY	OKAY	324	OKAY	OKAY	480	OKAY	OKAY
1	VN036	VN035	12	PVC	51.40	51.06	51.21	0.0066	0.013	1306	3789	15	OKAY	OKAY	17	OKAY	OKAY	41	OKAY	OKAY
1	VN041	VN035	12	PVC	52.69	51.78	108.79	0.0084	0.013	1466	3054	278	OKAY	OKAY	296	OKAY	OKAY	410	OKAY	OKAY
1	VN037	VN036	12	PVC	51.64	51.40	151.59	0.0016	0.013	638	2021	11	OKAY	OKAY	12	OKAY	OKAY	30	OKAY	OKAY

City of Monroe
General Sewer Plan
Hydraulic Model
Prepared by: Preston Love
Reviewed by: Adam Schuyler/Peter Cunningham
13 February 2015
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LEGEND	
Abbr.	**Basin**
B	Beaton
C	Cate's
E	Eastside
F	Fyelands
MH	Milwaukee Hill
RH	Reservoir Hill
S	Sawyer
SF	South Fryeland
SC	State Corrections
VN	Valley View North
VS	Valley View South
WM	West Main
WC	Woods Creek

C_{DIP} = 130
$C_{CONC/RCP}$ = 100
C_{PVC} = 140
C_{CLAY} = 110

Assumptions:
1) Manning's 'n' values: All 0.013 (ORANGE BOOK). However, actual values are: 0.01 (PVC pipe), 0.014 (clay), 0.012 (DI), 0.015 (concrete)
2) Where no pipe type is given, PVC is assumed
3) hL equal to one pipe diameter above upstream crown minus downstream crown

PIPE ID	MH UP	MH DOWN	DIA. (IN)	PIPE MATERIAL	IE IN	IE OUT	LENGTH (ft)	Slope "S"	Manning's "n"	100% Capacity (gpm)	200% Capacity (gpm)	2015 Peak Hour Flow (gpm)	OK for 2015 Flow at d/D = 1?	OK for 2015 Flow at d/D = 2?	Projected 2021 Peak Hour Flow (gpm)	OK for 2021 Flow at d/D = 1?	OK for 2021 Flow at d/D = 2?	Projected B/O Peak Hour Flow (gpm)	OK for B/O Flow at d/D = 1?	OK for B/O Flow at d/D = 2?
													DEFICIENT	DEFICIENT		DEFICIENT	DEFICIENT		DEFICIENT	DEFICIENT
													11	3		12	3		22	5
1	VN038	VN037	12	PVC	52.56	51.64	319.70	0.0029	0.013	860	1710	7	OKAY	OKAY	7	OKAY	OKAY	19	OKAY	OKAY
1	VN042	VN041	12	DI	52.78	52.69	123.29	0.0007	0.013	433	1957	270	OKAY	OKAY	286	OKAY	OKAY	387	OKAY	OKAY
1	VN044	VN042	12	PVC	53.80	52.78	171.56	0.0059	0.013	1236	2460	265	OKAY	OKAY	281	OKAY	OKAY	382	OKAY	OKAY
1	VN045	VN044	12	PVC	54.63	53.80	95.48	0.0087	0.013	1495	3202	158	OKAY	OKAY	168	OKAY	OKAY	238	OKAY	OKAY
1	VN067	VN044	12	PVC	55.48	53.80	320.94	0.0052	0.013	1160	2043	102	OKAY	OKAY	108	OKAY	OKAY	139	OKAY	OKAY
1	VN051	VN045	12	PVC	55.66	54.87	304.92	0.0026	0.013	816	1689	100	OKAY	OKAY	110	OKAY	OKAY	178	OKAY	OKAY
1	VN052	VN051	12	PVC	56.35	0.00	286.10	0.1970	0.013	7115	11388	81	OKAY	OKAY	91	OKAY	OKAY	158	OKAY	OKAY
1	VN054	VN052	12	PVC	56.95	56.35	320.99	0.0019	0.013	693	1546	47	OKAY	OKAY	57	OKAY	OKAY	123	OKAY	OKAY
1	VN055	VN054	12	PVC	57.05	56.95	152.54	0.0007	0.013	410	1888	39	OKAY	OKAY	49	OKAY	OKAY	114	OKAY	OKAY
1	VN056	VN0555	12	PVC	57.33	57.05	187.62	0.0015	0.013	619	1832	37	OKAY	OKAY	46	OKAY	OKAY	109	OKAY	OKAY
1	VN057	VN056	12	PVC	65.20	0.00	344.86	0.1891	0.013	6971	11125	35	OKAY	OKAY	43	OKAY	OKAY	104	OKAY	OKAY
1	VN068	VN067	12	PVC	57.03	55.34	340.71	0.0050	0.013	1129	1982	99	OKAY	OKAY	105	OKAY	OKAY	136	OKAY	OKAY
1	VN069	VN068	12	PVC	58.16	57.13	386.86	0.0027	0.013	827	1590	96	OKAY	OKAY	102	OKAY	OKAY	133	OKAY	OKAY
1	VN070	VN069	12	PVC	60.77	58.26	325.70	0.0077	0.013	1407	2345	82	OKAY	OKAY	87	OKAY	OKAY	118	OKAY	OKAY
1	VN071	VN070	12	PVC	62.95	0.00	353.81	0.1779	0.013	6762	10769	78	OKAY	OKAY	84	OKAY	OKAY	115	OKAY	OKAY
1	VN072	VN071	8	PVC	73.84	62.95	103.30	0.1054	0.013	1765	2860	55	OKAY	OKAY	61	OKAY	OKAY	91	OKAY	OKAY
1	VS004	VS003	18	PVC	39.06	38.74	246.04	0.0013	0.013	1705	5559	135	OKAY	OKAY	165	OKAY	OKAY	405	OKAY	OKAY
1	VS006	VS005	18	PVC	39.59	39.30	96.49	0.0030	0.013	2591	9138	112	OKAY	OKAY	137	OKAY	OKAY	333	OKAY	OKAY
1	VS007	VS006	18	PVC	39.91	39.59	310.36	0.0010	0.013	1518	4903	104	OKAY	OKAY	127	OKAY	OKAY	308	OKAY	OKAY
1	VS009	VS007	18	PVC	40.26	40.20	38.38	0.0016	0.013	1869	13964	83	OKAY	OKAY	102	OKAY	OKAY	250	OKAY	OKAY
1	VS010	VS007	15	PVC	41.46	39.91	235.17	0.0066	0.013	2360	4452	78	OKAY	OKAY	96	OKAY	OKAY	237	OKAY	OKAY
1	VS011	VS010	15	PVC	41.93	41.46	260.78	0.0018	0.013	1234	3235	73	OKAY	OKAY	90	OKAY	OKAY	225	OKAY	OKAY
1	VS012	VS011	15	PVC	42.40	41.93	281.33	0.0017	0.013	1188	3105	14	OKAY	OKAY	16	OKAY	OKAY	33	OKAY	OKAY
1	VS039	VS011	8	PVC	43.57	41.93	376.37	0.0044	0.013	359	595	51	OKAY	OKAY	64	OKAY	OKAY	170	OKAY	OKAY
1	VS013	VS012	15	PVC	42.84	42.30	329.95	0.0016	0.013	1176	2911	7	OKAY	OKAY	9	OKAY	OKAY	18	OKAY	OKAY
1	VS014	Park Place PS	18	PVC	44.10	43.30	30.00	0.0267	0.013	7719	19677	1,432	OKAY	OKAY	1,518	OKAY	OKAY	2,022	OKAY	OKAY
1	VS015	VS014	10	PVC	45.12	44.06	273.41	0.0039	0.013	614	1143	1,428	DEFICIENT	DEFICIENT	1,513	DEFICIENT	DEFICIENT	2,011	DEFICIENT	DEFICIENT
1	VS016	VS015	10	PVC	46.01	45.12	283.86	0.0031	0.013	552	1065	1,383	DEFICIENT	DEFICIENT	1,455	DEFICIENT	DEFICIENT	1,869	DEFICIENT	DEFICIENT
1	VS017	VS016	10	PVC	46.34	46.11	71.96	0.0032	0.013	557	1722	1,379	DEFICIENT	OKAY	1,451	DEFICIENT	OKAY	1,861	DEFICIENT	DEFICIENT
1	SC001	VS017	10	PVC	47.20	46.34	481.93	0.0018	0.013	416	792	1,229	DEFICIENT	DEFICIENT	1,282	DEFICIENT	DEFICIENT	1,539	DEFICIENT	DEFICIENT
1	VS019	VS018	10	PVC	44.77	43.62	320.25	0.0036	0.013	591	1076	142	OKAY	OKAY	160	OKAY	OKAY	306	OKAY	OKAY
1	VS020	VS019	10	PVC	46.44	44.77	284.34	0.0059	0.013	756	1302	138	OKAY	OKAY	155	OKAY	OKAY	297	OKAY	OKAY
1	VS021	VS020	10	PVC	46.57	45.98	127.18	0.0046	0.013	672	1482	133	OKAY	OKAY	150	OKAY	OKAY	287	OKAY	OKAY
1	VS022	VS021	10	PVC	47.29	46.67	215.53	0.0029	0.013	529	1127	129	OKAY	OKAY	145	OKAY	OKAY	278	OKAY	OKAY
1	VS027	VS022	10	PVC	48.29	47.39	331.93	0.0027	0.013	513	982	85	OKAY	OKAY	95	OKAY	OKAY	197	OKAY	OKAY
1	VS028	VS027	10	PVC	49.20	49.00	289.83	0.0007	0.013	259	799	79	OKAY	OKAY	89	OKAY	OKAY	186	OKAY	OKAY
1	VS029	VS028	10	PVC	49.50	49.20	103.63	0.0029	0.013	530	1464	72	OKAY	OKAY	82	OKAY	OKAY	176	OKAY	OKAY
1	VS030	VS029	10	PVC	49.94	49.50	160.73	0.0027	0.013	516	1230	66	OKAY	OKAY	75	OKAY	OKAY	166	OKAY	OKAY
1	VS031	VS030	10	PVC	50.75	49.94	287.72	0.0028	0.013	523	1030	60	OKAY	OKAY	68	OKAY	OKAY	155	OKAY	OKAY
1	VS033	VS031	10	PVC	51.47	50.75	259.91	0.0028	0.013	519	1056	49	OKAY	OKAY	56	OKAY	OKAY	137	OKAY	OKAY
1	VS034	VS033	10	PVC	52.26	51.47	282.45	0.0028	0.013	521	1034	43	OKAY	OKAY	49	OKAY	OKAY	127	OKAY	OKAY
1	VS035	VS034	10	PVC	52.93	52.26	241.18	0.0028	0.013	520	1080	37	OKAY	OKAY	42	OKAY	OKAY	78	OKAY	OKAY
1	VS037	VS035	10	PVC	53.26	52.93	112.96	0.0029	0.013	533	1417	27	OKAY	OKAY	31	OKAY	OKAY	57	OKAY	OKAY
1	VS038	VS037	10	PVC	54.35	52.93	395.71	0.0036	0.013	591	1029	18	OKAY	OKAY	21	OKAY	OKAY	38	OKAY	OKAY
1	VS038-B	VS038	10	PVC	55.19	54.35	300.00	0.0028	0.013	522	1017	9	OKAY	OKAY	10	OKAY	OKAY	19	OKAY	OKAY
1	VS040	VS039	8	PVC	44.84	43.57	423.08	0.0030	0.013	298	508	44	OKAY	OKAY	55	OKAY	OKAY	147	OKAY	OKAY

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2) Where no pipe type is given, PVC is assumed
3) hL equal to one pipe diameter above upstream crown minus downstream crown

PIPE ID	MH UP	MH DOWN	DIA. (IN)	PIPE MATERIAL	IE IN	IE OUT	LENGTH (ft)	Slope "S"	Manning's "n"	100% Capacity (gpm)	200% Capacity (gpm)	2015 Peak Hour Flow (gpm)	OK for 2015 Flow at d/D = 1?	OK for 2015 Flow at d/D = 2?	Projected 2021 Peak Hour Flow (gpm)	OK for 2021 Flow at d/D = 1?	OK for 2021 Flow at d/D = 2?	Projected B/O Peak Hour Flow (gpm)	OK for B/O Flow at d/D = 1?	OK for B/O Flow at d/D = 2?
													DEFICIENT	DEFICIENT		DEFICIENT	DEFICIENT		DEFICIENT	DEFICIENT
													11	3		12	3		22	5
1	VS005	VS04	18	PVC	39.30	39.06	168.35	0.0014	0.013	1785	**6661**	**120**	OKAY	OKAY	**147**	OKAY	OKAY	**358**	OKAY	OKAY
1	VS003	VS002	18	PVC	38.74	38.41	167.57	0.0020	0.013	2098	**6862**	**174**	OKAY	OKAY	**213**	OKAY	OKAY	**525**	OKAY	OKAY
1	VS002	VS001	18	PVC	38.47	37.81	186.72	0.0035	0.013	2810	**7079**	**182**	OKAY	OKAY	**223**	OKAY	OKAY	**550**	OKAY	OKAY
1	VS001	Valley View PS	18	PVC	37.81	37.47	273.61	0.0012	0.013	1666	**5280**	**190**	OKAY	OKAY	**233**	OKAY	OKAY	**575**	OKAY	OKAY
1	WC001	E030	24	PVC	57.08	57.01	65.00	0.0011	0.013	3341	**26080**	**369**	OKAY	OKAY	**432**	OKAY	OKAY	**962**	OKAY	OKAY
1	WC003	WC002	24	PVC	58.22	57.92	208.07	0.0014	0.013	3865	**14720**	**366**	OKAY	OKAY	**428**	OKAY	OKAY	**957**	OKAY	OKAY
1	WC004	WC003	24	PVC	58.63	58.22	314.25	0.0013	0.013	3677	**12080**	**362**	OKAY	OKAY	**424**	OKAY	OKAY	**953**	OKAY	OKAY
1	WC005	WC004	24	PVC	58.86	58.63	159.83	0.0014	0.013	3862	**16694**	**362**	OKAY	OKAY	**424**	OKAY	OKAY	**952**	OKAY	OKAY
1	WC006	WC005	24	PVC	59.31	58.86	303.52	0.0015	0.013	3920	**12419**	**360**	OKAY	OKAY	**422**	OKAY	OKAY	**950**	OKAY	OKAY
1	WC007-C	WC006	24	PVC	60.43	59.41	374.48	0.0027	0.013	5313	**12413**	**317**	OKAY	OKAY	**378**	OKAY	OKAY	**898**	OKAY	OKAY
1	WC006-C	Old Owen PS	8	PVC	53.38	53.12	40.69	0.0064	0.013	435	**1210**	**35**	OKAY	OKAY	**36**	OKAY	OKAY	**42**	OKAY	OKAY
1	WC006-B	WC006-C	8	PVC	53.48	53.38	32.72	0.0031	0.013	301	**1229**	**29**	OKAY	OKAY	**30**	OKAY	OKAY	**35**	OKAY	OKAY
1	WC005-C	WC006-B	8	PVC	55.52	53.48	294.57	0.0069	0.013	453	**741**	**27**	OKAY	OKAY	**28**	OKAY	OKAY	**33**	OKAY	OKAY
1	WC005-B	WC005-C	8	PVC	57.91	55.62	407.48	0.0056	0.013	408	**652**	**25**	OKAY	OKAY	**26**	OKAY	OKAY	**30**	OKAY	OKAY
1	WC008	WC007	18	PVC	60.89	60.53	102.72	0.0035	0.013	2798	**9020**	**311**	OKAY	OKAY	**366**	OKAY	OKAY	**780**	OKAY	OKAY
1	WC009	WC008	18	PVC	62.54	60.99	373.64	0.0041	0.013	3044	**5863**	**309**	OKAY	OKAY	**364**	OKAY	OKAY	**778**	OKAY	OKAY
1	WC010	WC009	18	PVC	63.71	62.64	214.44	0.0050	0.013	3339	**7216**	**307**	OKAY	OKAY	**362**	OKAY	OKAY	**776**	OKAY	OKAY
1	WC011	WC010	18	PVC	64.11	63.71	143.29	0.0028	0.013	2497	**7621**	**307**	OKAY	OKAY	**362**	OKAY	OKAY	**776**	OKAY	OKAY
1	WC012	WC011	18	PVC	65.00	64.11	348.37	0.0026	0.013	2389	**5337**	**307**	OKAY	OKAY	**362**	OKAY	OKAY	**775**	OKAY	OKAY
1	WC013	WC012	18	PVC	65.22	65.00	54.29	0.0041	0.013	3009	**12203**	**307**	OKAY	OKAY	**362**	OKAY	OKAY	**775**	OKAY	OKAY
1	WC014	WC013	18	PVC	67.03	65.22	76.44	0.0237	0.013	7273	**14449**	**305**	OKAY	OKAY	**360**	OKAY	OKAY	**773**	OKAY	OKAY
1	WC015	WC014	18	PVC	70.17	67.03	301.00	0.0104	0.013	4828	**8268**	**303**	OKAY	OKAY	**358**	OKAY	OKAY	**771**	OKAY	OKAY
1	WC016	WC015	18	PVC	72.18	70.17	398.91	0.0050	0.013	3355	**6106**	**301**	OKAY	OKAY	**356**	OKAY	OKAY	**768**	OKAY	OKAY
1	WC017	WC016	18	PVC	74.36	72.18	399.04	0.0055	0.013	3494	**6263**	**299**	OKAY	OKAY	**354**	OKAY	OKAY	**765**	OKAY	OKAY
1	WC018	WC017-C	10	PVC	118.10	77.77	302.68	0.1332	0.013	3599	**5717**	**271**	OKAY	OKAY	**301**	OKAY	OKAY	**539**	OKAY	OKAY
1	WC017-C	WC017-B	10	PVC	77.61	75.93	36.58	0.0459	0.013	2113	**3953**	**274**	OKAY	OKAY	**303**	OKAY	OKAY	**543**	OKAY	OKAY
1	WC017-B	WC017	18	PVC	75.80	74.36	185.84	0.0077	0.013	4161	**8384**	**297**	OKAY	OKAY	**352**	OKAY	OKAY	**761**	OKAY	OKAY
1	WC019	WC018	10	PVC	133.71	118.10	103.36	0.1510	0.013	3831	**6223**	**269**	OKAY	OKAY	**298**	OKAY	OKAY	**536**	OKAY	OKAY
1	WC020	WC019	10	PVC	157.43	133.71	47.35	0.5010	0.013	6978	**11786**	**267**	OKAY	OKAY	**296**	OKAY	OKAY	**532**	OKAY	OKAY
1	WC021	WC020	10	PVC	159.34	157.43	234.55	0.0081	0.013	890	**1518**	**264**	OKAY	OKAY	**293**	OKAY	OKAY	**528**	OKAY	OKAY
1	WC022	WC021	8	PVC	160.72	159.34	262.66	0.0053	0.013	394	**678**	**125**	OKAY	OKAY	**146**	OKAY	OKAY	**297**	OKAY	OKAY
1	WC053	WC021	8	PVC	170.48	159.34	28.41	0.3921	0.013	3405	**5814**	**137**	OKAY	OKAY	**145**	OKAY	OKAY	**227**	OKAY	OKAY
1	WC028	WC022	8	PVC	161.81	160.72	186.46	0.0058	0.013	416	**751**	**112**	OKAY	OKAY	**131**	OKAY	OKAY	**274**	OKAY	OKAY
1	WC031	WC028	8	PVC	162.54	161.81	112.52	0.0065	0.013	438	**872**	**105**	OKAY	OKAY	**124**	OKAY	OKAY	**263**	OKAY	OKAY
1	WC032	WC031	8	PVC	163.05	162.54	72.81	0.0070	0.013	455	**1005**	**102**	OKAY	OKAY	**121**	OKAY	OKAY	**259**	OKAY	OKAY
1	WC033	WC032	8	PVC	163.58	163.05	69.93	0.0076	0.013	473	**1037**	**100**	OKAY	OKAY	**119**	OKAY	OKAY	**255**	OKAY	OKAY
1	WC034	WC033	8	PVC	164.39	163.58	169.46	0.0048	0.013	376	**720**	**98**	OKAY	OKAY	**117**	OKAY	OKAY	**251**	OKAY	OKAY
1	WC037	WC034	8	PVC	165.02	164.39	125.98	0.0050	0.013	385	**788**	**91**	OKAY	OKAY	**109**	OKAY	OKAY	**240**	OKAY	OKAY
1	WC038	WC037	8	PVC	165.63	165.02	76.84	0.0079	0.013	484	**1020**	**84**	OKAY	OKAY	**102**	OKAY	OKAY	**228**	OKAY	OKAY
1	WC039	WC038	8	PVC	166.12	165.63	78.77	0.0062	0.013	429	**954**	**81**	OKAY	OKAY	**99**	OKAY	OKAY	**224**	OKAY	OKAY
1	WC040	WC039	8	PVC	166.66	166.12	73.51	0.0073	0.013	466	**1014**	**79**	OKAY	OKAY	**97**	OKAY	OKAY	**221**	OKAY	OKAY
1	WC118	WC040	8	PVC	167.38	166.66	141.96	0.0051	0.013	387	**766**	**70**	OKAY	OKAY	**87**	OKAY	OKAY	**205**	OKAY	OKAY
1	WC046	WC044	8	PVC	168.68	167.90	167.57	0.0047	0.013	371	**716**	**63**	OKAY	OKAY	**80**	OKAY	OKAY	**194**	OKAY	OKAY
1	WC047	WC046	8	PVC	174.24	172.70	312.54	0.0049	0.013	382	**642**	**61**	OKAY	OKAY	**77**	OKAY	OKAY	**190**	OKAY	OKAY
1	WC048	WC047	8	PVC	175.05	174.37	138.65	0.0049	0.013	381	**763**	**58**	OKAY	OKAY	**75**	OKAY	OKAY	**186**	OKAY	OKAY
1	WC049	WC048	8	PVC	175.80	175.10	128.78	0.0054	0.013	401	**801**	**56**	OKAY	OKAY	**72**	OKAY	OKAY	**182**	OKAY	OKAY

City of Monroe
General Sewer Plan
Hydraulic Model
Prepared by: Preston Love
Reviewed by: Adam Schuyler/Peter Cunningham
13 February 2015
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LEGEND

Abbr.	Basin
B	Beaton
C	Cate's
E	Eastside
F	Fyelands
MH	Milwaukee Hill
RH	Reservoir Hill
S	Sawyer
SF	South Fryeland
SC	State Corrections
VN	Valley View North
VS	Valley View South
WM	West Main
WC	Woods Creek

C_{DIP} = 130
$C_{CONC/RCP}$ = 100
C_{PVC} = 140
C_{CLAY} = 110

Assumptions:
1) Manning's 'n' values: All 0.013 (ORANGE BOOK). However, actual values are: 0.01 (PVC pipe), 0.014 (clay), 0.012 (DI), 0.015 (concrete)
2) Where no pipe type is given, PVC is assumed
3) hL equal to one pipe diameter above upstream crown minus downstream crown

PIPE ID	MH UP	MH DOWN	DIA. (IN)	PIPE MATERIAL	IE IN	IE OUT	LENGTH (ft)	Slope "S"	Manning's "n"	100% Capacity (gpm)	200% Capacity (gpm)	2015 Peak Hour Flow (gpm)	OK for 2015 Flow at d/D = 1?	OK for 2015 Flow at d/D = 2?	Projected 2021 Peak Hour Flow (gpm)	OK for 2021 Flow at d/D = 1?	OK for 2021 Flow at d/D = 2?	Projected B/O Peak Hour Flow (gpm)	OK for B/O Flow at d/D = 1?	OK for B/O Flow at d/D = 2?
													DEFICIENT	DEFICIENT		DEFICIENT	DEFICIENT		DEFICIENT	DEFICIENT
													11	3		12	3		22	5
1	WC050	WC049	8	PVC	176.53	175.85	144.89	0.0047	0.013	373	**745**	**54**	OKAY	OKAY	**70**	OKAY	OKAY	**178**	OKAY	OKAY
1	WC051	WC050	8	PVC	177.78	176.58	241.21	0.0050	0.013	384	**675**	**51**	OKAY	OKAY	**67**	OKAY	OKAY	**174**	OKAY	OKAY
1	WC052	WC051	8	PVC	181.23	177.81	214.66	0.0159	0.013	686	**1098**	**49**	OKAY	OKAY	**65**	OKAY	OKAY	**171**	OKAY	OKAY
1	RH001	WC052	8	PVC	182.19	181.23	157.75	0.0061	0.013	424	**788**	**46**	OKAY	OKAY	**61**	OKAY	OKAY	**162**	OKAY	OKAY
1	WC054	WC053	8	PVC	171.35	170.48	206.98	0.0042	0.013	353	**660**	**134**	OKAY	OKAY	**143**	OKAY	OKAY	**223**	OKAY	OKAY
1	WC055	WC054	8	PVC	171.82	171.35	39.84	0.0118	0.013	591	**1367**	**132**	OKAY	OKAY	**140**	OKAY	OKAY	**219**	OKAY	OKAY
1	WC056	WC055	8	PVC	178.93	171.82	190.12	0.0374	0.013	1052	**1661**	**130**	OKAY	OKAY	**138**	OKAY	OKAY	**215**	OKAY	OKAY
1	WC058	WC056	8	PVC	212.38	178.93	266.71	0.1254	0.013	1926	**3075**	**125**	OKAY	OKAY	**133**	OKAY	OKAY	**207**	OKAY	OKAY
1	WC059	WC058	8	PVC	219.88	212.38	152.38	0.0492	0.013	1206	**1922**	**74**	OKAY	OKAY	**79**	OKAY	OKAY	**123**	OKAY	OKAY
1	WC092	WC058	8	PVC	219.11	212.38	247.66	0.0272	0.013	896	**1401**	**49**	OKAY	OKAY	**52**	OKAY	OKAY	**81**	OKAY	OKAY
1	WC060	WC059	8	PVC	229.42	219.88	203.96	0.0468	0.013	1176	**1852**	**51**	OKAY	OKAY	**54**	OKAY	OKAY	**85**	OKAY	OKAY
1	WC065	WC060	8	PVC	230.44	229.42	147.11	0.0069	0.013	453	**835**	**39**	OKAY	OKAY	**42**	OKAY	OKAY	**65**	OKAY	OKAY
1	WC066	WC065	8	PVC	232.00	230.44	365.58	0.0043	0.013	355	**593**	**37**	OKAY	OKAY	**39**	OKAY	OKAY	**61**	OKAY	OKAY
1	WC067	WC066	8	PVC	233.00	232.00	223.79	0.0045	0.013	363	**661**	**35**	OKAY	OKAY	**37**	OKAY	OKAY	**58**	OKAY	OKAY
1	WC068	WC067	8	PVC	234.44	233.00	332.83	0.0043	0.013	358	**606**	**32**	OKAY	OKAY	**34**	OKAY	OKAY	**54**	OKAY	OKAY
1	WC069	WC068	8	PVC	235.26	234.44	180.57	0.0045	0.013	366	**698**	**30**	OKAY	OKAY	**32**	OKAY	OKAY	**50**	OKAY	OKAY
1	WC093	WC092	8	PVC	219.21	219.11	22.52	0.0044	0.013	362	**1504**	**46**	OKAY	OKAY	**49**	OKAY	OKAY	**77**	OKAY	OKAY
1	WC094	WC093	8	PVC	221.94	219.21	149.59	0.0182	0.013	735	**1208**	**44**	OKAY	OKAY	**47**	OKAY	OKAY	**73**	OKAY	OKAY
1	WC095	WC094	8	PVC	222.04	221.94	252.40	0.0004	0.013	108	**407**	**42**	OKAY	OKAY	**44**	OKAY	OKAY	**69**	OKAY	OKAY
1	WC096	WC095	8	PVC	223.36	222.04	256.72	0.0051	0.013	390	**675**	**39**	OKAY	OKAY	**42**	OKAY	OKAY	**65**	OKAY	OKAY
1	WC044	WC118	8	PVC	167.90	167.38	116.68	0.0045	0.013	363	**783**	**68**	OKAY	OKAY	**85**	OKAY	OKAY	**201**	OKAY	OKAY
1	WC132	Old Owen PS	8	PVC	57.96	54.99	99.68	0.0298	0.013	939	**1561**	**6**	OKAY	OKAY	**6**	OKAY	OKAY	**7**	OKAY	OKAY
1	WC098	WC096	8	PVC	226.03	225.58	59.43	0.0076	0.013	473	**1090**	**37**	OKAY	OKAY	**39**	OKAY	OKAY	**61**	OKAY	OKAY
1	WM007	West Main PS	8	PVC	38.71	32.80	183.19	0.0323	0.013	977	**1547**	**17**	OKAY	OKAY	**23**	OKAY	OKAY	**60**	OKAY	OKAY
1	WM000	West Main PS	8	PVC	34.00	32.80	69.73	0.0172	0.013	713	**1320**	**22**	OKAY	OKAY	**28**	OKAY	OKAY	**66**	OKAY	OKAY
1	C001	Cate's PS	8	PVC	47.54	47.16	86.88	0.0044	0.013	360	**858**	**23**	OKAY	OKAY	**23**	OKAY	OKAY	**26**	OKAY	OKAY
1	C006	Cate's PS	8	PVC	74.56	50.00	286.54	0.0857	0.013	1592	**2513**	**14**	OKAY	OKAY	**14**	OKAY	OKAY	**15**	OKAY	OKAY
1	E040	E022	8	CLAY	54.92	54.54	204.88	0.0019	0.013	234	**424**	**55**	OKAY	OKAY	**63**	OKAY	OKAY	**102**	OKAY	OKAY
1	F124-B	F124	8	PVC	21.37	20.64	140.86	0.0052	0.013	391	**772**	**116**	OKAY	OKAY	**127**	OKAY	OKAY	**194**	OKAY	OKAY
1	SF007		12	PVC	26.68	26.26	195.24	0.0022	0.013	744	**1896**	**189**	OKAY	OKAY	**198**	OKAY	OKAY	**255**	OKAY	OKAY
1	VS041	Fox Meadows PS	8	PVC	37.98	37.66	58.58	0.0055	0.013	402	**1028**	**39**	OKAY	OKAY	**49**	OKAY	OKAY	**133**	OKAY	OKAY
0	F125	F124-B	8	PVC	21.90	21.37	100.74	0.0053	0.013	394	**851**	**110**	OKAY	OKAY	**120**	OKAY	OKAY	**184**	OKAY	OKAY
0	E086	E085	8	CLAY	63.46	62.24	311.97	0.0039	0.013	340	**464**	**29**	OKAY	OKAY	**30**	OKAY	OKAY	**40**	OKAY	OKAY

City of Monroe
Sanitary Sewer System Plan
13 March 2015
Sewer System Hydraulic Model
Force Mains - Existing System

Valley View PS Flow Attenuation Factor: 40% *based on anecdotal information from the City on 3/11/2015; only applied to Valley View because tributary area is much greater than other pump stations*
South Fryelands PS Flow Attenuation Factor: 10% *due to smaller tributary area than VVPS*

PIPE ID	MH UP	MH DOWN	DIA. (in.)	PIPE TYPE	IE IN	IE OUT	PUMP STATION	LENGTH (ft)	Area "A" (ft^2)	Force Main Peak Capacity at 8 FPS (gpm)	Calibrated 2013 Peak Hour Flow (gpm)	Projected 2015 Peak Hour Flow (gpm)	Projected 2021 Peak Hour Flow (gpm)	Projected 2035 Peak Hour Flow (gpm)	Projected Buildout Peak Hour Flow (gpm)
81	PS	B012	4	DI	47.16	36.80	Cate's	4166	0.087	313	37	37	37	37	41
133	WC007-D	WC007-C	4	PVC	62.63	60.43	Calhoun STEP	2019	0.087	313	4	4	9	20	115
46	PS	VS015	4	PVC	32.80	45.03	West Main	2232	0.087	313	38	39	50	76	126
336	PS	VS040	4	PVC	37.66	44.39	Fox Meadows	576	0.087	313	39	39	49	74	133
159	PS	B-007A	6	DI	13.48	35.39	Fryelands	4667	0.196	705	688	689	738	853	1,043
225	PS	B007	8	PVC	18.95	34.43	Beaton	4031	0.349	1,253	306	311	332	380	460
232	PS	B037	8	PVC	19.10	38.02	S. Fryelands	4561	0.349	1,253	417	419	433	466	533
161	PS	F152	8	PVC	22.78	27.94	Sawyer	134	0.349	1,253	65	65	65	66	66
6	PS	E001	12	DI	31.93	48.00	Valley View	7865	0.785	2,820	1,522	1,532	1,691	2,061	2,975
347	PS	WC006	6	PVC	53.12	59.41	Old Owen	50	0.196	705	40	40	42	45	49
	PS	E001	16	PVC	43.30	48.00	Park Place	3988	1.396	5,013	1,426	1,432	1,518	1,718	2,021

Force Main capacity is evaluated at a maximum velocity of 8 ft/s, per Orange Book

City of Monroe					Influent Peak Hour Flows (gpm)					
Pump Station	**Pump Station Capacity (gpm)**	**Force Main Diameter (in)**	**Force Main Length (ft)**	**Force Main Velocity (ft/s)**	**2013**	**2015**	**2021**	**2035**	**Buildout**	**Max Velocity (ft/s)**
Beaton	580	8	4031	3.70	306	311	332	380	460	3.70
Cate's	150	4	4166	3.83	37	37	37	37	41	3.83
Fox Meadows	125	4	576	3.19	39	39	49	74	133	3.39
Fryelands	750	6	4667	8.51	688	689	738	853	1043	11.83
Old Owen	250	6	50	2.84	40	40	42	45	49	2.84
Park Place	1700	16	3988	2.71	1426	1432	1518	1718	2021	3.23
Sawyer	175	8	134	1.12	65	65	65	66	66	1.12
South Fryelands	450	8	4561	2.87	417	419	433	466	533	3.40
Valley View	1650	12	7865	4.68	1522	1532	1691	2061	2975	8.44
West Main	115	4	2232	2.94	38	39	50	76	126	3.22

City of Monroe
General Sewer Plan
Hydraulic Model - Southwest Study Area Inclusion
Prepared by: Preston Love
Reviewed by: Adam Schuyler/Peter Cunningham
13 February 2015
S:\Projects\Monroe\2015 Utility Plans\Sewer Model\[Hydraulic Sewer Model 2014 - SW Study Area Inc

LEGEND	
Abbr.	**Basin**
B	Beaton
C	Cate's
E	Eastside
F	Fyelands
MH	Milwaukee Hill
RH	Reservoir Hill
S	Sawyer
SF	South Fryeland
SC	State Corrections
VN	Valley View North
VS	Valley View South
WM	West Main
WC	Woods Creek
SWSA	Southwest Study Area

C_{DIP} = 130
$C_{CONC/RCP}$ = 100
C_{PVC} = 140
C_{CLAY} = 110

Assumptions:
1) Manning's 'n' values: All 0.013 (ORANGE BOOK). However, actual values are: 0.01 (PVC pipe), 0.014 (clay), 0.012 (DI), 0.015 (concrete)
2) Where no pipe type is given, PVC is assumed
3) hL equal to one pipe diameter above upstream crown minus downstream crown

	OK for 2015 Flow at d/D = 1?	OK for 2015 Flow at d/D = 2?	OK for 2021 Flow at d/D = 1?	OK for 2021 Flow at d/D = 2?	OK for B/O Flow at d/D = 1?	OK for B/O Flow at d/D = 2?
DEFICIENT	11	3	14	3	26	9

PIPE ID	MH UP	MH DOWN	DIA. (IN)	PIPE MATERIAL	IE IN	IE OUT	LENGTH (ft)	Slope "S"	Manning's "n"	100% Capacity (gpm)	200% Capacity (gpm)	2015 Peak Hour Flow (gpm)	OK for 2015 Flow at d/D = 1?	OK for 2015 Flow at d/D = 2?	Projected 2021 Peak Hour Flow (gpm)	OK for 2021 Flow at d/D = 1?	OK for 2021 Flow at d/D = 2?	Projected B/O Peak Hour Flow (gpm)	OK for B/O Flow at d/D = 1?	OK for B/O Flow at d/D = 2?
1	B002	B001	18	PVC	32.28	32.20	47.33	0.0017	0.013	1943	**12555**	**1,929**	OKAY	OKAY	**2,150**	DEFICIENT	OKAY	**3,878**	DEFICIENT	OKAY
1	VN001	B001	12	PVC	33.21	33.03	69.14	0.0026	0.013	818	**3007**	**459**	OKAY	OKAY	**499**	OKAY	OKAY	**919**	DEFICIENT	OKAY
1	B003	B002	10	PVC	32.68	32.48	35.31	0.0057	0.013	742	**2492**	**527**	OKAY	OKAY	**583**	OKAY	OKAY	**1,068**	DEFICIENT	OKAY
1	B003-B	B002	18	PVC	32.75	32.38	295.43	0.0013	0.013	1673	**5110**	**1,391**	OKAY	OKAY	**1,555**	OKAY	OKAY	**2,794**	DEFICIENT	OKAY
1	B004	B003	18	PVC	33.21	32.75	400.81	0.0011	0.013	1601	**4445**	**1,380**	OKAY	OKAY	**1,544**	OKAY	OKAY	**2,778**	DEFICIENT	OKAY
1	B032	B003	10	PVC	33.27	32.92	264.45	0.0013	0.013	359	**903**	**524**	DEFICIENT	OKAY	**580**	DEFICIENT	OKAY	**1,063**	DEFICIENT	DEFICIENT
1	B005	B004	18	PVC	33.96	33.63	400.24	0.0008	0.013	1357	**4286**	**1,369**	DEFICIENT	OKAY	**1,532**	DEFICIENT	OKAY	**2,762**	DEFICIENT	OKAY
1	B006	B005	18	PVC	34.43	33.96	342.49	0.0014	0.013	1751	**4853**	**1,358**	OKAY	OKAY	**1,521**	OKAY	OKAY	**2,746**	DEFICIENT	OKAY
1	B-007A	B007	18	PVC	34.79	34.43	243.97	0.0015	0.013	1816	**5651**	**1,022**	OKAY	OKAY	**1,163**	OKAY	OKAY	**2,250**	DEFICIENT	OKAY
1	B007	B006	18	PVC	34.95	34.43	273.46	0.0019	0.013	2061	**5555**	**1,347**	OKAY	OKAY	**1,509**	OKAY	OKAY	**2,730**	DEFICIENT	OKAY
1	B008	B007-A	18	PVC	34.91	34.79	42.60	0.0028	0.013	2509	**13471**	**319**	OKAY	OKAY	**410**	OKAY	OKAY	**1,187**	OKAY	OKAY
1	B009	B008	18	PVC	35.05	34.91	119.35	0.0012	0.013	1619	**7770**	**305**	OKAY	OKAY	**394**	OKAY	OKAY	**1,165**	OKAY	OKAY
1	B010	B009	18	PVC	35.40	35.15	302.51	0.0008	0.013	1359	**4867**	**290**	OKAY	OKAY	**379**	OKAY	OKAY	**1,144**	OKAY	OKAY
1	B011	B010	18	PVC	35.80	35.40	258.58	0.0016	0.013	1861	**5541**	**277**	OKAY	OKAY	**364**	OKAY	OKAY	**1,124**	OKAY	OKAY
1	B012	B011	18	DI	35.77	35.41	276.93	0.0013	0.013	1704	**4900**	**263**	OKAY	OKAY	**349**	OKAY	OKAY	**1,103**	OKAY	OKAY
1	B013	B012	8	PVC	37.39	32.05	74.96	0.0712	0.013	1451	**2388**	**179**	OKAY	OKAY	**222**	OKAY	OKAY	**486**	OKAY	OKAY
1	B014	B013	12	PVC	36.87	36.54	71.56	0.0046	0.013	1089	**3149**	**175**	OKAY	OKAY	**218**	OKAY	OKAY	**480**	OKAY	OKAY
1	B015	B014	12	PVC	39.00	36.87	309.26	0.0069	0.013	1330	**2267**	**172**	OKAY	OKAY	**214**	OKAY	OKAY	**474**	OKAY	OKAY
1	B016	B015	12	PVC	40.03	39.00	271.19	0.0038	0.013	988	**1926**	**168**	OKAY	OKAY	**209**	OKAY	OKAY	**468**	OKAY	OKAY
1	B017	B016	12	PVC	41.63	40.03	399.25	0.0040	0.013	1015	**1786**	**164**	OKAY	OKAY	**205**	OKAY	OKAY	**463**	OKAY	OKAY
1	B018	B017	12	PVC	42.27	41.63	169.66	0.0038	0.013	985	**2212**	**160**	OKAY	OKAY	**201**	OKAY	OKAY	**457**	OKAY	OKAY
1	B019	B018	12	PVC	43.03	42.27	178.28	0.0043	0.013	1047	**2237**	**156**	OKAY	OKAY	**196**	OKAY	OKAY	**451**	OKAY	OKAY
1	B020	B019	12	PVC	44.80	43.03	369.99	0.0048	0.013	1109	**1926**	**150**	OKAY	OKAY	**190**	OKAY	OKAY	**442**	OKAY	OKAY
1	B021	B020	12	PVC	46.23	44.80	366.34	0.0039	0.013	1002	**1804**	**148**	OKAY	OKAY	**189**	OKAY	OKAY	**440**	OKAY	OKAY
1	B022	B021	12	PVC	48.26	46.23	251.79	0.0081	0.013	1439	**2490**	**147**	OKAY	OKAY	**187**	OKAY	OKAY	**437**	OKAY	OKAY
1	B023	B022	12	PVC	48.41	48.26	322.97	0.0005	0.013	345	**1289**	**145**	OKAY	OKAY	**184**	OKAY	OKAY	**434**	DEFICIENT	OKAY
1	B024	B023	12	PVC	49.87	48.41	219.52	0.0067	0.013	1307	**2396**	**142**	OKAY	OKAY	**182**	OKAY	OKAY	**431**	OKAY	OKAY
1	B025	B024	12	PVC	59.41	49.87	399.75	0.0239	0.013	2477	**3804**	**137**	OKAY	OKAY	**177**	OKAY	OKAY	**423**	OKAY	OKAY
1	B026	B025	12	PVC	62.14	59.41	381.56	0.0072	0.013	1356	**2225**	**133**	OKAY	OKAY	**172**	OKAY	OKAY	**417**	OKAY	OKAY
1	B027	B026	12	PVC	65.80	62.14	44.69	0.0819	0.013	4588	**7999**	**128**	OKAY	OKAY	**167**	OKAY	OKAY	**410**	OKAY	OKAY
1	B028	B027	12	PVC	68.80	65.80	401.04	0.0075	0.013	1387	**2249**	**124**	OKAY	OKAY	**162**	OKAY	OKAY	**403**	OKAY	OKAY
1	B029	B028	12	PVC	75.65	68.80	223.03	0.0307	0.013	2810	**4447**	**119**	OKAY	OKAY	**157**	OKAY	OKAY	**396**	OKAY	OKAY
1	B030	B029	12	PVC	80.92	75.65	43.94	0.1199	0.013	5552	**9477**	**115**	OKAY	OKAY	**152**	OKAY	OKAY	**390**	OKAY	OKAY
1	B031	B030	12	PVC	109.98	80.92	187.88	0.1547	0.013	6305	**10082**	**110**	OKAY	OKAY	**147**	OKAY	OKAY	**383**	OKAY	OKAY
1	RH100	B031	20	DI	118.52	109.98	81.18	0.1052	0.013	20304	**31496**	**106**	OKAY	OKAY	**143**	OKAY	OKAY	**376**	OKAY	OKAY
1	B033	B032	10	PVC	34.50	33.27	72.64	0.0169	0.013	1283	**2452**	**518**	OKAY	OKAY	**574**	OKAY	OKAY	**1,055**	OKAY	OKAY
1	B034	B033	10	PVC	35.31	34.50	178.64	0.0045	0.013	664	**1333**	**513**	OKAY	OKAY	**568**	OKAY	OKAY	**1,047**	DEFICIENT	OKAY
1	B035	B034	10	PVC	36.15	35.31	298.38	0.0028	0.013	523	**1020**	**500**	OKAY	OKAY	**555**	DEFICIENT	OKAY	**1,028**	DEFICIENT	DEFICIENT
1	B036	B035	10	PVC	37.80	36.15	358.81	0.0046	0.013	669	**1143**	**484**	OKAY	OKAY	**538**	OKAY	OKAY	**1,005**	DEFICIENT	OKAY
1	B037	B036	10	PVC	37.92	37.80	105.71	0.0011	0.013	332	**1319**	**472**	DEFICIENT	OKAY	**525**	DEFICIENT	OKAY	**987**	DEFICIENT	OKAY
1	B049	B048	8	PVC	22.99	20.40	357.49	0.0072	0.013	463	**737**	**27**	OKAY	OKAY	**29**	OKAY	OKAY	**41**	OKAY	OKAY
1	B061	B060	10	PVC	22.07	20.47	170.86	0.0094	0.013	954	**1688**	**223**	OKAY	OKAY	**235**	OKAY	OKAY	**328**	OKAY	OKAY
1	B064A	B061	10	PVC	22.87	22.07	227.96	0.0035	0.013	584	**1165**	**209**	OKAY	OKAY	**220**	OKAY	OKAY	**306**	OKAY	OKAY
1	B073	B064	8	PVC	24.08	23.80	76.42	0.0037	0.013	329	**871**	**149**	OKAY	OKAY	**155**	OKAY	OKAY	**217**	OKAY	OKAY
1	B074	B073	8	PVC	25.61	0.00	402.40	0.0636	0.013	1372	**2138**	**145**	OKAY	OKAY	**151**	OKAY	OKAY	**211**	OKAY	OKAY
1	B075	B074	8	PVC	26.46	25.61	243.18	0.0035	0.013	321	**601**	**141**	OKAY	OKAY	**147**	OKAY	OKAY	**206**	OKAY	OKAY
1	B079	B075	8	PVC	26.86	26.46	74.45	0.0054	0.013	399	**942**	**130**	OKAY	OKAY	**135**	OKAY	OKAY	**189**	OKAY	OKAY
1	B080	B079	8	PVC	27.98	26.86	289.57	0.0039	0.013	338	**597**	**82**	OKAY	OKAY	**86**	OKAY	OKAY	**120**	OKAY	OKAY
1	B081	B080	8	PVC	28.67	27.98	167.95	0.0041	0.013	349	**691**	**64**	OKAY	OKAY	**67**	OKAY	OKAY	**94**	OKAY	OKAY
1	B082	B081	8	PVC	29.39	28.67	154.52	0.0047	0.013	371	**731**	**61**	OKAY	OKAY	**64**	OKAY	OKAY	**89**	OKAY	OKAY
1	B001	Valley View PS	18	PVC	32.10	32.03	98.14	0.0007	0.013	1262	**8435**	**2,410**	DEFICIENT	OKAY	**2,671**	DEFICIENT	OKAY	**4,830**	DEFICIENT	OKAY
1	VN002	B115	12	PVC	34.36	33.21	197.00	0.0058	0.013	1225	**2362**	**455**	OKAY	OKAY	**494**	OKAY	OKAY	**909**	OKAY	OKAY
1	B054	B120	8	PVC	21.27	19.95	329.01	0.0040	0.013	344	**590**	**30**	OKAY	OKAY	**33**	OKAY	OKAY	**45**	OKAY	OKAY
1	B064	B122	10	PVC	23.80	0.00	310.97	0.0765	0.013	2727	**4268**	**202**	OKAY	OKAY	**213**	OKAY	OKAY	**296**	OKAY	OKAY
1	B048	B123	8	PVC	20.40	0.00	360.99	0.0565	0.013	1293	**2012**	**35**	OKAY	OKAY	**38**	OKAY	OKAY	**53**	OKAY	OKAY
1	B060	Beaton PS	10	PVC	20.47	14.12	293.89	0.0216	0.013	1449	**2261**	**229**	OKAY	OKAY	**243**	OKAY	OKAY	**338**	OKAY	OKAY
1	B054A	Beaton PS	8	PVC	20.33	18.85	153.19	0.0097	0.013	534	**931**	**35**	OKAY	OKAY	**38**	OKAY	OKAY	**52**	OKAY	OKAY
1	B048A	Beaton PS	8	PVC	20.40	18.85	32.47	0.0477	0.013	1188	**2190**	**47**	OKAY	OKAY	**51**	OKAY	OKAY	**70**	OKAY	OKAY
1	E001	WWTP	30	RCP	52.00	51.50	65.00	0.0077	0.013	16188	**40941**	**5,000**	OKAY	OKAY	**5,494**	OKAY	OKAY	**9,290**	OKAY	OKAY
1	E002	E001	20	DI	45.77	39.08	48.00	0.1394	0.013	23371	**37553**	**967**	OKAY	OKAY	**1,072**	OKAY	OKAY	**1,864**	OKAY	OKAY
1	E003	E002	18	CLAY	46.25	45.87	79.52	0.0048	0.013	3268	**8186**	**810**	OKAY	OKAY	**909**	OKAY	OKAY	**1,652**	OKAY	OKAY
1	E004	E003	16	CLAY	46.70	46.30	83.00	0.0048	0.013	2397	**5616**	**810**	OKAY	OKAY	**909**	OKAY	OKAY	**1,652**	OKAY	OKAY

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Reviewed by: Adam Schuyler/Peter Cunningham
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LEGEND

Abbr.	Basin
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RH	Reservoir Hill
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SF	South Fryeland
SC	State Corrections
VN	Valley View North
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WM	West Main
WC	Woods Creek
SWSA	Southwest Study Area

C_{DIP} = 130
$C_{CONC/RCP}$ = 100
C_{PVC} = 140
C_{CLAY} = 110

Assumptions:
1) Manning's 'n' values: All 0.013 (ORANGE BOOK). However, actual values are: 0.01 (PVC pipe), 0.014 (clay), 0.012 (DI), 0.015 (concrete)
2) Where no pipe type is given, PVC is assumed
3) hL equal to one pipe diameter above upstream crown minus downstream crown

PIPE ID	MH UP	MH DOWN	DIA. (IN)	PIPE MATERIAL	IE IN	IE OUT	LENGTH (ft)	Slope "S"	Manning's "n"	100% Capacity (gpm)	200% Capacity (gpm)	2015 Peak Hour Flow (gpm)	OK for 2015 Flow at d/D = 1?	OK for 2015 Flow at d/D = 2?	Projected 2021 Peak Hour Flow (gpm)	OK for 2021 Flow at d/D = 1?	OK for 2021 Flow at d/D = 2?	Projected B/O Peak Hour Flow (gpm)	OK for B/O Flow at d/D = 1?	OK for B/O Flow at d/D = 2?
													DEFICIENT	DEFICIENT		DEFICIENT	DEFICIENT		DEFICIENT	DEFICIENT
													11	3		14	3		26	9
1	E005	E004	8	CLAY	59.61	47.15	406.46	0.0307	0.013	952	1148	50	OKAY	OKAY	52	OKAY	OKAY	64	OKAY	OKAY
1	E014	E013	24	PVC	46.30	45.9	362.48	0.0011	0.013	3382	11158	751	OKAY	OKAY	848	OKAY	OKAY	1,576	OKAY	OKAY
1	E015	E014	24	PVC	46.60	46.4	193.87	0.0010	0.013	3269	14930	745	OKAY	OKAY	842	OKAY	OKAY	1,569	OKAY	OKAY
1	E016	E015	24	PVC	47.09	46.7	14.87	0.0262	0.013	16484	62559	690	OKAY	OKAY	786	OKAY	OKAY	1,498	OKAY	OKAY
1	E135	E015	8	PVC	47.18	47.1	31.66	0.0025	0.013	273	1233	46	OKAY	OKAY	47	OKAY	OKAY	60	OKAY	OKAY
1	E017	E016	24	PVC	48.13	47.74	390.39	0.0010	0.013	3217	10695	690	OKAY	OKAY	786	OKAY	OKAY	1,498	OKAY	OKAY
1	E018	E017	24	PVC	48.49	48.23	247.33	0.0011	0.013	3300	13280	687	OKAY	OKAY	782	OKAY	OKAY	1,493	OKAY	OKAY
1	E019	E018	24	PVC	49.05	48.59	468.36	0.0010	0.013	3190	9845	618	OKAY	OKAY	707	OKAY	OKAY	1,383	OKAY	OKAY
1	E084	E018	10	CLAY	55.69	54.64	175.11	0.0060	0.013	763	1140	17	OKAY	OKAY	18	OKAY	OKAY	22	OKAY	OKAY
1	E085	E018	10	CLAY	56.95	50.69	149.24	0.0419	0.013	2019	2545	48	OKAY	OKAY	54	OKAY	OKAY	83	OKAY	OKAY
1	E020	E019	24	PVC	50.21	50.12	15.00	0.0060	0.013	7885	57915	618	OKAY	OKAY	707	OKAY	OKAY	1,383	OKAY	OKAY
1	E021	E020	24	PVC	52.95	51.97	264.86	0.0037	0.013	6192	14861	608	OKAY	OKAY	698	OKAY	OKAY	1,372	OKAY	OKAY
1	E022	E021	24	PVC	52.65	52.22	461.28	0.0009	0.013	3108	9861	604	OKAY	OKAY	693	OKAY	OKAY	1,365	OKAY	OKAY
1	E053	E054	24	CLAY	52.79	52.75	31.22	0.0013	0.013	3644	30223	544	OKAY	OKAY	625	OKAY	OKAY	1,256	OKAY	OKAY
1	E072-B	E023	8	PVC	53.96	53.86	9.02	0.0111	0.013	573	2466	132	OKAY	OKAY	144	OKAY	OKAY	211	OKAY	OKAY
1	E026	E027	10	CONC	55.54	55.13	145.72	0.0028	0.013	523	914	31	OKAY	OKAY	32	OKAY	OKAY	41	OKAY	OKAY
1	E038	E040	8	PVC	56.30	55.32	185.72	0.0053	0.013	395	727	19	OKAY	OKAY	22	OKAY	OKAY	34	OKAY	OKAY
1	E041	E040	8	CLAY	55.42	55.02	180.73	0.0022	0.013	256	458	28	OKAY	OKAY	32	OKAY	OKAY	53	OKAY	OKAY
1	E044	E041	8	CLAY	56.40	55.47	380.86	0.0024	0.013	269	381	16	OKAY	OKAY	19	OKAY	OKAY	32	OKAY	OKAY
1	E045	E044	8	CLAY	58.03	56.45	403.27	0.0039	0.013	340	444	5	OKAY	OKAY	6	OKAY	OKAY	11	OKAY	OKAY
1	E046	E045	8	CLAY	58.61	58.28	190.30	0.0017	0.013	226	430	3	OKAY	OKAY	4	OKAY	OKAY	7	OKAY	OKAY
1	E030	E047	24	DI	57.75	56.69	116.86	0.0091	0.013	9695	21786	373	OKAY	OKAY	436	OKAY	OKAY	967	OKAY	OKAY
1	E047	E048	24	PVC	56.69	56.6	83.21	0.0011	0.013	3348	22940	374	OKAY	OKAY	437	OKAY	OKAY	970	OKAY	OKAY
1	E048	E049	24	PVC	57.34	57.04	210.55	0.0014	0.013	3842	14626	376	OKAY	OKAY	439	OKAY	OKAY	973	OKAY	OKAY
1	E049	E050	24	PVC	57.04	56.57	365.00	0.0013	0.013	3653	11290	381	OKAY	OKAY	445	OKAY	OKAY	982	OKAY	OKAY
1	E050	E051	24	PVC	56.57	56.01	400.00	0.0014	0.013	3809	10955	387	OKAY	OKAY	452	OKAY	OKAY	996	OKAY	OKAY
1	E051	E052	24	PVC	55.17	54.83	356.40	0.0010	0.013	3144	11107	397	OKAY	OKAY	464	OKAY	OKAY	1,016	OKAY	OKAY
1	E052	E053	24	PVC	55.57	53.23	363.04	0.0064	0.013	8173	15356	405	OKAY	OKAY	473	OKAY	OKAY	1,032	OKAY	OKAY
1	E056	E054	10	CLAY	55.17	54.90	136.68	0.0020	0.013	438	976	132	OKAY	OKAY	144	OKAY	OKAY	211	OKAY	OKAY
1	E057	E056	10	CLAY	55.86	55.17	169.98	0.0041	0.013	628	1033	123	OKAY	OKAY	134	OKAY	OKAY	195	OKAY	OKAY
1	E058	E057	10	CLAY	56.21	55.86	160.47	0.0022	0.013	460	929	119	OKAY	OKAY	129	OKAY	OKAY	189	OKAY	OKAY
1	E059	E058	10	CLAY	56.73	56.36	20.34	0.0182	0.013	1330	2864	119	OKAY	OKAY	129	OKAY	OKAY	189	OKAY	OKAY
1	E060	E059	10	CLAY	58.26	56.93	407.71	0.0033	0.013	563	778	100	OKAY	OKAY	109	OKAY	OKAY	162	OKAY	OKAY
1	E061	E060	10	CLAY	59.32	59.24	176.74	0.0005	0.013	210	767	84	OKAY	OKAY	92	OKAY	OKAY	138	OKAY	OKAY
1	E063	E062	8	CLAY	59.67	59.42	22.52	0.0111	0.013	573	1301	9	OKAY	OKAY	10	OKAY	OKAY	15	OKAY	OKAY
1	E062	E061	8	CLAY	59.67	59.42	179.41	0.0014	0.013	203	424	11	OKAY	OKAY	12	OKAY	OKAY	18	OKAY	OKAY
1	E072	E061	8	CLAY	60.40	59.82	296.56	0.0020	0.013	240	381	71	OKAY	OKAY	77	OKAY	OKAY	114	OKAY	OKAY
1	E064	E063	8	CLAY	61.38	59.52	140.39	0.0132	0.013	626	837	8	OKAY	OKAY	9	OKAY	OKAY	13	OKAY	OKAY
1	E087	E086	8	CLAY	64.06	63.46	154.19	0.0039	0.013	339	548	22	OKAY	OKAY	23	OKAY	OKAY	30	OKAY	OKAY
1	E085-A	E084	8	CLAY	62.24	60.40	461.54	0.0040	0.013	343	438	36	OKAY	OKAY	38	OKAY	OKAY	53	OKAY	OKAY
1	E083	E084	10	CLAY	56.46	55.69	216.10	0.0036	0.013	588	932	15	OKAY	OKAY	16	OKAY	OKAY	20	OKAY	OKAY
1	E051-A	E098	8	CLAY	55.53	54.05	226.62	0.0065	0.013	439	592	41	OKAY	OKAY	47	OKAY	OKAY	74	OKAY	OKAY
1	E098	E049	10	CLAY	54.05	50.59	306.88	0.0113	0.013	1047	1314	43	OKAY	OKAY	48	OKAY	OKAY	76	OKAY	OKAY
1	E105	E106	10	CLAY	49.51	48.62	338.80	0.0026	0.013	505	760	109	OKAY	OKAY	114	OKAY	OKAY	150	OKAY	OKAY
1	E106	E109	10	CLAY	48.62	48.50	233.98	0.0005	0.013	223	674	130	OKAY	OKAY	136	OKAY	OKAY	177	OKAY	OKAY
1	E109-A	E105	10	CLAY	50.40	49.51	296.14	0.0030	0.013	540	818	99	OKAY	OKAY	103	OKAY	OKAY	136	OKAY	OKAY
1	E109	E110	10	CLAY	48.50	47.54	179.99	0.0053	0.013	720	1094	134	OKAY	OKAY	139	OKAY	OKAY	182	OKAY	OKAY
1	E110	E111	10	CLAY	47.54	46.78	263.60	0.0029	0.013	529	835	145	OKAY	OKAY	151	OKAY	OKAY	197	OKAY	OKAY
1	E111	E109	10	CLAY	51.02	50.40	261.68	0.0024	0.013	480	797	92	OKAY	OKAY	96	OKAY	OKAY	127	OKAY	OKAY
1	E111-A	E109-A	10	CLAY	46.78	46.18	165.95	0.0036	0.013	593	1012	157	OKAY	OKAY	163	OKAY	OKAY	211	OKAY	OKAY
1	E115	E111	10	CLAY	51.57	51.02	303.09	0.0018	0.013	420	717	89	OKAY	OKAY	94	OKAY	OKAY	124	OKAY	OKAY
1	E116	E115	10	CLAY	51.92	51.57	233.13	0.0015	0.013	382	759	82	OKAY	OKAY	85	OKAY	OKAY	113	OKAY	OKAY
1	E117	E116	10	CLAY	52.44	51.92	242.98	0.0021	0.013	456	799	77	OKAY	OKAY	81	OKAY	OKAY	107	OKAY	OKAY
1	E117-A	E116	8	CLAY	58.28	57.68	169.73	0.0035	0.013	323	520	24	OKAY	OKAY	25	OKAY	OKAY	32	OKAY	OKAY
1	E119	E120	8	CLAY	57.68	56.30	339.47	0.0041	0.013	347	463	33	OKAY	OKAY	35	OKAY	OKAY	44	OKAY	OKAY
1	E120-A	E117-A	8	CLAY	56.25	55.70	197.60	0.0028	0.013	287	469	40	OKAY	OKAY	42	OKAY	OKAY	53	OKAY	OKAY
1	E120	E117	10	CLAY	53.37	52.44	154.30	0.0060	0.013	765	1178	72	OKAY	OKAY	75	OKAY	OKAY	99	OKAY	OKAY
1	E121	E122	8	CLAY	55.77	55.29	21.60	0.0222	0.013	811	1502	40	OKAY	OKAY	42	OKAY	OKAY	53	OKAY	OKAY
1	E122-A	E120-A	10	CLAY	55.39	48.02	147.95	0.0498	0.013	2200	2766	46	OKAY	OKAY	47	OKAY	OKAY	60	OKAY	OKAY
1	E122	E120	8	CLAY	55.13	53.73	501.41	0.0028	0.013	287	377	63	OKAY	OKAY	66	OKAY	OKAY	87	OKAY	OKAY
1	F001	Fryelands PS	12	CLAY	13.67	13.57	58.333	0.0017	0.013	664	2494	300	OKAY	OKAY	319	OKAY	OKAY	436	OKAY	OKAY

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Assumptions:
1) Manning's 'n' values: All 0.013 (ORANGE BOOK). However, actual values are: 0.01 (PVC pipe), 0.014 (clay), 0.012 (DI), 0.015 (concrete)
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PIPE ID	MH UP	MH DOWN	DIA. (IN)	PIPE MATERIAL	IE IN	IE OUT	LENGTH (ft)	Slope "S"	Manning's "n"	100% Capacity (gpm)	200% Capacity (gpm)	2015 Peak Hour Flow (gpm)	OK for 2015 Flow at d/D = 1?	OK for 2015 Flow at d/D = 2?	Projected 2021 Peak Hour Flow (gpm)	OK for 2021 Flow at d/D = 1?	OK for 2021 Flow at d/D = 2?	Projected B/O Peak Hour Flow (gpm)	OK for B/O Flow at d/D = 1?	OK for B/O Flow at d/D = 2?
													DEFICIENT 11	DEFICIENT 3		DEFICIENT 14	DEFICIENT 3		DEFICIENT 26	DEFICIENT 9
1	F002	F001	12	PVC	14.23	13.77	175.08	0.0026	0.013	822	2042	300	OKAY	OKAY	319	OKAY	OKAY	436	OKAY	OKAY
1	F003	F002	12	PVC	15.16	14.23	234.78	0.0040	0.013	1009	2026	293	OKAY	OKAY	311	OKAY	OKAY	426	OKAY	OKAY
1	F004	F003	12	PVC	15.93	15.16	301.69	0.0026	0.013	810	1688	285	OKAY	OKAY	303	OKAY	OKAY	417	OKAY	OKAY
1	F005	F004	12	PVC	17.02	15.93	319.00	0.0034	0.013	937	1792	277	OKAY	OKAY	295	OKAY	OKAY	407	OKAY	OKAY
1	F006	F005	12	PVC	18.00	17.02	300.92	0.0033	0.013	915	1796	253	OKAY	OKAY	271	OKAY	OKAY	378	OKAY	OKAY
1	F007	F006	12	PVC	19.07	18.00	348.56	0.0031	0.013	888	1700	245	OKAY	OKAY	263	OKAY	OKAY	369	OKAY	OKAY
1	F008	F007	12	PVC	20.05	19.07	300.30	0.0033	0.013	916	1798	237	OKAY	OKAY	254	OKAY	OKAY	359	OKAY	OKAY
1	F009	F008	12	PVC	20.68	20.05	170.68	0.0037	0.013	974	2197	230	OKAY	OKAY	246	OKAY	OKAY	349	OKAY	OKAY
1	F010	F009	12	PVC	21.38	20.68	201.33	0.0035	0.013	945	2056	222	OKAY	OKAY	238	OKAY	OKAY	340	OKAY	OKAY
1	F011	F010	12	PVC	22.41	21.38	394.67	0.0026	0.013	819	1573	214	OKAY	OKAY	230	OKAY	OKAY	330	OKAY	OKAY
1	F012	F011	12	PVC	23.95	22.41	310.68	0.0050	0.013	1129	2020	190	OKAY	OKAY	206	OKAY	OKAY	301	OKAY	OKAY
1	F013	F012	12	PVC	24.67	23.95	127.03	0.0057	0.013	1207	2654	182	OKAY	OKAY	198	OKAY	OKAY	292	OKAY	OKAY
1	F014	F013	12	PVC	25.94	24.57	443.38	0.0031	0.013	891	1606	175	OKAY	OKAY	189	OKAY	OKAY	282	OKAY	OKAY
1	F015	F014	12	PVC	27.18	25.94	385.51	0.0032	0.013	909	1680	167	OKAY	OKAY	181	OKAY	OKAY	272	OKAY	OKAY
1	F017	F015	12	PVC	28.03	27.18	250.94	0.0034	0.013	933	1910	156	OKAY	OKAY	170	OKAY	OKAY	259	OKAY	OKAY
1	F018	F017	12	PVC	28.71	28.13	191.54	0.0030	0.013	882	2030	156	OKAY	OKAY	170	OKAY	OKAY	259	OKAY	OKAY
1	F019	F018	12	PVC	29.26	28.71	181.42	0.0030	0.013	883	2069	154	OKAY	OKAY	168	OKAY	OKAY	257	OKAY	OKAY
1	F078-B	F077	8	PVC	15.25	14.49	232.58	0.0033	0.013	311	595	389	DEFICIENT	OKAY	419	DEFICIENT	OKAY	607	DEFICIENT	DEFICIENT
1	F077	Fryelands PS	8	PVC	14.50	13.48	254.49	0.0040	0.013	344	621	389	DEFICIENT	OKAY	419	DEFICIENT	OKAY	607	DEFICIENT	OKAY
1	F081	F078	8	PVC	17.03	15.25	375.29	0.0047	0.013	374	615	228	OKAY	OKAY	243	OKAY	OKAY	338	OKAY	OKAY
1	F114	F078	8	PVC	16.39	15.25	294.35	0.0039	0.013	338	596	151	OKAY	OKAY	165	OKAY	OKAY	253	OKAY	OKAY
1	F083	F081	8	PVC	17.13	17.03	299.30	0.0003	0.013	99	371	219	DEFICIENT	OKAY	233	DEFICIENT	OKAY	322	DEFICIENT	OKAY
1	F084	F083	8	PVC	21.07	0.00	321.67	0.0655	0.013	1392	2178	215	OKAY	OKAY	230	OKAY	OKAY	317	OKAY	OKAY
1	F090	F084	8	PVC	23.32	21.07	370.25	0.0061	0.013	424	682	96	OKAY	OKAY	105	OKAY	OKAY	161	OKAY	OKAY
1	F149	F084	8	PVC	23.58	21.07	275.89	0.0091	0.013	519	837	106	OKAY	OKAY	110	OKAY	OKAY	135	OKAY	OKAY
1	F093	F090	8	PVC	25.04	23.32	332.99	0.0052	0.013	391	648	87	OKAY	OKAY	95	OKAY	OKAY	145	OKAY	OKAY
1	F094	F093	8	PVC	25.90	25.50	79.18	0.0051	0.013	386	911	84	OKAY	OKAY	91	OKAY	OKAY	140	OKAY	OKAY
1	F095	F094	8	PVC	26.33	25.90	90.98	0.0047	0.013	374	858	80	OKAY	OKAY	88	OKAY	OKAY	134	OKAY	OKAY
1	F098	F095	8	PVC	28.05	26.33	355.59	0.0048	0.013	378	625	71	OKAY	OKAY	77	OKAY	OKAY	118	OKAY	OKAY
1	F100	F098	8	PVC	29.75	28.05	350.65	0.0048	0.013	379	627	65	OKAY	OKAY	71	OKAY	OKAY	108	OKAY	OKAY
1	F103	F100	8	PVC	30.31	29.75	178.15	0.0031	0.013	305	634	55	OKAY	OKAY	60	OKAY	OKAY	92	OKAY	OKAY
1	F104	F103	10	PVC	31.16	30.81	172.20	0.0020	0.013	444	1139	52	OKAY	OKAY	57	OKAY	OKAY	87	OKAY	OKAY
1	F105	F104	8	PVC	31.97	31.16	314.81	0.0026	0.013	276	515	44	OKAY	OKAY	49	OKAY	OKAY	74	OKAY	OKAY
1	F106	F105	10	PVC	32.81	31.97	318.98	0.0026	0.013	506	984	37	OKAY	OKAY	40	OKAY	OKAY	62	OKAY	OKAY
1	F110	F106	10	PVC	33.43	32.81	249.67	0.0025	0.013	491	1041	23	OKAY	OKAY	25	OKAY	OKAY	38	OKAY	OKAY
1	F111	F110	10	PVC	33.84	33.43	138.57	0.0030	0.013	536	1315	19	OKAY	OKAY	21	OKAY	OKAY	32	OKAY	OKAY
1	F111-B	F111	10	PVC	34.52	33.04	238.33	0.0062	0.013	777	1372	13	OKAY	OKAY	14	OKAY	OKAY	22	OKAY	OKAY
1	F119	F114	8	PVC	17.97	16.39	290.76	0.0054	0.013	401	675	135	OKAY	OKAY	148	OKAY	OKAY	226	OKAY	OKAY
1	F121	F119	8	PVC	19.53	17.97	292.44	0.0053	0.013	397	669	129	OKAY	OKAY	141	OKAY	OKAY	216	OKAY	OKAY
1	F123	F121	8	PVC	19.95	19.53	71.89	0.0058	0.013	416	970	123	OKAY	OKAY	134	OKAY	OKAY	205	OKAY	OKAY
1	F124	F123	8	PVC	21.37	19.95	186.80	0.0076	0.013	474	823	120	OKAY	OKAY	131	OKAY	OKAY	200	OKAY	OKAY
1	F126	F125	8	PVC	23.48	21.90	397.39	0.0040	0.013	343	570	107	OKAY	OKAY	117	OKAY	OKAY	178	OKAY	OKAY
1	F152	F151	8	PVC	27.94	26.45	276.42	0.0054	0.013	399	678	68	OKAY	OKAY	69	OKAY	OKAY	72	OKAY	OKAY
1	F151	F150	8	PVC	26.45	25.20	242.39	0.0052	0.013	390	683	78	OKAY	OKAY	79	OKAY	OKAY	87	OKAY	OKAY
1	F150	F149	8	PVC	25.20	23.58	275.37	0.0059	0.013	417	701	87	OKAY	OKAY	90	OKAY	OKAY	103	OKAY	OKAY
1	VS018	VS013	10	PVC	43.62	42.89	150.48	0.0049	0.013	687	1424	147	OKAY	OKAY	165	OKAY	OKAY	315	OKAY	OKAY
1	RH002	RH001	8	PVC	183.59	182.42	139.71	0.0084	0.013	498	899	44	OKAY	OKAY	59	OKAY	OKAY	158	OKAY	OKAY
1	RH003	RH002	8	PVC	187.78	183.82	111.78	0.0354	0.013	1023	1671	43	OKAY	OKAY	58	OKAY	OKAY	153	OKAY	OKAY
1	RH004	RH003	8	PVC	202.71	188.01	196.20	0.0749	0.013	1488	2359	42	OKAY	OKAY	56	OKAY	OKAY	149	OKAY	OKAY
1	RH011	RH004	8	PVC	212.74	211.23	305.33	0.0049	0.013	382	646	32	OKAY	OKAY	43	OKAY	OKAY	114	OKAY	OKAY
1	RH013	RH011	8	PVC	228.93	219.90	216.12	0.0418	0.013	1111	1746	30	OKAY	OKAY	40	OKAY	OKAY	106	OKAY	OKAY
1	RH014	RH013	8	PVC	224.60	224.07	112.36	0.0047	0.013	373	802	29	OKAY	OKAY	39	OKAY	OKAY	102	OKAY	OKAY
1	RH016	RH014	8	PVC	227.15	224.69	251.54	0.0098	0.013	538	872	28	OKAY	OKAY	37	OKAY	OKAY	98	OKAY	OKAY
1	RH104	RH103	8	PVC	187.33	184.65	129.52	0.0207	0.013	782	1295	17	OKAY	OKAY	23	OKAY	OKAY	60	OKAY	OKAY
1	RH105	RH103	15	PVC	208.87	184.65	206.97	0.1170	0.013	9944	15733	35	OKAY	OKAY	48	OKAY	OKAY	126	OKAY	OKAY
1	RH101	RH100	20	DI	142.60	118.52	367.20	0.0656	0.013	16031	22970	106	OKAY	OKAY	142	OKAY	OKAY	376	OKAY	OKAY
1	RH102	RH101	20	DI	171.24	142.60	103.07	0.2779	0.013	32999	49852	106	OKAY	OKAY	142	OKAY	OKAY	376	OKAY	OKAY
1	RH103	RH102	12	PVC	184.65	171.24	345.91	0.0388	0.013	3157	4871	53	OKAY	OKAY	72	OKAY	OKAY	190	OKAY	OKAY
1	RH106	RH102	8	DI	174.23	171.24	148.33	0.0202	0.013	772	1173	44	OKAY	OKAY	59	OKAY	OKAY	156	OKAY	OKAY
1	RH107	RH106	8	PVC	191.12	174.23	389.97	0.0433	0.013	1132	1749	42	OKAY	OKAY	57	OKAY	OKAY	151	OKAY	OKAY
1	RH108	RH107	8	PVC	202.43	191.12	265.34	0.0426	0.013	1123	1751	31	OKAY	OKAY	42	OKAY	OKAY	110	OKAY	OKAY

City of Monroe
General Sewer Plan
Hydraulic Model - Southwest Study Area Inclusion
Prepared by: Preston Love
Reviewed by: Adam Schuyler/Peter Cunningham
13 February 2015
S:\Projects\Monroe\2015 Utility Plans\Sewer Model\[Hydraulic Sewer Model 2014 - SW Study Area Inc

LEGEND	
Abbr.	**Basin**
B	Beaton
C	Cate's
E	Eastside
F	Fyelands
MH	Milwaukee Hill
RH	Reservoir Hill
S	Sawyer
SF	South Fryeland
SC	State Corrections
VN	Valley View North
VS	Valley View South
WM	West Main
WC	Woods Creek
SWSA	Southwest Study Area

C_{DIP} = 130
$C_{CONC/RCP}$ = 100
C_{PVC} = 140
C_{CLAY} = 110

Assumptions:
1) Manning's 'n' values: All 0.013 (ORANGE BOOK). However, actual values are: 0.01 (PVC pipe), 0.014 (clay), 0.012 (DI), 0.015 (concrete)
2) Where no pipe type is given, PVC is assumed
3) hL equal to one pipe diameter above upstream crown minus downstream crown

	OK for 2015 Flow at d/D = 1?	OK for 2015 Flow at d/D = 2?	OK for 2021 Flow at d/D = 1?	OK for 2021 Flow at d/D = 2?	OK for B/O Flow at d/D = 1?	OK for B/O Flow at d/D = 2?
DEFICIENT	11	3	14	3	26	9

PIPE ID	MH UP	MH DOWN	DIA. (IN)	PIPE MATERIAL	IE IN	IE OUT	LENGTH (ft)	Slope "S"	Manning's "n"	100% Capacity (gpm)	200% Capacity (gpm)	2015 Peak Hour Flow (gpm)	OK for 2015 Flow at d/D = 1?	OK for 2015 Flow at d/D = 2?	Projected 2021 Peak Hour Flow (gpm)	OK for 2021 Flow at d/D = 1?	OK for 2021 Flow at d/D = 2?	Projected B/O Peak Hour Flow (gpm)	OK for B/O Flow at d/D = 1?	OK for B/O Flow at d/D = 2?
1	RH109	RH108	8	PVC	204.70	202.43	170.04	0.0133	0.013	628	**1042**	**30**	**OKAY**	**OKAY**	**40**	**OKAY**	**OKAY**	**105**	**OKAY**	**OKAY**
1	RH110	RH109	8	PVC	205.56	204.70	90.29	0.0095	0.013	531	**1030**	**28**	**OKAY**	**OKAY**	**38**	**OKAY**	**OKAY**	**101**	**OKAY**	**OKAY**
1	RH111	RH110	8	PVC	207.01	205.56	188.23	0.0077	0.013	477	**826**	**27**	**OKAY**	**OKAY**	**36**	**OKAY**	**OKAY**	**96**	**OKAY**	**OKAY**
1	S001	Sawyer PS	8	PVC	23.38	22.88	88.58	0.0056	0.013	409	**900**	**43**	**OKAY**	**OKAY**	**43**	**OKAY**	**OKAY**	**44**	**OKAY**	**OKAY**
1	S002	S001	8	PVC	24.56	23.39	334.13	0.0035	0.013	322	**561**	**40**	**OKAY**	**OKAY**	**40**	**OKAY**	**OKAY**	**41**	**OKAY**	**OKAY**
1	S016	Sawyer PS	8	PVC	24.59	23.38	262.79	0.0046	0.013	369	**646**	**22**	**OKAY**	**OKAY**	**22**	**OKAY**	**OKAY**	**23**	**OKAY**	**OKAY**
1	SF001	South Fryelands PS	8	PVC	19.10	0.00	18.35	1.0408	0.013	5547	**9729**	**466**	**OKAY**	**OKAY**	**520**	**OKAY**	**OKAY**	**979**	**OKAY**	**OKAY**
1	SF002	SF001	8	PVC	20.26	19.10	258.16	0.0045	0.013	364	**643**	**267**	**OKAY**	**OKAY**	**316**	**OKAY**	**OKAY**	**735**	**DEFICIENT**	**DEFICIENT**
1	SF116	SF001	8	PVC	20.25	19.10	195.00	0.0059	0.013	418	**746**	**193**	**OKAY**	**OKAY**	**198**	**OKAY**	**OKAY**	**237**	**OKAY**	**OKAY**
1	SF003	SF002	8	PVC	20.66	20.26	129.82	0.0031	0.013	302	**697**	**263**	**OKAY**	**OKAY**	**312**	**DEFICIENT**	**OKAY**	**730**	**DEFICIENT**	**DEFICIENT**
1	SF004	SF003	8	PVC	20.88	20.66	64.73	0.0034	0.013	317	**919**	**259**	**OKAY**	**OKAY**	**307**	**OKAY**	**OKAY**	**726**	**DEFICIENT**	**OKAY**
1	SF005	SF004	12	PVC	25.49	20.88	258.95	0.0178	0.013	2139	**3421**	**197**	**OKAY**	**OKAY**	**245**	**OKAY**	**OKAY**	**652**	**OKAY**	**OKAY**
1	SF006	SF005	12	PVC	26.15	25.49	251.99	0.0026	0.013	820	**1798**	**193**	**OKAY**	**OKAY**	**240**	**OKAY**	**OKAY**	**647**	**OKAY**	**OKAY**
1	SF009	SF007	12	PVC	27.22	26.68	197.53	0.0027	0.013	838	**1969**	**181**	**OKAY**	**OKAY**	**228**	**OKAY**	**OKAY**	**632**	**OKAY**	**OKAY**
1	SF011	SF009	12	PVC	28.10	27.22	304.67	0.0029	0.013	862	**1735**	**173**	**OKAY**	**OKAY**	**220**	**OKAY**	**OKAY**	**622**	**OKAY**	**OKAY**
1	SF015	SF011	12	PVC	29.16	28.10	184.16	0.0058	0.013	1216	**2393**	**156**	**OKAY**	**OKAY**	**203**	**OKAY**	**OKAY**	**601**	**OKAY**	**OKAY**
1	SF016	SF015	12	PVC	32.04	29.16	294.65	0.0098	0.013	1585	**2614**	**151**	**OKAY**	**OKAY**	**198**	**OKAY**	**OKAY**	**594**	**OKAY**	**OKAY**
1	SF017	SF016	12	PVC	44.22	32.04	305.73	0.0398	0.013	3200	**4962**	**146**	**OKAY**	**OKAY**	**192**	**OKAY**	**OKAY**	**588**	**OKAY**	**OKAY**
1	SF018	SF017	12	PVC	52.13	44.22	269.04	0.0294	0.013	2749	**4303**	**145**	**OKAY**	**OKAY**	**191**	**OKAY**	**OKAY**	**586**	**OKAY**	**OKAY**
1	SWSA	SF018	8	PVC	52.63	52.13	53.30	0.0094	0.013	527	**1184**	**0**	**OKAY**	**OKAY**	**9**	**OKAY**	**OKAY**	**87**	**OKAY**	**OKAY**
1	SF049	SF048-B	8	PVC	22.35	21.28	238.88	0.0045	0.013	364	**653**	**99**	**OKAY**	**OKAY**	**101**	**OKAY**	**OKAY**	**120**	**OKAY**	**OKAY**
1	SF048-B	SF048	8	PVC	21.28	20.25	282.71	0.0036	0.013	328	**588**	**105**	**OKAY**	**OKAY**	**107**	**OKAY**	**OKAY**	**127**	**OKAY**	**OKAY**
1	SF051	SF050	8	PVC	24.07	23.44	156.87	0.0040	0.013	345	**700**	**91**	**OKAY**	**OKAY**	**93**	**OKAY**	**OKAY**	**110**	**OKAY**	**OKAY**
1	SF061	SF051	8	PVC	24.89	24.07	157.00	0.0052	0.013	393	**753**	**75**	**OKAY**	**OKAY**	**77**	**OKAY**	**OKAY**	**91**	**OKAY**	**OKAY**
1	SF062	SF061	8	PVC	26.23	24.89	338.42	0.0040	0.013	342	**585**	**73**	**OKAY**	**OKAY**	**75**	**OKAY**	**OKAY**	**89**	**OKAY**	**OKAY**
1	SF063	SF062	8	PVC	27.00	26.23	180.30	0.0043	0.013	355	**686**	**68**	**OKAY**	**OKAY**	**69**	**OKAY**	**OKAY**	**82**	**OKAY**	**OKAY**
1	SF064	SF063	8	PVC	28.43	27.00	283.56	0.0050	0.013	386	**659**	**66**	**OKAY**	**OKAY**	**67**	**OKAY**	**OKAY**	**80**	**OKAY**	**OKAY**
1	SF081	SF080	10	PVC	25.82	24.82	233.48	0.0043	0.013	645	**1224**	**80**	**OKAY**	**OKAY**	**83**	**OKAY**	**OKAY**	**100**	**OKAY**	**OKAY**
1	SF096	SF081	10	PVC	26.30	25.82	141.92	0.0034	0.013	573	**1337**	**51**	**OKAY**	**OKAY**	**53**	**OKAY**	**OKAY**	**65**	**OKAY**	**OKAY**
1	SF099	SF096	10	PVC	27.37	26.30	266.36	0.0040	0.013	625	**1163**	**45**	**OKAY**	**OKAY**	**47**	**OKAY**	**OKAY**	**58**	**OKAY**	**OKAY**
1	SF100	SF099	10	PVC	28.01	27.47	98.59	0.0055	0.013	730	**1668**	**25**	**OKAY**	**OKAY**	**26**	**OKAY**	**OKAY**	**33**	**OKAY**	**OKAY**
1	SF050	SF115	8	PVC	23.44	22.35	246.69	0.0044	0.013	361	**645**	**93**	**OKAY**	**OKAY**	**95**	**OKAY**	**OKAY**	**113**	**OKAY**	**OKAY**
1	SF080	SF116	10	PVC	24.82	20.25	309.14	0.0148	0.013	1199	**1886**	**82**	**OKAY**	**OKAY**	**85**	**OKAY**	**OKAY**	**103**	**OKAY**	**OKAY**
1	VN003	VN002	12	PVC	36.14	34.36	348.53	0.0051	0.013	1146	**1993**	**451**	**OKAY**	**OKAY**	**490**	**OKAY**	**OKAY**	**898**	**OKAY**	**OKAY**
1	VN004	VN003	12	PVC	37.98	36.14	358.66	0.0051	0.013	1148	**1986**	**448**	**OKAY**	**OKAY**	**486**	**OKAY**	**OKAY**	**888**	**OKAY**	**OKAY**
1	VN013	VN004	12	PVC	39.50	38.47	290.81	0.0035	0.013	954	**1855**	**400**	**OKAY**	**OKAY**	**433**	**OKAY**	**OKAY**	**755**	**OKAY**	**OKAY**
1	VN014	VN013	12	PVC	40.47	39.60	160.86	0.0054	0.013	1179	**2444**	**393**	**OKAY**	**OKAY**	**424**	**OKAY**	**OKAY**	**734**	**OKAY**	**OKAY**
1	VN022	VN014	12	PVC	41.47	40.57	188.06	0.0048	0.013	1109	**2265**	**375**	**OKAY**	**OKAY**	**405**	**OKAY**	**OKAY**	**685**	**OKAY**	**OKAY**
1	VN027	VN022	12	PVC	43.74	41.48	435.82	0.0052	0.013	1154	**1925**	**355**	**OKAY**	**OKAY**	**382**	**OKAY**	**OKAY**	**628**	**OKAY**	**OKAY**
1	VN031	VN027	12	PVC	45.33	43.74	299.03	0.0053	0.013	1169	**2084**	**340**	**OKAY**	**OKAY**	**365**	**OKAY**	**OKAY**	**584**	**OKAY**	**OKAY**
1	VN032	VN031	12	PVC	46.83	45.33	278.51	0.0054	0.013	1177	**2125**	**331**	**OKAY**	**OKAY**	**355**	**OKAY**	**OKAY**	**559**	**OKAY**	**OKAY**
1	VN033	VN032	12	PVC	47.43	46.83	102.12	0.0059	0.013	1229	**2871**	**320**	**OKAY**	**OKAY**	**343**	**OKAY**	**OKAY**	**529**	**OKAY**	**OKAY**
1	VN034	VN033	12	PVC	49.39	47.53	362.88	0.0051	0.013	1148	**1981**	**312**	**OKAY**	**OKAY**	**334**	**OKAY**	**OKAY**	**505**	**OKAY**	**OKAY**
1	VN035	VN034	12	PVC	51.06	49.49	367.84	0.0043	0.013	1047	**1856**	**303**	**OKAY**	**OKAY**	**324**	**OKAY**	**OKAY**	**480**	**OKAY**	**OKAY**
1	VN036	VN035	12	PVC	51.40	51.06	51.21	0.0066	0.013	1306	**3789**	**15**	**OKAY**	**OKAY**	**17**	**OKAY**	**OKAY**	**41**	**OKAY**	**OKAY**
1	VN041	VN035	12	PVC	52.69	51.78	108.79	0.0084	0.013	1466	**3054**	**278**	**OKAY**	**OKAY**	**296**	**OKAY**	**OKAY**	**410**	**OKAY**	**OKAY**
1	VN037	VN036	12	PVC	51.64	51.40	151.59	0.0016	0.013	638	**2021**	**11**	**OKAY**	**OKAY**	**12**	**OKAY**	**OKAY**	**30**	**OKAY**	**OKAY**
1	VN038	VN037	12	PVC	52.56	51.64	319.70	0.0029	0.013	860	**1710**	**7**	**OKAY**	**OKAY**	**7**	**OKAY**	**OKAY**	**19**	**OKAY**	**OKAY**
1	VN042	VN041	12	DI	52.78	52.69	123.29	0.0007	0.013	433	**1957**	**270**	**OKAY**	**OKAY**	**286**	**OKAY**	**OKAY**	**387**	**OKAY**	**OKAY**
1	VN044	VN042	12	PVC	53.80	52.78	171.56	0.0059	0.013	1236	**2460**	**265**	**OKAY**	**OKAY**	**281**	**OKAY**	**OKAY**	**382**	**OKAY**	**OKAY**
1	VN045	VN044	12	PVC	54.63	53.80	95.48	0.0087	0.013	1495	**3202**	**158**	**OKAY**	**OKAY**	**168**	**OKAY**	**OKAY**	**238**	**OKAY**	**OKAY**
1	VN067	VN044	12	PVC	55.48	53.80	320.94	0.0052	0.013	1160	**2043**	**102**	**OKAY**	**OKAY**	**108**	**OKAY**	**OKAY**	**139**	**OKAY**	**OKAY**
1	VN051	VN045	12	PVC	55.66	54.87	304.92	0.0026	0.013	816	**1689**	**100**	**OKAY**	**OKAY**	**110**	**OKAY**	**OKAY**	**178**	**OKAY**	**OKAY**
1	VN052	VN051	12	PVC	56.35	0.00	286.10	0.1970	0.013	7115	**11388**	**81**	**OKAY**	**OKAY**	**91**	**OKAY**	**OKAY**	**158**	**OKAY**	**OKAY**
1	VN054	VN052	12	PVC	56.95	56.35	320.99	0.0019	0.013	693	**1546**	**47**	**OKAY**	**OKAY**	**57**	**OKAY**	**OKAY**	**123**	**OKAY**	**OKAY**
1	VN055	VN054	12	PVC	57.05	56.95	152.54	0.0007	0.013	410	**1888**	**39**	**OKAY**	**OKAY**	**49**	**OKAY**	**OKAY**	**114**	**OKAY**	**OKAY**
1	VN056	VN0555	12	PVC	57.33	57.05	187.62	0.0015	0.013	619	**1832**	**37**	**OKAY**	**OKAY**	**46**	**OKAY**	**OKAY**	**109**	**OKAY**	**OKAY**
1	VN057	VN056	12	PVC	65.20	0.00	344.86	0.1891	0.013	6971	**11125**	**35**	**OKAY**	**OKAY**	**43**	**OKAY**	**OKAY**	**104**	**OKAY**	**OKAY**
1	VN068	VN067	12	PVC	57.03	55.34	340.71	0.0050	0.013	1129	**1982**	**99**	**OKAY**	**OKAY**	**105**	**OKAY**	**OKAY**	**136**	**OKAY**	**OKAY**
1	VN069	VN068	12	PVC	58.16	57.13	386.86	0.0027	0.013	827	**1590**	**96**	**OKAY**	**OKAY**	**102**	**OKAY**	**OKAY**	**133**	**OKAY**	**OKAY**
1	VN070	VN069	12	PVC	60.77	58.26	325.70	0.0077	0.013	1407	**2345**	**82**	**OKAY**	**OKAY**	**87**	**OKAY**	**OKAY**	**118**	**OKAY**	**OKAY**

City of Monroe
General Sewer Plan
Hydraulic Model - Southwest Study Area Inclusion
Prepared by: Preston Love
Reviewed by: Adam Schuyler/Peter Cunningham
13 February 2015
S:\Projects\Monroe\2015 Utility Plans\Sewer Model\[Hydraulic Sewer Model 2014 - SW Study Area Inc

LEGEND	
Abbr.	Basin
B	Beaton
C	Cate's
E	Eastside
F	Fyelands
MH	Milwaukee Hill
RH	Reservoir Hill
S	Sawyer
SF	South Fryeland
SC	State Corrections
VN	Valley View North
VS	Valley View South
WM	West Main
WC	Woods Creek
SWSA	Southwest Study Area

C_{DIP} = 130
$C_{CONC/RCP}$ = 100
C_{PVC} = 140
C_{CLAY} = 110

Assumptions:
1) Manning's 'n' values: All 0.013 (ORANGE BOOK). However, actual values are: 0.01 (PVC pipe), 0.014 (clay), 0.012 (DI), 0.015 (concrete)
2) Where no pipe type is given, PVC is assumed
3) hL equal to one pipe diameter above upstream crown minus downstream crown

	OK for 2015 Flow at d/D = 1?	OK for 2015 Flow at d/D = 2?	OK for 2021 Flow at d/D = 1?	OK for 2021 Flow at d/D = 2?	OK for B/O Flow at d/D = 1?	OK for B/O Flow at d/D = 2?
	DEFICIENT	DEFICIENT	DEFICIENT	DEFICIENT	DEFICIENT	DEFICIENT
	11	3	14	3	26	9

PIPE ID	MH UP	MH DOWN	DIA. (IN)	PIPE MATERIAL	IE IN	IE OUT	LENGTH (ft)	Slope "S"	Manning's "n"	100% Capacity (gpm)	200% Capacity (gpm)	2015 Peak Hour Flow (gpm)	OK for 2015 Flow at d/D = 1?	OK for 2015 Flow at d/D = 2?	Projected 2021 Peak Hour Flow (gpm)	OK for 2021 Flow at d/D = 1?	OK for 2021 Flow at d/D = 2?	Projected B/O Peak Hour Flow (gpm)	OK for B/O Flow at d/D = 1?	OK for B/O Flow at d/D = 2?
1	VN071	VN070	12	PVC	62.95	0.00	353.81	0.1779	0.013	6762	10769	78	OKAY	OKAY	84	OKAY	OKAY	115	OKAY	OKAY
1	VN072	VN071	8	PVC	73.84	62.95	103.30	0.1054	0.013	1765	2860	55	OKAY	OKAY	61	OKAY	OKAY	91	OKAY	OKAY
1	VS004	VS003	18	PVC	39.06	38.74	246.04	0.0013	0.013	1705	5559	135	OKAY	OKAY	165	OKAY	OKAY	405	OKAY	OKAY
1	VS006	VS005	18	PVC	39.59	39.30	96.49	0.0030	0.013	2591	9138	112	OKAY	OKAY	137	OKAY	OKAY	333	OKAY	OKAY
1	VS007	VS006	18	PVC	39.91	39.59	310.36	0.0010	0.013	1518	4903	104	OKAY	OKAY	127	OKAY	OKAY	308	OKAY	OKAY
1	VS009	VS007	18	PVC	40.26	40.20	38.38	0.0016	0.013	1869	13964	83	OKAY	OKAY	102	OKAY	OKAY	250	OKAY	OKAY
1	VS010	VS007	15	PVC	41.46	39.91	235.17	0.0066	0.013	2360	4452	78	OKAY	OKAY	96	OKAY	OKAY	237	OKAY	OKAY
1	VS011	VS010	15	PVC	41.93	41.46	260.78	0.0018	0.013	1234	3235	73	OKAY	OKAY	90	OKAY	OKAY	225	OKAY	OKAY
1	VS012	VS011	15	PVC	42.40	41.93	281.33	0.0017	0.013	1188	3105	14	OKAY	OKAY	16	OKAY	OKAY	33	OKAY	OKAY
1	VS039	VS011	8	PVC	43.57	41.93	376.37	0.0044	0.013	359	595	51	OKAY	OKAY	64	OKAY	OKAY	170	OKAY	OKAY
1	VS013	VS012	15	PVC	42.84	42.30	329.95	0.0016	0.013	1176	2911	7	OKAY	OKAY	9	OKAY	OKAY	18	OKAY	OKAY
1	VS014	Park Place PS	18	PVC	44.10	43.30	30.00	0.0267	0.013	7719	19677	1,432	OKAY	OKAY	1,518	OKAY	OKAY	2,022	OKAY	OKAY
1	VS015	VS014	10	PVC	45.12	44.06	273.41	0.0039	0.013	614	1143	1,428	DEFICIENT	DEFICIENT	1,513	DEFICIENT	DEFICIENT	2,011	DEFICIENT	DEFICIENT
1	VS016	VS015	10	PVC	46.01	45.12	283.86	0.0031	0.013	552	1065	1,383	DEFICIENT	DEFICIENT	1,455	DEFICIENT	DEFICIENT	1,869	DEFICIENT	DEFICIENT
1	VS017	VS016	10	PVC	46.34	46.11	71.96	0.0032	0.013	557	1722	1,379	DEFICIENT	OKAY	1,451	DEFICIENT	OKAY	1,861	DEFICIENT	DEFICIENT
1	SC001	VS017	10	PVC	47.20	46.34	481.93	0.0018	0.013	416	792	1,229	DEFICIENT	DEFICIENT	1,282	DEFICIENT	DEFICIENT	1,539	DEFICIENT	DEFICIENT
1	VS019	VS018	10	PVC	44.77	43.62	320.25	0.0036	0.013	591	1076	142	OKAY	OKAY	160	OKAY	OKAY	306	OKAY	OKAY
1	VS020	VS019	10	PVC	46.44	44.77	284.34	0.0059	0.013	756	1302	138	OKAY	OKAY	155	OKAY	OKAY	297	OKAY	OKAY
1	VS021	VS020	10	PVC	46.57	45.98	127.18	0.0046	0.013	672	1482	133	OKAY	OKAY	150	OKAY	OKAY	287	OKAY	OKAY
1	VS022	VS021	10	PVC	47.29	46.67	215.53	0.0029	0.013	529	1127	129	OKAY	OKAY	145	OKAY	OKAY	278	OKAY	OKAY
1	VS027	VS022	10	PVC	48.29	47.39	331.93	0.0027	0.013	513	982	85	OKAY	OKAY	95	OKAY	OKAY	197	OKAY	OKAY
1	VS028	VS027	10	PVC	49.20	49.00	289.83	0.0007	0.013	259	799	79	OKAY	OKAY	89	OKAY	OKAY	186	OKAY	OKAY
1	VS029	VS028	10	PVC	49.50	49.20	103.63	0.0029	0.013	530	1464	72	OKAY	OKAY	82	OKAY	OKAY	176	OKAY	OKAY
1	VS030	VS029	10	PVC	49.94	49.50	160.73	0.0027	0.013	516	1230	66	OKAY	OKAY	75	OKAY	OKAY	166	OKAY	OKAY
1	VS031	VS030	10	PVC	50.75	49.94	287.72	0.0028	0.013	523	1030	60	OKAY	OKAY	68	OKAY	OKAY	155	OKAY	OKAY
1	VS033	VS031	10	PVC	51.47	50.75	259.91	0.0028	0.013	519	1056	49	OKAY	OKAY	56	OKAY	OKAY	137	OKAY	OKAY
1	VS034	VS033	10	PVC	52.26	51.47	282.45	0.0028	0.013	521	1034	43	OKAY	OKAY	49	OKAY	OKAY	127	OKAY	OKAY
1	VS035	VS034	10	PVC	52.93	52.26	241.18	0.0028	0.013	520	1080	37	OKAY	OKAY	42	OKAY	OKAY	78	OKAY	OKAY
1	VS037	VS035	10	PVC	53.26	52.93	112.96	0.0029	0.013	533	1417	27	OKAY	OKAY	31	OKAY	OKAY	57	OKAY	OKAY
1	VS038	VS037	10	PVC	54.35	52.93	395.71	0.0036	0.013	591	1029	18	OKAY	OKAY	21	OKAY	OKAY	38	OKAY	OKAY
1	VS038-B	VS038	10	PVC	55.19	54.35	300.00	0.0028	0.013	522	1017	9	OKAY	OKAY	10	OKAY	OKAY	19	OKAY	OKAY
1	VS040	VS039	8	PVC	44.84	43.57	423.08	0.0030	0.013	298	508	44	OKAY	OKAY	55	OKAY	OKAY	147	OKAY	OKAY
1	VS005	VS04	18	PVC	39.30	39.06	168.35	0.0014	0.013	1785	6661	120	OKAY	OKAY	147	OKAY	OKAY	358	OKAY	OKAY
1	VS003	VS002	18	PVC	38.74	38.41	167.57	0.0020	0.013	2098	6862	174	OKAY	OKAY	213	OKAY	OKAY	525	OKAY	OKAY
1	VS002	VS001	18	PVC	38.47	37.81	186.72	0.0035	0.013	2810	7079	182	OKAY	OKAY	223	OKAY	OKAY	550	OKAY	OKAY
1	VS001	Valley View PS	18	PVC	37.81	37.47	273.61	0.0012	0.013	1666	5280	190	OKAY	OKAY	233	OKAY	OKAY	575	OKAY	OKAY
1	WC001	E030	24	PVC	57.08	57.01	65.00	0.0011	0.013	3341	26080	369	OKAY	OKAY	432	OKAY	OKAY	962	OKAY	OKAY
1	WC003	WC002	24	PVC	58.22	57.92	208.07	0.0014	0.013	3865	14720	366	OKAY	OKAY	428	OKAY	OKAY	957	OKAY	OKAY
1	WC004	WC003	24	PVC	58.63	58.22	314.25	0.0013	0.013	3677	12080	362	OKAY	OKAY	424	OKAY	OKAY	953	OKAY	OKAY
1	WC005	WC004	24	PVC	58.86	58.63	159.83	0.0014	0.013	3862	16694	362	OKAY	OKAY	424	OKAY	OKAY	952	OKAY	OKAY
1	WC006	WC005	24	PVC	59.31	58.86	303.52	0.0015	0.013	3920	12419	360	OKAY	OKAY	422	OKAY	OKAY	950	OKAY	OKAY
1	WC007-C	WC006	24	PVC	60.43	59.41	374.48	0.0027	0.013	5313	12413	317	OKAY	OKAY	378	OKAY	OKAY	898	OKAY	OKAY
1	WC006-C	Old Owen PS	8	PVC	53.38	53.12	40.69	0.0064	0.013	435	1210	35	OKAY	OKAY	36	OKAY	OKAY	42	OKAY	OKAY
1	WC006-B	WC006-C	8	PVC	53.48	53.38	32.72	0.0031	0.013	301	1229	29	OKAY	OKAY	30	OKAY	OKAY	35	OKAY	OKAY
1	WC005-C	WC006-B	8	PVC	55.52	53.48	294.57	0.0069	0.013	453	741	27	OKAY	OKAY	28	OKAY	OKAY	33	OKAY	OKAY
1	WC005-B	WC005-C	8	PVC	57.91	55.62	407.48	0.0056	0.013	408	652	25	OKAY	OKAY	26	OKAY	OKAY	30	OKAY	OKAY
1	WC008	WC007	18	PVC	60.89	60.53	102.72	0.0035	0.013	2798	9020	311	OKAY	OKAY	366	OKAY	OKAY	780	OKAY	OKAY
1	WC009	WC008	18	PVC	62.54	60.99	373.64	0.0041	0.013	3044	5863	309	OKAY	OKAY	364	OKAY	OKAY	778	OKAY	OKAY
1	WC010	WC009	18	PVC	63.71	62.64	214.44	0.0050	0.013	3339	7216	307	OKAY	OKAY	362	OKAY	OKAY	776	OKAY	OKAY
1	WC011	WC010	18	PVC	64.11	63.71	143.29	0.0028	0.013	2497	7621	307	OKAY	OKAY	362	OKAY	OKAY	776	OKAY	OKAY
1	WC012	WC011	18	PVC	65.00	64.11	348.37	0.0026	0.013	2389	5337	307	OKAY	OKAY	362	OKAY	OKAY	775	OKAY	OKAY
1	WC013	WC012	18	PVC	65.22	65.00	54.29	0.0041	0.013	3009	12203	307	OKAY	OKAY	362	OKAY	OKAY	775	OKAY	OKAY
1	WC014	WC013	18	PVC	67.03	65.22	76.44	0.0237	0.013	7273	14449	305	OKAY	OKAY	360	OKAY	OKAY	773	OKAY	OKAY
1	WC015	WC014	18	PVC	70.17	67.03	301.00	0.0104	0.013	4828	8268	303	OKAY	OKAY	358	OKAY	OKAY	771	OKAY	OKAY
1	WC016	WC015	18	PVC	72.18	70.17	398.91	0.0050	0.013	3355	6106	301	OKAY	OKAY	356	OKAY	OKAY	768	OKAY	OKAY
1	WC017	WC016	18	PVC	74.36	72.18	399.04	0.0055	0.013	3494	6263	299	OKAY	OKAY	354	OKAY	OKAY	765	OKAY	OKAY
1	WC018	WC017-C	10	PVC	118.10	77.77	302.68	0.1332	0.013	3599	5717	271	OKAY	OKAY	301	OKAY	OKAY	539	OKAY	OKAY
1	WC017-C	WC017-B	10	PVC	77.61	75.93	36.58	0.0459	0.013	2113	3953	274	OKAY	OKAY	303	OKAY	OKAY	543	OKAY	OKAY
1	WC017-B	WC017	18	PVC	75.80	74.36	185.84	0.0077	0.013	4161	8384	297	OKAY	OKAY	352	OKAY	OKAY	761	OKAY	OKAY
1	WC019	WC018	10	PVC	133.71	118.10	103.36	0.1510	0.013	3831	6223	269	OKAY	OKAY	298	OKAY	OKAY	536	OKAY	OKAY
1	WC020	WC019	10	PVC	157.43	133.71	47.35	0.5010	0.013	6978	11786	267	OKAY	OKAY	296	OKAY	OKAY	532	OKAY	OKAY

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LEGEND

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C_{DIP} = 130
$C_{CONC/RCP}$ = 100
C_{PVC} = 140
C_{CLAY} = 110

Assumptions:
1) Manning's 'n' values: All 0.013 (ORANGE BOOK). However, actual values are: 0.01 (PVC pipe), 0.014 (clay), 0.012 (DI), 0.015 (concrete)
2) Where no pipe type is given, PVC is assumed
3) hL equal to one pipe diameter above upstream crown minus downstream crown

	OK for 2015 Flow at d/D = 1?	OK for 2015 Flow at d/D = 2?	OK for 2021 Flow at d/D = 1?	OK for 2021 Flow at d/D = 2?	OK for B/O Flow at d/D = 1?	OK for B/O Flow at d/D = 2?
	DEFICIENT	DEFICIENT	DEFICIENT	DEFICIENT	DEFICIENT	DEFICIENT
	11	3	14	3	26	9

PIPE ID	MH UP	MH DOWN	DIA. (IN)	PIPE MATERIAL	IE IN	IE OUT	LENGTH (ft)	Slope "S"	Manning's "n"	100% Capacity (gpm)	200% Capacity (gpm)	2015 Peak Hour Flow (gpm)	OK for 2015 Flow at d/D = 1?	OK for 2015 Flow at d/D = 2?	Projected 2021 Peak Hour Flow (gpm)	OK for 2021 Flow at d/D = 1?	OK for 2021 Flow at d/D = 2?	Projected B/O Peak Hour Flow (gpm)	OK for B/O Flow at d/D = 1?	OK for B/O Flow at d/D = 2?
1	WC021	WC020	10	PVC	159.34	157.43	234.55	0.0081	0.013	890	**1518**	**264**	**OKAY**	**OKAY**	**293**	**OKAY**	**OKAY**	**528**	**OKAY**	**OKAY**
1	WC022	WC021	8	PVC	160.72	159.34	262.66	0.0053	0.013	394	**678**	**125**	**OKAY**	**OKAY**	**146**	**OKAY**	**OKAY**	**297**	**OKAY**	**OKAY**
1	WC053	WC021	8	PVC	170.48	159.34	28.41	0.3921	0.013	3405	**5814**	**137**	**OKAY**	**OKAY**	**145**	**OKAY**	**OKAY**	**227**	**OKAY**	**OKAY**
1	WC028	WC022	8	PVC	161.81	160.72	186.46	0.0058	0.013	416	**751**	**112**	**OKAY**	**OKAY**	**131**	**OKAY**	**OKAY**	**274**	**OKAY**	**OKAY**
1	WC031	WC028	8	PVC	162.54	161.81	112.52	0.0065	0.013	438	**872**	**105**	**OKAY**	**OKAY**	**124**	**OKAY**	**OKAY**	**263**	**OKAY**	**OKAY**
1	WC032	WC031	8	PVC	163.05	162.54	72.81	0.0070	0.013	455	**1005**	**102**	**OKAY**	**OKAY**	**121**	**OKAY**	**OKAY**	**259**	**OKAY**	**OKAY**
1	WC033	WC032	8	PVC	163.58	163.05	69.93	0.0076	0.013	473	**1037**	**100**	**OKAY**	**OKAY**	**119**	**OKAY**	**OKAY**	**255**	**OKAY**	**OKAY**
1	WC034	WC033	8	PVC	164.39	163.58	169.46	0.0048	0.013	376	**720**	**98**	**OKAY**	**OKAY**	**117**	**OKAY**	**OKAY**	**251**	**OKAY**	**OKAY**
1	WC037	WC034	8	PVC	165.02	164.39	125.98	0.0050	0.013	385	**788**	**91**	**OKAY**	**OKAY**	**109**	**OKAY**	**OKAY**	**240**	**OKAY**	**OKAY**
1	WC038	WC037	8	PVC	165.63	165.02	76.84	0.0079	0.013	484	**1020**	**84**	**OKAY**	**OKAY**	**102**	**OKAY**	**OKAY**	**228**	**OKAY**	**OKAY**
1	WC039	WC038	8	PVC	166.12	165.63	78.77	0.0062	0.013	429	**954**	**81**	**OKAY**	**OKAY**	**99**	**OKAY**	**OKAY**	**224**	**OKAY**	**OKAY**
1	WC040	WC039	8	PVC	166.66	166.12	73.51	0.0073	0.013	466	**1014**	**79**	**OKAY**	**OKAY**	**97**	**OKAY**	**OKAY**	**221**	**OKAY**	**OKAY**
1	WC118	WC040	8	PVC	167.38	166.66	141.96	0.0051	0.013	387	**766**	**70**	**OKAY**	**OKAY**	**87**	**OKAY**	**OKAY**	**205**	**OKAY**	**OKAY**
1	WC046	WC044	8	PVC	168.68	167.90	167.57	0.0047	0.013	371	**716**	**63**	**OKAY**	**OKAY**	**80**	**OKAY**	**OKAY**	**194**	**OKAY**	**OKAY**
1	WC047	WC046	8	PVC	174.24	172.70	312.54	0.0049	0.013	382	**642**	**61**	**OKAY**	**OKAY**	**77**	**OKAY**	**OKAY**	**190**	**OKAY**	**OKAY**
1	WC048	WC047	8	PVC	175.05	174.37	138.65	0.0049	0.013	381	**763**	**58**	**OKAY**	**OKAY**	**75**	**OKAY**	**OKAY**	**186**	**OKAY**	**OKAY**
1	WC049	WC048	8	PVC	175.80	175.10	128.78	0.0054	0.013	401	**801**	**56**	**OKAY**	**OKAY**	**72**	**OKAY**	**OKAY**	**182**	**OKAY**	**OKAY**
1	WC050	WC049	8	PVC	176.53	175.85	144.89	0.0047	0.013	373	**745**	**54**	**OKAY**	**OKAY**	**70**	**OKAY**	**OKAY**	**178**	**OKAY**	**OKAY**
1	WC051	WC050	8	PVC	177.78	176.58	241.21	0.0050	0.013	384	**675**	**51**	**OKAY**	**OKAY**	**67**	**OKAY**	**OKAY**	**174**	**OKAY**	**OKAY**
1	WC052	WC051	8	PVC	181.23	177.81	214.66	0.0159	0.013	686	**1098**	**49**	**OKAY**	**OKAY**	**65**	**OKAY**	**OKAY**	**171**	**OKAY**	**OKAY**
1	RH001	WC052	8	PVC	182.19	181.23	157.75	0.0061	0.013	424	**788**	**46**	**OKAY**	**OKAY**	**61**	**OKAY**	**OKAY**	**162**	**OKAY**	**OKAY**
1	WC054	WC053	8	PVC	171.35	170.48	206.98	0.0042	0.013	353	**660**	**134**	**OKAY**	**OKAY**	**143**	**OKAY**	**OKAY**	**223**	**OKAY**	**OKAY**
1	WC055	WC054	8	PVC	171.82	171.35	39.84	0.0118	0.013	591	**1367**	**132**	**OKAY**	**OKAY**	**140**	**OKAY**	**OKAY**	**219**	**OKAY**	**OKAY**
1	WC056	WC055	8	PVC	178.93	171.82	190.12	0.0374	0.013	1052	**1661**	**130**	**OKAY**	**OKAY**	**138**	**OKAY**	**OKAY**	**215**	**OKAY**	**OKAY**
1	WC058	WC056	8	PVC	212.38	178.93	266.71	0.1254	0.013	1926	**3075**	**125**	**OKAY**	**OKAY**	**133**	**OKAY**	**OKAY**	**207**	**OKAY**	**OKAY**
1	WC059	WC058	8	PVC	219.88	212.38	152.38	0.0492	0.013	1206	**1922**	**74**	**OKAY**	**OKAY**	**79**	**OKAY**	**OKAY**	**123**	**OKAY**	**OKAY**
1	WC092	WC058	8	PVC	219.11	212.38	247.66	0.0272	0.013	896	**1401**	**49**	**OKAY**	**OKAY**	**52**	**OKAY**	**OKAY**	**81**	**OKAY**	**OKAY**
1	WC060	WC059	8	PVC	229.42	219.88	203.96	0.0468	0.013	1176	**1852**	**51**	**OKAY**	**OKAY**	**54**	**OKAY**	**OKAY**	**85**	**OKAY**	**OKAY**
1	WC065	WC060	8	PVC	230.44	229.42	147.11	0.0069	0.013	453	**835**	**39**	**OKAY**	**OKAY**	**42**	**OKAY**	**OKAY**	**65**	**OKAY**	**OKAY**
1	WC066	WC065	8	PVC	232.00	230.44	365.58	0.0043	0.013	355	**593**	**37**	**OKAY**	**OKAY**	**39**	**OKAY**	**OKAY**	**61**	**OKAY**	**OKAY**
1	WC067	WC066	8	PVC	233.00	232.00	223.79	0.0045	0.013	363	**661**	**35**	**OKAY**	**OKAY**	**37**	**OKAY**	**OKAY**	**58**	**OKAY**	**OKAY**
1	WC068	WC067	8	PVC	234.44	233.00	332.83	0.0043	0.013	358	**606**	**32**	**OKAY**	**OKAY**	**34**	**OKAY**	**OKAY**	**54**	**OKAY**	**OKAY**
1	WC069	WC068	8	PVC	235.26	234.44	180.57	0.0045	0.013	366	**698**	**30**	**OKAY**	**OKAY**	**32**	**OKAY**	**OKAY**	**50**	**OKAY**	**OKAY**
1	WC093	WC092	8	PVC	219.21	219.11	22.52	0.0044	0.013	362	**1504**	**46**	**OKAY**	**OKAY**	**49**	**OKAY**	**OKAY**	**77**	**OKAY**	**OKAY**
1	WC094	WC093	8	PVC	221.94	219.21	149.59	0.0182	0.013	735	**1208**	**44**	**OKAY**	**OKAY**	**47**	**OKAY**	**OKAY**	**73**	**OKAY**	**OKAY**
1	WC095	WC094	8	PVC	222.04	221.94	252.40	0.0004	0.013	108	**407**	**42**	**OKAY**	**OKAY**	**44**	**OKAY**	**OKAY**	**69**	**OKAY**	**OKAY**
1	WC096	WC095	8	PVC	223.36	222.04	256.72	0.0051	0.013	390	**675**	**39**	**OKAY**	**OKAY**	**42**	**OKAY**	**OKAY**	**65**	**OKAY**	**OKAY**
1	WC044	WC118	8	PVC	167.90	167.38	116.68	0.0045	0.013	363	**783**	**68**	**OKAY**	**OKAY**	**85**	**OKAY**	**OKAY**	**201**	**OKAY**	**OKAY**
1	WC132	Old Owen PS	8	PVC	57.96	54.99	99.68	0.0298	0.013	939	**1561**	**6**	**OKAY**	**OKAY**	**6**	**OKAY**	**OKAY**	**7**	**OKAY**	**OKAY**
1	WC098	WC096	8	PVC	226.03	225.58	59.43	0.0076	0.013	473	**1090**	**37**	**OKAY**	**OKAY**	**39**	**OKAY**	**OKAY**	**61**	**OKAY**	**OKAY**
1	WM007	West Main PS	8	PVC	38.71	32.80	183.19	0.0323	0.013	977	**1547**	**17**	**OKAY**	**OKAY**	**23**	**OKAY**	**OKAY**	**60**	**OKAY**	**OKAY**
1	WM000	West Main PS	8	PVC	34.00	32.80	69.73	0.0172	0.013	713	**1320**	**22**	**OKAY**	**OKAY**	**28**	**OKAY**	**OKAY**	**66**	**OKAY**	**OKAY**
1	C001	Cate's PS	8	PVC	47.54	47.16	86.88	0.0044	0.013	360	**858**	**23**	**OKAY**	**OKAY**	**23**	**OKAY**	**OKAY**	**26**	**OKAY**	**OKAY**
1	C006	Cate's PS	8	PVC	74.56	50.00	286.54	0.0857	0.013	1592	**2513**	**14**	**OKAY**	**OKAY**	**14**	**OKAY**	**OKAY**	**15**	**OKAY**	**OKAY**
1	E040	E022	8	CLAY	54.92	54.54	204.88	0.0019	0.013	234	**424**	**55**	**OKAY**	**OKAY**	**63**	**OKAY**	**OKAY**	**102**	**OKAY**	**OKAY**
1	F124-B	F124	8	PVC	21.37	20.64	140.86	0.0052	0.013	391	**772**	**116**	**OKAY**	**OKAY**	**127**	**OKAY**	**OKAY**	**194**	**OKAY**	**OKAY**
1	SF007		12	PVC	26.68	26.26	195.24	0.0022	0.013	744	**1896**	**189**	**OKAY**	**OKAY**	**236**	**OKAY**	**OKAY**	**642**	**OKAY**	**OKAY**
1	VS041	Fox Meadows PS	8	PVC	37.98	37.66	58.58	0.0055	0.013	402	**1028**	**39**	**OKAY**	**OKAY**	**49**	**OKAY**	**OKAY**	**133**	**OKAY**	**OKAY**
0	F125	F124-B	8	PVC	21.90	21.37	100.74	0.0053	0.013	394	**851**	**110**	**OKAY**	**OKAY**	**120**	**OKAY**	**OKAY**	**184**	**OKAY**	**OKAY**
0	E086	E085	8	CLAY	63.46	62.24	311.97	0.0039	0.013	340	**464**	**29**	**OKAY**	**OKAY**	**30**	**OKAY**	**OKAY**	**40**	**OKAY**	**OKAY**

City of Monroe

Sanitary Sewer System Plan

Valley View PS Flow Attenuation Factor: 40% *based on anecdotal information from the City on 3/11/2015; only applied to Valley View because tributary area is much greater than other pump stations*

South Fryelands PS Flow Attenuation Factor: 10% *due to smaller tributary area than VVPS*

Sewer System Hydraulic Model

Pump Station Analysis - SW Study Area Inclusion

PIPE ID	MH UP	MH DOWN	DIA. (in.)	PIPE TYPE	IE IN	IE OUT	PUMP STATION	LENGTH (ft)	Area "A" (ft^2)	Force Main Peak Capacity at 8 FPS (gpm)	Calibrated 2013 Peak Hour Flow (gpm)	Projected 2015 Peak Hour Flow (gpm)	Projected 2021 Peak Hour Flow (gpm)	Projected 2035 Peak Hour Flow (gpm)	Projected Buildout Peak Hour Flow (gpm)
81	PS	B012	4	DI	47.16	36.80	Cate's	4166	0.087	313	37	37	37	37	41
133	WC007-D	WC007-C	4	PVC	62.63	60.43	Calhoun STEP	2019	0.087	313	2	4	9	20	115
46	PS	VS015	4	PVC	32.80	45.03	West Main	2232	0.087	313	35	39	50	76	126
336	PS	VS040	4	PVC	37.66	44.39	Fox Meadows	576	0.087	313	35	39	49	74	133
159	PS	B-007A	6	DI	13.48	35.39	Fryelands	4667	0.196	705	673	689	738	853	1,043
225	PS	B007	8	PVC	18.95	34.43	Beaton	4031	0.349	1,253	304	311	332	380	460
232	PS	B037	8	PVC	19.10	38.02	S. Fryelands	4561	0.349	1,253	461	419	468	612	881
161	PS	F152	8	PVC	22.78	27.94	Sawyer	134	0.349	1,253	65	65	65	66	66
6	PS	E001	12	DI	31.93	48.00	Valley View	7865	0.785	2,820	2,513	1,532	1,711	2,148	3,184
347	PS	WC006	6	PVC	53.12	59.41	Old Owen	50	0.196	705	40	40	42	45	49
	PS	E001	16	PVC	43.30	48.00	Park Place	3988	1.396	5,013	1,444	1,432	1,518	1,718	2,021

Force Main capacity is evaluated at a maximum velocity of 8 ft/s, per Orange Book

City of Monroe					Influent Peak Hour Flows (gpm)					
Pump Station	**Pump Station Capacity (gpm)**	**Force Main Diameter (in)**	**Force Main Length (ft)**	**Force Main Velocity (ft/s)**	**2013**	**2015**	**2021**	**2035**	**Buildout**	**Max Velocity (ft/s)**
Beaton	580	8	4031	3.70	304	311	332	380	460	3.70
Cate's	150	4	4166	3.83	37	37	37	37	41	3.83
Fox Meadows	125	4	576	3.19	35	39	49	74	133	3.39
Fryelands	750	6	4667	8.51	673	689	738	853	1043	11.83
Old Owen	250	6	50	2.84	40	40	42	45	49	2.84
Park Place	1700	16	3988	2.71	1444	1432	1518	1718	2021	3.23
Sawyer	175	8	134	1.12	65	65	65	66	66	1.12
South Fryelands	450	8	4561	2.87	461	419	468	612	881	5.62
Valley View	1650	12	7865	4.68	2513	1532	1711	2148	3184	9.03
West Main	115	4	2232	2.94	35	39	50	76	126	3.22

Appendix SS-C

Population Projections

MEMORANDUM

Date: **February 3, 2015**

To: Adam Schuyler

CC: Craig Chambers

From: Abby Weber

Subject: Final Methodology for Population Analysis for City of Monroe Sanitary Sewer System Plan Update

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The data and methodology used to establish baseline and projected population estimates for two contributing populations – residents and employees – for the City of Monroe Sanitary Sewer System Plan Update are presented in this memo.

The baseline year varied based on available data, but generally reflects the year of the most recent data available for each contributing population. Year 2015 is the “current year”. In instances where 2015 data was not available, a population was calculated by interpolation between the baseline and future projections. The target years for population projections are 2021 (used for 6-year CIP), 2035 (used for 20 year CIP), and build-out.

The projection methodology uses Snohomish County’s adopted 2035 Population and Employment Growth Targets for the Monroe UGA for target year 2035, and uses the adopted target as an interpolation point for 2021 and build-out. Beyond the current Monroe UGA, growth was calculated using County rural lands data.

Conversations regarding demographic data and local long-range planning efforts with the City of Monroe and Snohomish County staff; staff and facility planners at the school district and at individual schools; and Studio Cascade, the City’s consultant on the 2015 Comprehensive Plan update, have informed this methodology and ensured consistency.

DATA

The following resources and data were utilized in establishing baseline population and projections:

- 2010 Census
  - Monroe population data by census block
- 2012 American Community Survey (ACS)
  - Monroe self-employment estimate (8.634%)

- Snohomish County
    - 2012 Snohomish County Buildable Lands Report (BLR)
        - Parcel-level shapefile
            - Total HU and employment capacity per parcel
    - Countywide Planning Policies for Snohomish County
        - Adopted 2035 Population and Employment Growth Targets
    - Micro Analysis Zone 2035 population forecast data (custom request)
        - County recommended using ‘Alternative 3 – Snohomish County Tomorrow population allocation, with map changes’ as 2035 population target on rural lands
    - Parcel shapefile
        - Land use per parcel
    - Snohomish County Property Use Codes
- Office of Financial Management (OFM)
    - Current population estimates
- Puget Sound Regional Council (PSRC)
    - Land Use Baseline
        - By TAZ (custom request)
        - By Jurisdiction – City of Monroe
    - King County Census Block shapefile
- Washington State Employment Security Department
    - Covered Employment estimates (custom request provided by PSRC)
- Studio Cascade
    - Updated FLUM
        - Zoning shapefile

RESIDENTIAL POPULATION

Baseline

Year 2010 served as the residential population baseline. Population estimates were calculated using 2010 census population data and county parcel data. Census block data and parcel data were joined spatially using GIS, and a residential density was calculated for each census block (the ratio of population to total residential acreage). Residential parcels were identified using Snohomish County Property Use Codes and GIS parcel data. The residential density was then applied to the acreage of each individual residential parcel to produce a population estimate per parcel. The parcel population values were re-aggregated by mini-basin.

Baseline populations were similarly established for the sewered portions of mini-basins.

Projected

Population figures were interpolated for 2015, 2021 and 2025 between 2010 baseline estimates and 2035 projections for each mini-basin. Residential population figures were also interpolated for 2013 and 2025 for modeling purposes.

It was assumed that the unsewered population would not grow within the service area. Sewered populations were calculated for 2013, 2015, 2021 and 2025 as the total population minus the 2010 unsewered population.

The CPP 2035 Population Growth Target pertains only to the current Monroe UGA, projections beyond the Monroe UGA were conducted separately. Additionally, the State Corrections mini-basin projections were calculated separately. Each methodology is discussed below.

Monroe UGA

Countywide Planning Policies for Snohomish County adopted a 2035 Population Growth Target of 24,754 for the Monroe UGA. This adopted target was distributed throughout the Monroe UGA based on development capacity.

The population analysis utilized the Snohomish County 2012 Buildable Lands Report (BLR) data to establish the development capacity per parcel. BLR data was obtained for the Monroe UGA. The BLR identifies parcels as vacant, partially used, or re-developable given a 2025 planning horizon. The BLR provides the additional housing unit capacity per parcel. This data was revised to reflect Studio Cascade’s recommended zoning and density changes on the Future Land Use Map.

The development capacity is calculated for each parcel as its additional capacity divided by the total Monroe UGA capacity, resulting in the percentage of total growth captured per parcel, or development capacity. The 2035 Population Growth Target was distributed to each parcel based on development capacity, and re-aggregated by mini-basin. Population figures were then interpolated for 2013, 2015, 2021 and 2025 between 2010 baseline data and 2035 Population Growth Targets.

Build-out within the Monroe UGA also utilized the BLR. Prior to market reductions, the housing unit capacity calculation at the parcel level equates to the build-out capacity. The build-out population was calculated for each parcel as a function of housing unit capacity, single-family or multi-family average household size and occupancy rates, and aggregated by mini-basin.

Use	Average Household Size	Occupancy Rate
Single Family	2.9	.96
Multi Family	2.0	.92

A build-out date was calculated based the residential build-out total population for use in UGA Expansion projections. A trendline formula was established between Snohomish County's CPP 2011 population estimate and 2035 population target, solve for the build-out year (x) where y is the population of the build-out year. This gives a build-out year of 2056 for the Monroe UGA under the proposed FLUM.

Southwest UGA Study Area

The Southwest UGA Study Area mini-basin population growth analysis was conducted separate from the current Monroe UGA. Given the areas current status of rural lands, year 2015 population assumed no population growth from the 2010 baseline figure. Based on conversations with Studio Cascade, the area would most likely be considered for inclusion in the UGA in 2017 and be zoned a combination of residential Low Density SFR, Mixed Use, and Commercial. Build-out population capacity was established by subtracting critical areas from residential parcels, and applying a residential density of 4 units per acre and 16 units per acre to Mixed Use parcels. Using 2017 as the year to be included in the UGA and 2056 as the build-out year, population figures were interpolated for 2021, 2025 and 2035.

State Corrections

The State Corrections mini-basin population growth analysis was conducted separately since County population targets refer to the general residential population rather than Department of Corrections (DOC) inmates. The 2011 Capital Improvement Plan (CIP) was obtained from the DOC. The CIP provided a 20-year inmate growth rate of 13.5%, from this a rate 16.9 inmate per year growth was calculated.

EMPLOYMENT POPULATION

Baseline

Year 2013 served as the baseline employment population year. Employment population projections were calculated using 2013 Covered Employment estimates and 2012 American Community Survey (ACS) self-employment estimates. Covered employment estimates were provided by Puget Sound Regional Council (PSRC) staff by custom data request. Covered employment refers to positions covered by the WA Unemployment Insurance Act, and accounts for approximately 85-90% of all employment. The Act exempts self-employed individuals, which are accounted for by increasing covered employment figures by the ACS self-employment estimate of 8.634%.

Projected

Population figures were interpolated for 2015, 2021 and 2025 between 2013 baseline estimates and 2035 projections for each mini-basin. Sewered populations were calculated for 2015 and 2025 as the total population minus the 2010 unsewered population (2010 total minus 2010 sewered). The CPP 2035 Employment Growth Target pertains only to the current Monroe UGA. However, no employment growth is projected to occur beyond the UGA, in the residentially zoned UGA Expansion mini-basin. The State Corrections mini-basin projections were calculated separately. Both methodologies are addressed below.

Monroe UGA

Countywide Planning Policies for Snohomish County adopted a 2035 Employment Growth Target of 11,781 for the Monroe UGA. This adopted target was distributed throughout the Monroe UGA based on development capacity. The population analysis utilizes Snohomish County 2012 BLR data to establish the development capacity per parcel. BLR GIS data was obtained for the Monroe UGA, which provides the additional employment capacity per parcel. BLR capacity data was revised to reflect Studio Cascade's recommended zoning and density changes on the Future Land Use Map. Revised employment capacities were calculated as a function of buildable acreage and employment densities. The BLR establishes employment densities based on zoning and recent development activity (1995-2010).

Use	Employees per Acre
Commercial	16.68
Mixed Use	15

The development capacity is calculated for each parcel as its additional employment capacity divided the total Monroe UGA employment capacity, resulting in the percentage of employment population growth captured per parcel. The 2035 Employment Growth Target was distributed to each parcel based on development capacity, and re-aggregated by mini-basin. Employment figures were then interpolated for 2015, 2021 and 2025 between 2013 baseline data and 2035 Population Growth Targets.

Similar to residential growth, build-out within the Monroe UGA also utilized the BLR. The BLR GIS data provides the additional employment capacity for each parcel. When the revised employment capacity is aggregated by mini-basin and added to the baseline, this equates to the build-out employment population.

Southwest UGA Study Area

The Southwest UGA Study Area mini-basin population growth analysis was conducted separate from the current Monroe UGA. Given the areas current status of rural lands, year 2015 population assumed no population growth from the 2010 baseline figure. Based on conversations with Studio Cascade, the area would most likely be considered for inclusion in the UGA in 2017 and commercial zoning designations would be a combination Mixed Use and Commercial. Build-out employment capacity was established by subtracting critical areas from commercial parcels, and multiplying the remaining buildable acreage by the employment density. Using 2017 as the year to be included in the UGA and 2056 as the build-out year, population figures were interpolated for 2021, 2025 and 2035.

State Corrections

The State Corrections mini-basin population growth analysis was conducted separately. DOC employment projections were calculated as a ratio of the total inmate population. Historical employment and inmate was obtained from the DOC, and an inmate to employee ratio was established. This ratio was applied to inmate growth to calculate employment for each target year.

Appendix SS-D

DMR Data

WASTEWATER TREATMENT PLANT MONITORING REPORT

Permit No.	WA-002048-6	**Month**	January	**Year**	2009
Facility Name	CITY OF MONROE	**Location**	522 SOUTH SAMS STREET, MONROE		
Receiving Water	SKYKOMISH RIVER				
Plant Type	ACTIVATED SLUDGE			**NO DISCHARGE**	

					EFFLUENT									
Frequency	3/WEEK	3/WEEK	3/WEEK	3/WEEK	CONT	3/WEEK	3/WEEK	1/MONTH	3/WEEK	3/WEEK	1/MONTH	3/WEEK	7/WEEK	2/MONTH
Type	24 HC	CALC	24 HC	CALC	MEAS	24 HC	CALC	CALC	24 HC	CALC	CALC	GRAB	GRAB	GRAB
Day of the Month	BOD 5-DAY mg/l	BOD 5-DAY lbs/day	TSS mg/l	TSS lbs/day	FLOW mgd	BOD 5-DAY mg/l	BOD 5-DAY lbs/day	BOD 5-DAY % removal	TSS mg/l	TSS lbs/day	TSS % removal	FECAL COLIFORM # CFU/100 ml	pH standard units	MERCURY [JULY-OCT] ug/l
1					1.964								6.3	
2					1.859								6.3	
3					1.766								6.4	
4					1.667								6.4	
5	248	4691	262	4956	1.760	4	76	98	5	95	98	17	6.2	
6	207	4200	170	3450	2.268	4	81	98	10	203	94	12	6.4	
7	121	2983	216	5325	2.433	4	99	97	5	123	98	6	6.1	
8					2.956								6.2	
9					2.361								6.0	
10					1.982								6.4	
11					2.410								6.3	
12					2.031							20	6.2	
13	251	4007	212	3384	1.978	3	48	99	4	64	98	10	6.3	
14	201	3095	143	2202	1.914	4	62	98	4	62	97	6	6.3	
15	298	4411	227	3360	1.846	6	89	98	8	118	96		6.1	
16					1.775								6.4	
17					1.662								6.4	
18					1.634								6.5	
19	215	3002	182	2541	1.634	5	70	98	5	70	97		6.4	
20	259	3316	155	1984	1.674	5	64	98	3	38	98	240	6.3	
21	249	3038	309	3770	1.535	5	61	98	6	73	98	216	6.3	
22					1.463							78	6.5	
23					1.487								6.3	
24					1.505								6.3	
25					1.459								6.3	
26	187	2305	268	3304	1.466	11	136	94	20	247	93		6.3	
27	195	2370	456	5541	1.478	11	134	94	27	328	94	104	6.2	
28	166	2017	250	3038	1.457	7	85	96	16	194	94	14	6.1	
29					1.457							4	6.1	
30					1.422								6.0	
31					1.385								6.0	
Total	*****	39434	*****	42854	55.688	*****	1003	*****	*****	1615	*****	*****	*****	*****
	AVG 216	AVG 3286	AVG 238	AVG 3571	AVG 1.796	AVG 6	AVG 84	AVG 97	AVG 9	AVG 135	AVG 96	GEM 24	MIN 6.0	AVG
Permit Limit	*****	**6090**	*****	**5940**	**2.840**	**30**	**711**	**85**	**30**	**711**	**85**	**200**	**6.0**	**0.16**
	MAX 298	MAX 4691	MAX 456	MAX 5541	MXD 2.956	AVW 10	AVW 118	*****	AVW 21	AVW 256	*****	GM7 159	MAX 6.5	MXD
Permit Limit	*****	*****	*****	*****	*****	**45**	**1066**	*****	**45**	**1066**	*****	**400**	**9.0**	**0.28**

AVG=Average **AVW** =Highest Weekly Average **GEM**=Geometric Mean **MAX**=Maximum **MIN**=Minimum **MXD**=Max Daily **GM7**=highest 7-day Geometric Mean

COMMENT AND EXPLANATION OF ANY VIOLATIONS MUST BE ATTACHED ON A SEPARATE SHEET.

Mail to: Department of Ecology, Northwest Regional Office, Water Quality, 3190 160th Ave SE Bellevue, WA 98008

I certify under penalty of law that I have personally examined the information submitted herein; and based on my inquiry of those individuals immediately responsible, I believe the information to be accurate and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fines and/or imprisonment. (Penalties under statutes 18 & 33 U.S.C. may include fines up to $10,000 and/or maximum imprisonmentof five years.)

Name and Title (Typed or Printed)

Signature

Phone Number

WASTEWATER TREATMENT PLANT MONITORING REPORT

Permit No.	**WA-002048-6**	**Month**	**February** **Year** **2009**
Facility Name	**CITY OF MONROE**	**Location**	**522 SOUTH SAMS STREET, MONROE**
Receiving Water	**SKYKOMISH RIVER**		
Plant Type	**ACTIVATED SLUDGE**	**NO DISCHARGE**	

					EFFLUENT									
Frequency	3/WEEK	3/WEEK	3/WEEK	3/WEEK	CONT	3/WEEK	3/WEEK	1/MONTH	3/WEEK	3/WEEK	1/MONTH	3/WEEK	7/WEEK	2/MONTH
Type	24 HC	CALC	24 HC	CALC	MEAS	24 HC	CALC	CALC	24 HC	CALC	CALC	GRAB	GRAB	GRAB
Day of the Month	BOD 5-DAY mg/l	BOD 5-DAY lbs/day	TSS mg/l	TSS lbs/day	FLOW mgd	BOD 5-DAY mg/l	BOD 5-DAY lbs/day	BOD 5-DAY % removal	TSS mg/l	TSS lbs/day	TSS % removal	FECAL COLIFORM # CFU/100 ml	pH standard units	MERCURY [JULY-OCT] ug/l
1					1.387								6.3	
2	229	2748	371	4452	1.376	5	60	98	10	120	97	2	6.3	
3	287	3430	182	2175	1.439	6	72	98	11	131	94	13	6.4	
4	164	1927	222	2609	1.433	4	47	98	10	118	95	15	6.4	
5					1.409								6.6	
6					1.398								6.5	
7					1.341								6.5	
8					1.375								6.6	
9					1.431							15	6.6	
10	177	2115	197	2354	1.482	5	60	97	8	96	96	17	6.6	
11	245	2846	297	3450	1.433	4	46	98	14	163	95	47	6.7	
12	340	3961	242	2820	1.393	7	82	98	10	117	96		6.6	
13					1.397								6.5	
14					1.376								6.5	
15					1.326								6.6	
16	235	2603	227	2514	1.307	4	44	98	6	66	97		6.7	
17	288	3238	232	2608	1.328	4	45	99	8	90	97	13	6.7	
18	223	2427	206	2242	1.348	4	44	98	8	87	96	16	6.7	
19					1.305							11	6.6	
20					1.333								6.5	
21					1.334								6.4	
22					1.308								6.5	
23	272	3432	248	3129	1.378	5	63	98	8	101	97	2	6.8	
24	258	3047	248	2929	1.513	3	35	99	4	47	98	14	6.5	
25	471	5735	450	5479	1.416	5	61	99	4	49	99	2	6.4	
26					1.460								6.5	
27					1.356								6.4	
28					1.340								6.4	
Total	*****	37510	*****	36763	38.722	*****	659	*****	*****	1184	*****	*****	*****	*****
	AVG 266	AVG 3126	AVG 260	AVG 3064	AVG 1.383	AVG 5	AVG 55	AVG 98	AVG 8	AVG 99	AVG 97	GEM 10	MIN 6.3	AVG
Permit Limit	*****	**6090**	*****	**5940**	**2.840**	**30**	**711**	**85**	**30**	**711**	**85**	**200**	**6.0**	**0.16**
	MAX 471	MAX 5735	MAX 450	MAX 5479	MXD 1.513	AVW 5	AVW 63	*****	AVW 10	AVW 123	*****	GM7 23	MAX 6.8	MXD
Permit Limit	*****	*****	*****	*****	*****	**45**	**1066**	*****	**45**	**1066**	*****	**400**	**9.0**	**0.28**

AVG=Average **AVW** =Highest Weekly Average **GEM**=Geometric Mean **MAX**=Maximum **MIN**=Minimum **MXD**=Max Daily **GM7**=highest 7-day Geometric Mean

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Name and Title (Typed or Printed)

Signature

Phone Number

WASTEWATER TREATMENT PLANT MONITORING REPORT

Permit No. WA-002048-6 | **Month** March | **Year** 2009
Facility Name CITY OF MONROE | **Location** 522 SOUTH SAMS STREET, MONROE
Receiving Water SKYKOMISH RIVER
Plant Type ACTIVATED SLUDGE | **NO DISCHARGE** ☐

					EFFLUENT									
Frequency	3/WEEK	3/WEEK	3/WEEK	3/WEEK	CONT	3/WEEK	3/WEEK	1/MONTH	3/WEEK	3/WEEK	1/MONTH	3/WEEK	7/WEEK	2/MONTH
Type	24 HC	CALC	24 HC	CALC	MEAS	24 HC	CALC	CALC	24 HC	CALC	CALC	GRAB	GRAB	GRAB
Day of the Month	BOD 5-DAY mg/l	BOD 5-DAY lbs/day	TSS mg/l	TSS lbs/day	FLOW mgd	BOD 5-DAY mg/l	BOD 5-DAY lbs/day	BOD 5-DAY % removal	TSS mg/l	TSS lbs/day	TSS % removal	FECAL COLIFORM # CFU/100 ml	pH standard units	MERCURY [JULY-OCT] ug/l
1					1.291								6.5	
2	261	3071	210	2471	1.469	2	24	99	2	24	99	10	6.5	
3	253	3024	172	2056	1.411	12	143	95	10	120	94	8	6.5	
4	371	4527	328	4002	1.433	8	98	98	6	73	98	10	6.5	
5					1.463								6.4	
6					1.403								6.4	
7					1.330								6.3	
8					1.434								6.5	
9	261	3113	382	4556	1.367	5	60	98	13	155	97		6.5	
10	346	3974	308	3537	1.430	6	69	98	7	80	98	14	6.4	
11	366	4139	636	7193	1.377	8	90	98	14	158	98	10	6.4	
12					1.356							17	6.3	
13					1.310								6.6	
14					1.314								6.6	
15					1.424								6.6	
16	651	7525	358	4138	1.437	5	58	99	9	104	97	10	6.6	
17	453	5191	390	4469	1.386	7	80	98	17	195	96	7	6.5	
18	261	2843	222	2418	1.374	7	76	97	18	196	92	6	6.5	
19					1.306								6.7	
20					1.437								6.6	
21					1.480								6.7	
22					1.329								6.7	
23	286	3573	147	1837	1.592	11	137	96	17	212	88	11	6.8	
24	256	5195	206	4180	1.498	16	325	94	21	426	90	11	6.6	
25	279	4495	954	15372	2.433	8	129	97	19	306	98	4	6.5	
26					1.932								6.4	
27					1.712								6.5	
28					1.720								6.3	
29					2.050								6.2	
30	244	3343	183	2508	1.668	6	82	98	9	123	95	10	6.4	
31	357	5166	203	2937	1.643	5	72	99	8	116	96	10	6.6	
Total	*****	59178	*****	61673	46.809	*****	1443	*****	*****	2289	*****	*****	*****	*****
	AVG 332	AVG 4227	AVG 336	AVG 4405	AVG 1.510	AVG 8	AVG 103	AVG 97	AVG 12	AVG 163	AVG 95	GEM 9	MIN 6.2	AVG
Permit Limit	*****	**6090**	*****	**5940**	**2.840**	**30**	**711**	**85**	**30**	**711**	**85**	**200**	**6.0**	**0.16**
	MAX 651	MAX 7525	MAX 954	MAX 15372	MXD 2.433	AVW 12	AVW 197	*****	AVW 18	AVW 315	*****	GM7 13	MAX 6.8	MXD
Permit Limit	*****	*****	*****	*****	*****	**45**	**1066**	*****	**45**	**1066**	*****	**400**	**9.0**	**0.28**

AVG=Average **AVW** =Highest Weekly Average **GEM**=Geometric Mean **MAX**=Maximum **MIN**=Minimum **MXD**=Max Daily **GM7**=highest 7-day Geometric Mean

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John Lande WWTP Manager
Name and Title (Typed or Printed)

Signature

360-863-4503
Phone Number

WASTEWATER TREATMENT PLANT MONITORING REPORT

Permit No.	**WA-002048-6**	**Month** **April**	**Year** **2009**
Facility Name	**CITY OF MONROE**	**Location**	**522 SOUTH SAMS STREET, MONROE**
Receiving Water	**SKYKOMISH RIVER**		
Plant Type	**ACTIVATED SLUDGE**	**NO DISCHARGE**	

					EFFLUENT									
Frequency	3/WEEK	3/WEEK	3/WEEK	3/WEEK	CONT	3/WEEK	3/WEEK	1/MONTH	3/WEEK	3/WEEK	1/MONTH	3/WEEK	7/WEEK	2/MONTH
Type	24 HC	CALC	24 HC	CALC	MEAS	24 HC	CALC	CALC	24 HC	CALC	CALC	GRAB	GRAB	GRAB
Day of the Month	BOD 5-DAY mg/l	BOD 5-DAY lbs/day	TSS mg/l	TSS lbs/day	FLOW mgd	BOD 5-DAY mg/l	BOD 5-DAY lbs/day	BOD 5-DAY % removal	TSS mg/l	TSS lbs/day	TSS % removal	FECAL COLIFORM # CFU/100 ml	pH standard units	MERCURY [JULY-OCT] ug/l
1	148	3007	161	3271	1.735	9	183	94	9	183	94	6	6.5	
2					2.436								6.5	
3					2.678								6.4	
4					1.837								6.5	
5					1.730								6.5	
6	203	2815	196	2718	1.702	6	83	97	15	208	92	6	6.6	
7	323	4377	183	2480	1.663	5	68	98	6	81	97	6	6.6	
8	220	2710	96	1183	1.625	5	62	98	14	172	85	32	6.7	
9					1.477								6.6	
10					1.620								6.6	
11					1.529								6.6	
12					1.593								6.6	
13	206	2993	149	2165	1.836	6	87	97	11	160	93	121	6.5	
14	251	3427	206	2812	1.742	6	82	98	9	123	96	40	6.4	
15	243	3188	171	2243	1.637	5	66	98	8	105	95	196	6.4	
16					1.573								6.6	
17					1.636								6.4	
18					1.536								6.5	
19					1.490								6.6	
20	282	3493	231	2861	1.495	6	74	98	5	62	98	312	6.6	
21	262	3114	200	2377	1.485	5	59	98	6	71	97	188	6.7	
22	275	3394	195	2407	1.425	8	99	97	8	99	96	28	6.6	
23					1.480								6.5	
24					1.376								6.7	
25					1.301								6.4	
26					1.293								6.5	
27	416	4479	349	3758	1.361	18	194	96	24	258	93		6.6	
28	388	4126	320	3403	1.291	18	191	95	21	223	93	76	6.8	
29	300	3110	251	2602	1.275	9	93	97	12	124	95	116	6.7	
30					1.243							74	6.7	
31														
Total	*****	44233	*****	34280	48.100	*****	1341	*****	*****	1870	*****	*****	*****	*****
	AVG 271	AVG 3403	AVG 208	AVG 2637	AVG 1.603	AVG 8	AVG 103	AVG 97	AVG 11	AVG 144	AVG 94	GEM 48	MIN 6.4	AVG
Permit Limit	*****	**6090**	*****	**5940**	**2.840**	**30**	**711**	**85**	**30**	**711**	**85**	**200**	**6.0**	**0.16**
	MAX 416	MAX 4479	MAX 349	MAX 3758	MXD 2.678	AVW 15	AVW 159	*****	AVW 19	AVW 202	*****	GM7 118	MAX 6.8	MXD
Permit Limit	*****	*****	*****	*****	*****	**45**	**1066**	*****	**45**	**1066**	*****	**400**	**9.0**	**0.28**

AVG=Average **AVW** =Highest Weekly Average **GEM**=Geometric Mean **MAX**=Maximum **MIN**=Minimum **MXD**=Max Daily **GM7**=highest 7-day Geometric Mean

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Name and Title (Typed or Printed)

Signature

Phone Number

WASTEWATER TREATMENT PLANT MONITORING REPORT

Permit No.	**WA-002048-6**	**Month**	**May**
Facility Name	**CITY OF MONROE**	**Year**	**2009**
Receiving Water	**SKYKOMISH RIVER**	**Location**	**522 SOUTH SAMS STREET, MONROE**
Plant Type	**ACTIVATED SLUDGE**	**NO DISCHARGE**	

					EFFLUENT									
Frequency	3/WEEK	3/WEEK	3/WEEK	3/WEEK	CONT	3/WEEK	3/WEEK	1/MONTH	3/WEEK	3/WEEK	1/MONTH	3/WEEK	7/WEEK	2/MONTH
Type	24 HC	CALC	24 HC	CALC	MEAS	24 HC	CALC	CALC	24 HC	CALC	CALC	GRAB	GRAB	GRAB
Day of the Month	BOD 5-DAY mg/l	BOD 5-DAY lbs/day	TSS mg/l	TSS lbs/day	FLOW mgd	BOD 5-DAY mg/l	BOD 5-DAY lbs/day	BOD 5-DAY % removal	TSS mg/l	TSS lbs/day	TSS % removal	FECAL COLIFORM # CFU/100 ml	pH standard units	MERCURY [JULY-OCT] ug/l
1					1.258								6.7	
2					1.237								6.6	
3					1.263								6.6	
4					1.287							800	6.8	
5	190	2515	254	3362	1.940	8	106	96	14	185	94	5	6.8	
6	199	2871	189	2727	1.587	9	130	95	23	332	88		6.4	
7	180	2238	175	2176	1.730	6	75	97	12	149	93	7	6.4	
8					1.491								6.4	
9					1.430								6.6	
10					1.399								6.4	
11	250	3071	170	2088	1.473	9	111	96	15	184	91	70	6.7	
12	237	2862	171	2065	1.473	7	85	97	11	133	94	140	6.7	
13	215	2724	196	2483	1.448	7	89	97	11	139	94	2	6.7	
14					1.519								6.5	
15					1.373								6.1	
16					1.347								6.0	
17					1.340								6.1	
18					1.380							12	6.5	
19	211	3131	192	2849	1.589	8	119	96	9	134	95	112	6.6	
20	279	3497	251	3146	1.779	5	63	98	8	100	97	28	6.6	
21	146	1591	223	2431	1.503	8	87	95	6	65	97		6.6	
22					1.307								6.4	
23					1.361								6.5	
24					1.318								6.5	
25					1.284								6.6	
26					1.365							12	6.7	
27	234	2494	291	3102	1.358	6	64	97	11	117	96	18	6.7	
28	211	2152	183	1867	1.278	6	61	97	8	82	96	21	6.6	
29	275	3225	342	4010	1.223	8	94	97	16	188	95		6.6	
30					1.406								6.4	
31					1.301								6.1	
Total	*****	32371	*****	32306	44.047	*****	1082	*****	*****	1809	*****	*****	*****	*****
	AVG 219	AVG 2698	AVG 220	AVG 2692	AVG 1.421	AVG 7	AVG 90	AVG 97	AVG 12	AVG 151	AVG 94	GEM 26	MIN 6.0	AVG
Permit Limit	*****	**6090**	*****	**5940**	**2.840**	**30**	**711**	**85**	**30**	**711**	**85**	**200**	**6.0**	**0.16**
	MAX 279	MAX 3497	MAX 342	MAX 4010	MXD 1.940	AVW 8	AVW 104	*****	AVW 16	AVW 222	*****	GM7 34	MAX 6.8	MXD
Permit Limit	*****	*****	*****	*****	*****	**45**	**1066**	*****	**45**	**1066**	*****	**400**	**9.0**	**0.28**

AVG=Average **AVW** =Highest Weekly Average **GEM**=Geometric Mean **MAX**=Maximum **MIN**=Minimum **MXD**=Max Daily **GM7**=highest 7-day Geometric Mean

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Name and Title (Typed or Printed)

Signature

Phone Number

WASTEWATER TREATMENT PLANT MONITORING REPORT

Permit No.	WA-002048-6	**Month** June	**Year** 2009	
Facility Name	CITY OF MONROE	**Location**	522 SOUTH SAMS STREET, MONROE	
Receiving Water	SKYKOMISH RIVER			
Plant Type	ACTIVATED SLUDGE		**NO DISCHARGE**	☐

					EFFLUENT									
Frequency	3/WEEK	3/WEEK	3/WEEK	3/WEEK	CONT	3/WEEK	3/WEEK	1/MONTH	3/WEEK	3/WEEK	1/MONTH	3/WEEK	7/WEEK	2/MONTH
Type	24 HC	CALC	24 HC	CALC	MEAS	24 HC	CALC	CALC	24 HC	CALC	CALC	GRAB	GRAB	GRAB
Day of the Month	BOD 5-DAY mg/l	BOD 5-DAY lbs/day	TSS mg/l	TSS lbs/day	FLOW mgd	BOD 5-DAY mg/l	BOD 5-DAY lbs/day	BOD 5-DAY % removal	TSS mg/l	TSS lbs/day	TSS % removal	FECAL COLIFORM # CFU/100 ml	pH standard units	MERCURY [JULY-OCT] ug/l
1	227	2603	187	2144	1.343	4	46	98	9	103	95	7	6.4	
2	229	3117	150	2042	1.375	5	68	98	11	150	93	11	6.6	
3	231	2946	176	2244	1.632	6	77	97	8	102	95	21	6.7	
4					1.529								6.7	
5					1.433								6.8	
6					1.338								6.8	
7					1.343								6.7	
8	278	3128	237	2666	1.369	7	79	97	12	135	95	5	6.7	
9	289	3136	197	2138	1.349	5	54	98	8	87	96	22	6.7	
10	258	2715	189	1989	1.301	4	42	98	11	116	94	19	6.6	
11					1.262								6.8	
12					1.330								6.8	
13					1.255								6.8	
14					1.291								6.7	
15	320	3550	262	2906	1.302	6	67	98	10	111	96	22	6.6	
16	361	3923	327	3554	1.330	5	54	99	8	87	98	42	6.8	
17	356	3958	226	2512	1.303	5	56	99	7	78	97	64	6.8	
18					1.333								6.8	
19					1.273								6.7	
20					1.494								6.8	
21					1.304								6.7	
22	359	3805	227	2406	1.343	4	42	99	7	74	97	62	6.7	
23	360	3771	247	2587	1.271	12	126	97	15	157	94	52	6.6	
24	315	3160	200	2007	1.256	6	60	98	6	60	97	27	6.9	
25					1.203								6.9	
26					1.309								6.8	
27					1.305								6.8	
28					1.284								6.8	
29	287	2987	241	2508	1.285	3	31	99	6	62	98	11	6.8	
30	294	2955	216	2171	1.248	2	20	99	3	30	99	6	6.9	
Total	*****	45753	*****	33875	41.198	*****	822	*****	*****	1352	*****	*****	*****	*****
	AVG 297	AVG 3268	AVG 220	AVG 2420	AVG 1.329	AVG 5	AVG 59	AVG 98	AVG 9	AVG 97	AVG 96	GEM 19	MIN 6.4	AVG
Permit Limit	*****	**6090**	*****	**5940**	**2.840**	**30**	**711**	**85**	**30**	**711**	**85**	**200**	**6.0**	**0.16**
	MAX 361	MAX 3958	MAX 327	MAX 3554	MXD 1.632	AVW 7	AVW 76	*****	AVW 10	AVW 118	*****	GM7 44	MAX 6.9	MXD
Permit Limit	*****	*****	*****	*****	*****	**45**	**1066**	*****	**45**	**1066**	*****	**400**	**9.0**	**0.28**

AVG=Average **AVW** =Highest Weekly Average **GEM**=Geometric Mean **MAX**=Maximum **MIN**=Minimum **MXD**=Max Daily **GM7**=highest 7-day Geometric Mean

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DONOVAN SHEPPARD WWTP SUPERVISOR

Name and Title (Typed or Printed)

Signature

360-794-6558

Phone Number

WASTEWATER TREATMENT PLANT MONITORING REPORT

Permit No.	WA-002048-6		**Month**	July	**Year** 2009
Facility Name	CITY OF MONROE		**Location**	522 SOUTH SAMS STREET, MONROE	
Receiving Water	SKYKOMISH RIVER				
Plant Type	ACTIVATED SLUDGE		**NO DISCHARGE**	☐	

					EFFLUENT									
Frequency	3/WEEK	3/WEEK	3/WEEK	3/WEEK	CONT	3/WEEK	3/WEEK	1/MONTH	3/WEEK	3/WEEK	1/MONTH	3/WEEK	7/WEEK	2/MONTH
Type	24 HC	CALC	24 HC	CALC	MEAS	24 HC	CALC	CALC	24 HC	CALC	CALC	GRAB	GRAB	GRAB
Day of the Month	BOD 5-DAY mg/l	BOD 5-DAY lbs/day	TSS mg/l	TSS lbs/day	FLOW mgd	BOD 5-DAY mg/l	BOD 5-DAY lbs/day	BOD 5-DAY % removal	TSS mg/l	TSS lbs/day	TSS % removal	FECAL COLIFORM # CFU/100 ml	pH standard units	MERCURY (JULY-OCT) ug/l
1	478	3759	436	3429	1.205	3	24	99	2	16	100	8	6.8	
2					0.943								7.0	
3					1.217								6.9	
4					1.235								6.9	
5					1.197								6.7	
6	328	3523	256	2750	1.224	6	64	98	2	21	99	52	6.8	
7	331	3511	192	2037	1.288	8	85	98	6	64	97	98	6.9	
8	301	3128	214	2224	1.272	12	125	96	12	125	94	76	6.8	
9					1.246								6.6	
10					1.212								6.9	
11					1.169								6.9	
12					1.140								6.9	
13	330	3330	253	2553	1.225	10	101	97	15	151	94	110	6.6	
14	343	3584	252	2633	1.210	13	136	96	22	230	91	80	6.6	
15	355	3781	248	2641	1.253	14	149	96	20	213	92	149	6.6	
16					1.277								6.7	
17					1.047								6.6	
18					1.207								6.8	
19					1.181								6.7	
20	363	3412	254	2387	1.234	8	75	98	9	85	96	132	6.5	0.0105
21	349	3679	150	1581	1.127	7	74	98	7	74	95	206	6.8	
22	424	4526	313	3341	1.264	8	85	98	11	117	96	124	6.8	0.0087
23					1.280								6.9	
24					1.263								6.8	
25					1.265								6.8	
26					1.206								6.8	
27	754	8288	673	7398	1.226	8	88	99	11	121	98		6.8	
28	285	2833	177	1760	1.318	6	60	98	8	80	95	33	6.9	
29	356	3857	233	2524	1.192	6	65	98	12	130	95	30	6.9	
30					1.299							116	6.7	
31					1.316								7.2	
Total	*****	51213	*****	37259	37.738	*****	1130	*****	*****	1426	*****	*****	*****	*****
	AVG 384	AVG 3939	AVG 281	AVG 2866	AVG 1.217	AVG 8	AVG 87	AVG 98	AVG 11	AVG 110	AVG 96	GEM 73	MIN 6.5	AVG 0.0096
Permit Limit	*****	**6090**	*****	**5940**	**2.840**	**30**	**711**	**85**	**30**	**711**	**85**	**200**	**6.0**	**0.16**
	MAX 754	MAX 8288	MAX 673	MAX 7398	MXD 1.318	AVW 12	AVW 129	*****	AVW 19	AVW 198	*****	GM7 150	MAX 7.2	MXD 0.0105
Permit Limit	*****	*****	*****	*****	*****	**45**	**1066**	*****	**45**	**1066**	*****	**400**	**9.0**	**0.28**

AVG=Average AVW =Highest Weekly Average GEM=Geometric Mean MAX=Maximum MIN=Minimum MXD=Max Daily GM7=highest 7-day Geometric Mean

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DONNAN SHEPPARD WWTP SUPERVISOR
Name and Title (Typed or Printed)

Signature

360-794-6558
Phone Number

Mailed 8-12-09

WASTEWATER TREATMENT PLANT MONITORING REPORT

Permit No.	WA-002048-6	Month	August	Year 2009
Facility Name	CITY OF MONROE	Location	522 SOUTH SAMS STREET, MONROE	
Receiving Water	SKYKOMISH RIVER			
Plant Type	ACTIVATED SLUDGE		NO DISCHARGE	☐

					EFFLUENT									
Frequency	3/WEEK	3/WEEK	3/WEEK	3/WEEK	CONT	3/WEEK	3/WEEK	1/MONTH	3/WEEK	3/WEEK	1/MONTH	3/WEEK	7/WEEK	2/MONTH
Type	24 HC	CALC	24 HC	CALC	MEAS	24 HC	CALC	CALC	24 HC	CALC	CALC	GRAB	GRAB	GRAB
Day of the Month	BOD 5-DAY mg/l	BOD 5-DAY lbs/day	TSS mg/l	TSS lbs/day	FLOW mgd	BOD 5-DAY mg/l	BOD 5-DAY lbs/day	BOD 5-DAY % removal	TSS mg/l	TSS lbs/day	TSS % removal	FECAL COLIFORM # CFU/100 ml	pH standard units	MERCURY [JULY-OCT] ug/l
1					1.281								7.1	
2					1.238								7.0	
3	524	5611	525	5622	1.231	6	64	99	9	96	98	42	6.9	
4	419	4459	422	4491	1.284	5	53	99	12	128	97	40	6.9	
5	364	3880	384	4093	1.276	5	53	99	14	149	96	72	6.9	
6					1.278								6.9	
7					1.277								6.8	
8					1.240								6.7	
9					1.256								6.7	
10	246	3028	145	1785	1.251	5	62	98	12	148	92	79	6.7	
11	280	3239	500	5784	1.476	6	69	98	8	93	98	95	6.7	
12	243	2687	179	1980	1.387	9	100	96	10	111	94	52	6.8	0.00343
13					1.326								6.8	
14					1.454								6.7	
15					1.260								6.8	
16					1.257								6.8	
17					1.250								6.5	
18	362	3898	378	4070	1.174	9	97	98	21	226	94	220	6.8	
19	388	4029	348	3613	1.291	9	93	98	15	156	96	8	6.8	
20	418	4748	458	5202	1.245	8	91	98	9	102	98	12	6.8	
21					1.362								6.9	
22					1.217								6.9	
23					1.105								7.0	
24	262	3278	249	3115	1.110	10	125	96	15	188	94	85	7.0	
25	264	3263	222	2744	1.500	10	124	96	18	222	92	17	6.9	0.00619
26	287	3313	271	3128	1.482	8	92	97	14	162	95	15	6.6	
27					1.384								6.6	
28					0.940								6.7	
29					1.268								6.8	
30					1.268								6.8	
31					1.322							136	6.8	
Total	*****	45432	*****	45627	39.690	*****	1024	*****	*****	1780	*****	*****	*****	*****
	AVG 338	AVG 3786	AVG 340	AVG 3802	AVG 1.280	AVG 8	AVG 85	AVG 98	AVG 13	AVG 148	AVG 95	GEM 45	MIN 6.5	AVG 0.00481
Permit Limit	*****	6090	*****	5940	2.840	30	711	85	30	711	85	200	6.0	0.16
	MAX 524	MAX 5611	MAX 525	MAX 5784	MXD 1.500	AVW 9	AVW 114	*****	AVW 16	AVW 191	*****	GM7 73	MAX 7.1	MXD 0.00619
Permit Limit	*****	*****	*****	*****	*****	45	1066	*****	45	1066	*****	400	9.0	0.28

AVG=Average **AVW** =Highest Weekly Average **GEM**=Geometric Mean **MAX**=Maximum **MIN**=Minimum **MXD**=Max Daily **GM7**=highest 7-day Geometric Mean

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DONOVAN SHEPPARD
Name and Title (Typed or Printed)

Donovan Sheppard
Signature

360-794-6558
Phone Number

WASTEWATER TREATMENT PLANT MONITORING REPORT

Permit No.	WA-002048-6	Month	September	Year 2009
Facility Name	CITY OF MONROE	Location	522 SOUTH SAMS STREET, MONROE	
Receiving Water	SKYKOMISH RIVER			
Plant Type	ACTIVATED SLUDGE		NO DISCHARGE	☐

					EFFLUENT									
Frequency	3/WEEK	3/WEEK	3/WEEK	3/WEEK	CONT	3/WEEK	3/WEEK	1/MONTH	3/WEEK	3/WEEK	1/MONTH	3/WEEK	7/WEEK	2/MONTH
Type	24 HC	CALC	24 HC	CALC	MEAS	24 HC	CALC	CALC	24 HC	CALC	CALC	GRAB	GRAB	GRAB
Day of the Month	BOD 5-DAY mg/l	BOD 5-DAY lbs/day	TSS mg/l	TSS lbs/day	FLOW mgd	BOD 5-DAY mg/l	BOD 5-DAY lbs/day	BOD 5-DAY % removal	TSS mg/l	TSS lbs/day	TSS % removal	FECAL COLIFORM # CFU/100 ml	pH standard units	MERCURY [JULY-OCT] ug/l
1	351	3724	281	2981	1.342	10	106	97	16	170	94	2	6.8	0.00427
2	356	3786	278	2956	1.272	6	64	98	7	74	97	4	6.8	
3	297	3282	273	3017	1.275	6	66	98	8	88	97		6.8	0.0097
4					1.325								6.8	
5					1.346								6.8	
6					1.344								6.8	
7	321	4862	311	4710	1.560	6	91	98	8	121	97		6.7	
8	260	2930	223	2513	1.816	5	56	98	5	56	98	44	6.9	
9	293	3162	258	2784	1.351	4	43	99	8	86	97	158	6.8	
10					1.294							38	6.8	
11					1.264								6.6	
12					1.244								6.7	
13					1.265								6.8	
14	256	2782	253	2749	1.267	4	43	98	7	76	97	14	6.7	
15	294	3173	245	2644	1.303	4	43	99	5	54	98	40	6.7	
16	288	3041	232	2450	1.294	3	32	99	7	74	97	70	6.6	
17					1.266								6.7	
18					1.258								6.9	
19					1.304								6.8	
20					1.759								6.8	
21	255	2914	302	3451	1.279	4	46	98	4	46	99	8	6.9	
22	378	4076	282	3041	1.370	3	32	99	3	32	99	18	6.9	
23	267	2641	213	2107	1.293	3	30	99	4	40	98	10	6.8	
24					1.186								6.6	
25					1.267								6.7	
26					1.237								6.7	
27					1.209								6.8	
28					1.261							10	6.8	
29	267	3868	229	3317	1.274	4	58	99	8	116	97	10	6.7	
30	276	2898	211	2216	1.737	2	21	99	5	53	98	8	6.7	
Total	*****	47137	*****	40935	41.521	*****	732	*****	*****	1086	*****	*****	*****	*****
	AVG 297	AVG 3367	AVG 257	AVG 2924	AVG 1.339	AVG 5	AVG 52	AVG 98	AVG 7	AVG 78	AVG 97	GEM 16	MIN 6.6	AVG 0.00698
Permit Limit	*****	**6090**	*****	**5940**	**2.840**	**30**	**711**	**85**	**30**	**711**	**85**	**200**	**6.0**	**0.16**
	MAX 378	MAX 4862	MAX 311	MAX 4710	MXD 1.816	AVW 7	AVW 79	*****	AVW 10	AVW 111	*****	GM7 64	MAX 6.9	MXD 0.0097
Permit Limit	*****	*****	*****	*****	*****	**45**	**1066**	*****	**45**	**1066**	*****	**400**	**9.0**	**0.28**

AVG=Average **AVW** =Highest Weekly Average **GEM**=Geometric Mean **MAX**=Maximum **MIN**=Minimum **MXD**=Max Daily **GM7**=highest 7-day Geometric Mean

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DONOVAN SHEPPARD WWTP SUPERVISOR
Name and Title (Typed or Printed)

Donovan Sheppard
Signature

360-794-6558
Phone Number

WASTEWATER TREATMENT PLANT MONITORING REPORT

Permit No.	WA-002048-6	**Month**	October	**Year** 2009
Facility Name	CITY OF MONROE	**Location**	522 SOUTH SAMS STREET, MONROE	
Receiving Water	SKYKOMISH RIVER			
Plant Type	ACTIVATED SLUDGE		NO DISCHARGE	☐

					EFFLUENT									
Frequency	3/WEEK	3/WEEK	3/WEEK	3/WEEK	CONT	3/WEEK	3/WEEK	1/MONTH	3/WEEK	3/WEEK	1/MONTH	3/WEEK	7/WEEK	2/MONTH
Type	24 HC	CALC	24 HC	CALC	MEAS	24 HC	CALC	CALC	24 HC	CALC	CALC	GRAB	GRAB	GRAB
Day of the Month	BOD 5-DAY mg/l	BOD 5-DAY lbs/day	TSS mg/l	TSS lbs/day	FLOW mgd	BOD 5-DAY mg/l	BOD 5-DAY lbs/day	BOD 5-DAY % removal	TSS mg/l	TSS lbs/day	TSS % removal	FECAL COLIFORM # CFU/100 ml	pH standard units	MERCURY [JULY-OCT] ug/l
1	258	2866	333	3699	1.259	3	33	99	8	89	98		6.6	0.00224
2					1.332								6.6	
3					1.249								6.6	
4					1.250								6.7	
5	307	3536	289	3329	1.270	3	35	99	10	115	97	46	6.6	0.00121
6	399	4446	340	3788	1.381	3	33	99	4	45	99	36	6.6	
7	338	3597	318	3384	1.336	3	32	99	7	74	98	16	6.6	
8					1.276								6.6	
9					1.301								6.6	
10					1.270								6.3	
11					1.315								6.6	
12	242	2622	216	2340	1.291	8	87	97	17	184	92	34	6.6	
13	426	4899	497	5716	1.299	8	92	98	31	357	94	48	6.6	
14	258	3559	1161	16015	1.379	5	69	98	7	97	99	72	6.6	
15					1.654								6.5	
16					1.347								6.8	
17					1.914								6.3	
18					1.919								6.6	
19	270	3121	392	4531	1.423	6	69	98	10	116	97	30	6.6	
20	341	3970	232	2701	1.386	16	186	95	27	314	88	104	6.6	
21	304	2966	221	2156	1.396	14	137	95	20	195	91		6.7	
22					1.170							144	7.1	
23					1.662								6.6	
24					2.116								6.4	
25					1.447								6.7	
26	193	3907	314	6356	1.913	4	81	98	3	61	99	50	6.5	
27	184	2666	151	2187	2.427	4	58	98	1	14	99	21	6.6	
28	239	3227	129	1742	1.737	4	54	98	2	27	98	22	6.6	
29					1.619								6.6	
30					1.924								6.7	
31					1.653								6.7	
Total	*****	45381	*****	57945	46.915	*****	966	*****	*****	1688	*****	*****	*****	*****
	AVG 289	AVG 3491	AVG 353	AVG 4457	AVG 1.513	AVG 6	AVG 74	AVG 98	AVG 11	AVG 130	AVG 96	GEM 42	MIN 6.3	AVG 0.00172
Permit Limit	*****	6090	*****	5940	2.840	30	711	85	30	711	85	200	6.0	0.16
	MAX 426	MAX 4899	MAX 1161	MAX 16015	MXD 2.427	AVW 12	AVW 131	*****	AVW 19	AVW 208	*****	GM7 77	MAX 7.1	MXD 0.00224
Permit Limit	*****	*****	*****	*****	*****	45	1066	*****	45	1066	*****	400	9.0	0.28

AVG=Average **AVW** =Highest Weekly Average **GEM**=Geometric Mean **MAX**=Maximum **MIN**=Minimum **MXD**=Max Daily **GM7**=highest 7-day Geometric Mean

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DONOVAN SHEPPARD WWTP SUPERVISOR

Name and Title (Typed or Printed)

Donovan Sheppard

Signature

360-794-6558

Phone Number

WASTEWATER TREATMENT PLANT MONITORING REPORT

Permit No.	WA-002048-6	Month	November	Year	2009
Facility Name	CITY OF MONROE	Location	522 SOUTH SAMS STREET, MONROE		
Receiving Water	SKYKOMISH RIVER				
Plant Type	ACTIVATED SLUDGE			NO DISCHARGE	☐

					EFFLUENT									
Frequency	3/WEEK	3/WEEK	3/WEEK	3/WEEK	CONT	3/WEEK	3/WEEK	1/MONTH	3/WEEK	3/WEEK	1/MONTH	3/WEEK	7/WEEK	2/MONTH
Type	24 HC	CALC	24 HC	CALC	MEAS	24 HC	CALC	CALC	24 HC	CALC	CALC	GRAB	GRAB	GRAB
Day of the Month	BOD 5-DAY mg/l	BOD 5-DAY lbs/day	TSS mg/l	TSS lbs/day	FLOW mgd	BOD 5-DAY mg/l	BOD 5-DAY lbs/day	BOD 5-DAY % removal	TSS mg/l	TSS lbs/day	TSS % removal	FECAL COLIFORM # CFU/100 ml	pH standard units	MERCURY [JULY-OCT] ug/l
1					1.619								6.6	
2	254	3372	208	2762	1.607	8	106	97	12	159	94	100	6.5	
3	244	3030	188	2335	1.592	7	87	97	10	124	95	126	6.5	
4	308	3843	470	5864	1.489	7	87	98	10	125	98	84	6.4	
5					1.496								6.4	
6					1.867								6.1	
7					2.156								6.5	
8					1.801								6.3	
9					1.606							6	6.3	
10	212	3317	406	6352	1.831	10	156	95	23	360	94	37	6.2	
11	240	3299	163	2240	1.876	6	82	98	6	82	96		6.7	
12	229	3098	233	3152	1.648	4	54	98	4	54	98	100	6.8	
13					1.622								6.7	
14					1.808								6.5	
15					1.654								6.7	
16	155	3180	170	3488	1.672	5	103	97	8	164	95	46	6.8	
17	228	3516	168	2591	2.460	5	77	98	7	108	96	6	6.6	
18	182	3046	157	2628	1.849	5	84	97	9	151	94	88	6.7	
19					2.007								6.7	
20					2.529								6.6	
21					1.957								6.7	
22					2.099								6.6	
23	203	3284	206	3333	1.949	5	81	98	5	81	98	30	6.6	
24	231	3479	178	2681	1.940	5	75	98	5	75	97	18	6.8	
25					1.806							59	6.8	
26	200	3533	222	3921	2.175	5	88	98	7	124	97		6.6	
27					2.118								6.8	
28					1.783								6.7	
29					1.735								6.5	
30	220	3088	198	2779	1.709	5	70	98	4	56	98	58	6.6	
Total	*****	43086	*****	44126	57.143	*****	1152	*****	*****	1663	*****	*****	*****	*****
	AVG 224	AVG 3314	AVG 228	AVG 3394	AVG 1.843	AVG 6	AVG 89	AVG 97	AVG 8	AVG 128	AVG 96	GEM 41	MIN 6.1	AVG
Permit Limit	*****	6090	*****	5940	2.840	30	711	85	30	711	85	200	6.0	0.16
	MAX 308	MAX 3843	MAX 470	MAX 6352	MXD 2.529	AVW 7	AVW 97	*****	AVW 11	AVW 165	*****	GM7 102	MAX 6.8	MXD
Permit Limit	*****	*****	*****	*****	*****	45	1066	*****	45	1066	*****	400	9.0	0.28

AVG=Average **AVW** =Highest Weekly Average **GEM**=Geometric Mean **MAX**=Maximum **MIN**=Minimum **MXD**=Max Daily **GM7**=highest 7-day Geometric Mean

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Donovan Gryczan WWTP Supervisor
Name and Title (Typed or Printed)

Donovan Gryczan
Signature

360-794-6558
Phone Number

WASTEWATER TREATMENT PLANT MONITORING REPORT

Permit No.	WA-002048-6	Month	December
Facility Name	CITY OF MONROE	Year	2009
Receiving Water	SKYKOMISH RIVER	Location	522 SOUTH SAMS STREET, MONROE
Plant Type	ACTIVATED SLUDGE	NO DISCHARGE	

					EFFLUENT									
Frequency	3/WEEK	3/WEEK	3/WEEK	3/WEEK	CONT	3/WEEK	3/WEEK	1/MONTH	3/WEEK	3/WEEK	1/MONTH	3/WEEK	7/WEEK	2/MONTH
Type	24 HC	CALC	24 HC	CALC	MEAS	24 HC	CALC	CALC	24 HC	CALC	CALC	GRAB	GRAB	GRAB
Day of the Month	BOD 5-DAY mg/l	BOD 5-DAY lbs/day	TSS mg/l	TSS lbs/day	FLOW mgd	BOD 5-DAY mg/l	BOD 5-DAY lbs/day	BOD 5-DAY % removal	TSS mg/l	TSS lbs/day	TSS % removal	FECAL COLIFORM # CFU/100 ml	pH standard units	MERCURY [JULY-OCT] ug/l
1	243	3429	129	1820	1.683	6	85	98	7	99	95	10	6.6	
2	239	3269	248	3392	1.692	6	82	97	6	82	98	53	6.7	
3					1.640								6.6	
4					1.574								6.4	
5					1.540								6.6	
6					1.554								6.6	
7	172	2149	275	3436	1.511	7	87	96	6	75	98	15	6.4	
8	241	3045	277	3500	1.498	10	126	96	9	114	97		6.6	
9	203	2455	356	4305	1.515	13	157	94	16	193	96	200	6.5	
10					1.450							114	6.5	
11					1.446								6.5	
12					1.403								6.6	
13					1.390								6.4	
14	253	3216	271	3444	1.410	11	140	96	17	216	94	120	6.2	
15	334	4329	1048	13582	1.524	9	117	97	19	246	98	81	6.2	
16	314	4407	322	4520	1.554	10	140	97	4	56	99	164	6.3	
17					1.683								6.4	
18					1.555								6.5	
19					1.567								6.7	
20					1.614								6.5	
21	373	5836	591	9247	1.819	16	250	96	27	422	95	27	6.7	
22	313	4124	309	4072	1.876	14	184	96	12	158	96	66	6.5	
23	366	4881	189	2520	1.580	14	187	96	14	187	93	99	6.7	
24					1.599								6.7	
25					1.606								6.5	
26					1.446								6.4	
27					1.562								6.5	
28	252	3327	186	2456	1.533	19	251	92	13	172	93	137	6.2	
29	257	3312	177	2281	1.583	16	206	94	15	193	92	156	6.4	
30	290	3698	200	2550	1.545	17	217	94	18	230	91	207	6.4	
31					1.529								6.4	
Total	*****	51476	*****	61125	48.481	*****	2230	*****	*****	2443	*****	*****	*****	*****
	AVG 275	AVG 3677	AVG 327	AVG 4366	AVG 1.564	AVG 12	AVG 159	AVG 96	AVG 13	AVG 175	AVG 95	GEM 76	MIN 6.2	AVG
Permit Limit	*****	6090	*****	5940	2.840	30	711	85	30	711	85	200	6.0	0.16
	MAX 373	MAX 5836	MAX 1048	MAX 13582	MXD 1.876	AVW 17	AVW 225	*****	AVW 18	AVW 256	*****	GM7 164	MAX 6.7	MXD
Permit Limit	*****	*****	*****	*****	*****	45	1066	*****	45	1066	*****	400	9.0	0.28

AVG=Average **AVW** =Highest Weekly Average **GEM**=Geometric Mean **MAX**=Maximum **MIN**=Minimum **MXD**=Max Daily **GM7**=highest 7-day Geometric Mean

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WASTEWATER TREATMENT PLANT MONITORING REPORT

Permit No.	WA-002048-6	Month	January	Year	2010
Facility Name	CITY OF MONROE	Location	522 SOUTH SAMS STREET, MONROE		
Receiving Water	SKYKOMISH RIVER				
Plant Type	ACTIVATED SLUDGE			NO DISCHARGE	

					EFFLUENT									
Frequency	3/WEEK	3/WEEK	3/WEEK	3/WEEK	CONT	3/WEEK	3/WEEK	1/MONTH	3/WEEK	3/WEEK	1/MONTH	3/WEEK	7/WEEK	2/MONTH
Type	24 HC	CALC	24 HC	CALC	MEAS	24 HC	CALC	CALC	24 HC	CALC	CALC	GRAB	GRAB	GRAB
Day of the Month	BOD 5-DAY mg/l	BOD 5-DAY lbs/day	TSS mg/l	TSS lbs/day	FLOW mgd	BOD 5-DAY mg/l	BOD 5-DAY lbs/day	BOD 5-DAY % removal	TSS mg/l	TSS lbs/day	TSS % removal	FECAL COLIFORM # CFU/100 ml	pH standard units	MERCURY [JULY-OCT] ug/l
1					1.645								6.6	
2					1.585								6.5	
3					1.520								6.6	
4	307	5082	350	5794	1.573	21	348	93	24	397	93	250	6.2	
5	289	4194	245	3555	1.985	17	247	94	15	218	94	290	6.2	
6	243	3352	608	8387	1.740	16	221	93	19	262	97	20	6.6	
7					1.654								6.4	
8					1.599								6.4	
9					1.980								6.9	
10					1.595								6.7	
11					1.629							570	6.2	
12	256	4411	368	6341	2.354	20	345	92	23	396	94	4	6.2	
13	170	3316	293	5716	2.066	12	234	93	16	312	95	148	6.6	
14	265	4137	255	3981	2.339	8	125	97	12	187	95		6.6	
15					1.872								6.5	
16					2.115								6.5	
17					1.726								6.6	
18					1.683								6.6	
19	272	3784	330	4591	1.698	11	153	96	16	223	95	4	6.5	
20	234	3193	290	3957	1.668	9	123	96	18	246	94	18	6.4	
21	242	3112	213	2739	1.636	11	141	95	18	231	92	4	6.5	
22					1.542								6.5	
23					1.301								6.6	
24					1.602								6.6	
25	138	1775	200	2572	1.676	14	180	90	23	296	89	25	6.2	
26	147	1746	729	8658	1.542	15	178	90	26	309	96	8	6.4	
27	591	7359	470	5852	1.424	19	237	97	30	374	94	240	6.9	
28					1.493								6.4	
29					1.171								6.5	
30					1.581								6.7	
31					1.438								6.5	
Total	*****	45461	*****	62143	52.432	*****	2531	*****	*****	3451	*****	*****	*****	*****
	AVG 263	AVG 3788	AVG 363	AVG 5179	AVG 1.691	AVG 14	AVG 211	AVG 94	AVG 20	AVG 288	AVG 94	GEM 37	MIN 6.2	AVG
Permit Limit	*****	6090	*****	5940	2.840	30	711	85	30	711	85	200	6.0	0.16
	MAX 591	MAX 7359	MAX 729	MAX 8658	MXD 2.354	AVW 18	AVW 272	*****	AVW 26	AVW 326	*****	GM7 113	MAX 6.9	MXD
Permit Limit	*****	*****	*****	*****	*****	45	1066	*****	45	1066	*****	400	9.0	0.28

AVG=Average AVW =Highest Weekly Average GEM=Geometric Mean MAX=Maximum MIN=Minimum MXD=Max Daily GM7=highest 7-day Geometric Mean

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DONOVAN SHEPPARD WWTP SUPERVISOR

Name and Title (Typed or Printed)

Donovan Sheppard

Signature

360-794-6559

Phone Number

WASTEWATER TREATMENT PLANT MONITORING REPORT

Permit No.	WA-002048-6	**Month**	February	**Year**	2010
Facility Name	CITY OF MONROE	**Location**	522 SOUTH SAMS STREET, MONROE		
Receiving Water	SKYKOMISH RIVER				
Plant Type	ACTIVATED SLUDGE			**NO DISCHARGE**	

					EFFLUENT									
Frequency	3/WEEK	3/WEEK	3/WEEK	3/WEEK	CONT	3/WEEK	3/WEEK	1/MONTH	3/WEEK	3/WEEK	1/MONTH	3/WEEK	7/WEEK	2/MONTH
Type	24 HC	CALC	24 HC	CALC	MEAS	24 HC	CALC	CALC	24 HC	CALC	CALC	GRAB	GRAB	GRAB
Day of the Month	BOD 5-DAY mg/l	BOD 5-DAY lbs/day	TSS mg/l	TSS lbs/day	FLOW mgd	BOD 5-DAY mg/l	BOD 5-DAY lbs/day	BOD 5-DAY % removal	TSS mg/l	TSS lbs/day	TSS % removal	FECAL COLIFORM # CFU/100 ml	pH standard units	MERCURY [JULY-OCT] ug/l
1	225	2670	206	2445	1.539	19	225	92	37	439	82	7	6.3	
2	244	2688	150	1653	1.423	17	187	93	36	397	76	18	6.7	
3	236	2618	276	3061	1.321	20	222	92	42	466	85	41	6.5	
4					1.330								6.2	
5					1.356								6.3	
6					1.415								6.3	
7					1.428								6.2	
8					1.384							58	6.0	
9	390	4102	371	3902	1.179	18	189	95	43	452	88	40	6.3	
10	299	3284	279	3064	1.261	17	187	94	40	439	86	34	6.4	
11	270	3497	271	3510	1.317	16	207	94	35	453	87		6.4	
12					1.553								6.5	
13					1.600								6.7	
14					1.758								6.5	
15	232	3216	229	3174	1.866	17	236	93	35	485	85		6.5	
16	222	3116	176	2470	1.662	17	239	92	32	449	82	11	6.2	
17	273	3618	230	3048	1.683	18	239	93	27	358	88	68	6.7	
18					1.589							8	6.7	
19					1.530								6.7	
20					1.544								6.7	
21					1.529				23	287			6.4	
22	289	3608	333	4157	1.498	6	75	98	13	162	96	7	6.1	
23	265	3198	221	2667	1.497	6	72	98	15	181	93	4	6.4	
24	258	3187	217	2680	1.447	8	99	97	12	148	94	4	6.4	
25					1.481								6.6	
26					1.460								6.5	
27					1.596								6.6	
28					1.458								6.5	
Total	*****	38801	*****	35832	41.704	*****	2177	*****	*****	4717	*****	*****	*****	*****
	AVG 267	AVG 3233	AVG 247	AVG 2986	AVG 1.489	AVG 15	AVG 181	AVG 94	AVG 30	AVG 363	AVG 87	GEM 16	MIN 6.0	AVG
Permit Limit	*****	**6090**	*****	**5940**	**2.840**	**30**	**711**	**85**	**30**	**711**	**85**	**200**	**6.0**	**0.16**
	MAX 390	MAX 4102	MAX 371	MAX 4157	MXD 1.866	AVW 19	AVW 238	*****	AVW 39	AVW 448	*****	GM7 43	MAX 6.7	MXD
Permit Limit	*****	*****	*****	*****	*****	**45**	**1066**	*****	**45**	**1066**	*****	**400**	**9.0**	**0.28**

AVG=Average **AVW** =Highest Weekly Average **GEM**=Geometric Mean **MAX**=Maximum **MIN**=Minimum **MXD**=Max Daily **GM7**=highest 7-day Geometric Mean

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DONOVAN SHEPPARD WWTP SUPERVISOR

Name and Title (Typed or Printed)

Donovan Sheppard

Signature

360-794-6558

Phone Number

WASTEWATER TREATMENT PLANT MONITORING REPORT

Permit No.	WA-002048-6		Month March	Year 2010
Facility Name	CITY OF MONROE		Location	522 SOUTH SAMS STREET, MONROE
Receiving Water	SKYKOMISH RIVER			
Plant Type	ACTIVATED SLUDGE		NO DISCHARGE	

					EFFLUENT									
Frequency	3/WEEK	3/WEEK	3/WEEK	3/WEEK	CONT	3/WEEK	3/WEEK	1/MONTH	3/WEEK	3/WEEK	1/MONTH	3/WEEK	7/WEEK	2/MONTH
Type	24 HC	CALC	24 HC	CALC	MEAS	24 HC	CALC	CALC	24 HC	CALC	CALC	GRAB	GRAB	GRAB
Day of the Month	BOD 5-DAY mg/l	BOD 5-DAY lbs/day	TSS mg/l	TSS lbs/day	FLOW mgd	BOD 5-DAY mg/l	BOD 5-DAY lbs/day	BOD 5-DAY % removal	TSS mg/l	TSS lbs/day	TSS % removal	FECAL COLIFORM # CFU/100 ml	pH standard units	MERCURY [JULY-OCT] ug/l
1	525	6270	500	5971	1.444	6	72	99	9	107	98	5	6.3	
2	285	3561	288	3598	1.432	4	50	99	9	112	97	22	6.1	
3	331	3724	233	2621	1.498	5	56	98	11	124	95	93	6.4	
4					1.349								6.4	
5					1.343								6.2	
6					1.321								6.4	
7					1.318								6.4	
8	225	2483	182	2008	1.423	4	44	98	19	210	90	46	6.3	
9	256	2748	171	1835	1.323	5	54	98	17	182	90	50	6.3	
10	260	2771	225	2398	1.287	4	43	98	8	85	96	10	6.3	
11					1.278								6.3	
12					1.854								6.2	
13					1.916								6.2	
14					1.449								6.5	
15	339	3972	275	3222	1.438	16	187	95	28	328	90	28	6.5	
16	330	3801	238	2741	1.405	18	207	95	22	253	91	22	6.4	
17	254	3152	221	2743	1.381	14	174	94	18	223	92	18	6.7	
18					1.488								6.7	
19					1.456								6.7	
20					1.392								6.7	
21					1.396								6.6	
22	390	4690	392	4714	1.476	5	60	99	12	144	97		6.3	
23	360	4149	271	3124	1.442	2	23	99	5	58	98	8	6.4	
24	367	4175	225	2560	1.382	3	34	99	8	91	96	8	6.7	
25					1.364							84	6.7	
26					1.619								6.6	
27					1.369								6.7	
28					1.357								6.6	
29	214	2929	191	2614	1.659	3	41	99	5	68	97	18	6.5	
30	246	3024	192	2360	1.641	5	61	98	11	135	94	8	6.4	
31	258	3294	226	2886	1.474	4	51	98	8	102	96	58	6.6	
Total	*****	54743	*****	45396	44.974	*****	1158	*****	*****	2225	*****	*****	*****	*****
	AVG 309	AVG 3650	AVG 255	AVG 3026	AVG 1.451	AVG 7	AVG 77	AVG 98	AVG 13	AVG 148	AVG 95	GEM 22	MIN 6.1	AVG
Permit Limit	*****	6090	*****	5940	2.840	30	711	85	30	711	85	200	6.0	0.16
	MAX 525	MAX 6270	MAX 500	MAX 5971	MXD 1.916	AVW 16	AVW 189	*****	AVW 23	AVW 268	*****	GM7 28	MAX 6.7	MXD
Permit Limit	*****	*****	*****	*****	*****	45	1066	*****	45	1066	*****	400	9.0	0.28

AVG=Average **AVW** =Highest Weekly Average **GEM**=Geometric Mean **MAX**=Maximum **MIN**=Minimum **MXD**=Max Daily **GM7**=highest 7-day Geometric Mean

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DONOVAN SHEPPARD WWTP SUPERVISOR

Name and Title (Typed or Printed)

Donovan Sheppard

Signature

360-794-6558

Phone Number

WASTEWATER TREATMENT PLANT MONITORING REPORT

Permit No.	WA-002048-6	**Month** April	**Year**	**2010**
Facility Name	CITY OF MONROE	**Location**	522 SOUTH SAMS STREET, MONROE	
Receiving Water	SKYKOMISH RIVER			
Plant Type	ACTIVATED SLUDGE		**NO DISCHARGE**	☐

					EFFLUENT									
Frequency	3/WEEK	3/WEEK	3/WEEK	3/WEEK	CONT	3/WEEK	3/WEEK	1/MONTH	3/WEEK	3/WEEK	1/MONTH	3/WEEK	7/WEEK	2/MONTH
Type	24 HC	CALC	24 HC	CALC	MEAS	24 HC	CALC	CALC	24 HC	CALC	CALC	GRAB	GRAB	GRAB
Day of the Month	BOD 5-DAY mg/l	BOD 5-DAY lbs/day	TSS mg/l	TSS lbs/day	FLOW mgd	BOD 5-DAY mg/l	BOD 5-DAY lbs/day	BOD 5-DAY % removal	TSS mg/l	TSS lbs/day	TSS % removal	FECAL COLIFORM # CFU/100 ml	pH standard units	MERCURY [JULY-OCT] ug/l
1					1.531								6.5	
2					1.407								6.5	
3					1.619								6.5	
4					1.426								6.4	
5	259	3568	153	2108	1.511	4	55	98	9	124	94	14	6.4	
6	223	2864	153	1965	1.652	2	26	99	5	64	97	8	6.4	
7	207	2899	197	2759	1.540	4	56	98	4	56	98	4	6.6	
8					1.679								6.5	
9					1.570								6.6	
10					1.408								6.4	
11					1.380								6.1	
12	237	2730	203	2338	1.432	7	81	97	11	127	95	17	6.0	
13	254	2860	179	2015	1.381	4	45	98	11	124	94	21	6.4	
14	241	2631	227	2478	1.350	4	44	98	8	87	96	30	6.0	
15					1.309								6.6	
16					1.306								6.7	
17					1.275								6.7	
18					1.284								6.7	
19	255	2782	247	2694	1.307	10	109	96	19	207	92	570	6.6	
20	210	2988	114	1622	1.308	8	114	96	15	213	87	21	6.6	
21	157	2141	76	1036	1.706	8	109	95	19	259	75	2000	6.6	
22					1.635							39	6.0	
23					1.413								6.6	
24					1.360								6.7	
25					1.339								6.5	
26	289	3529	217	2650	1.368	11	134	96	12	147	94	10	6.4	
27	258	2954	150	1718	1.464	6	69	98	9	103	94	14	6.6	
28	270	2772	204	2094	1.373	6	62	98	12	123	94	10	6.8	
29					1.231								6.8	
30					1.319								6.9	
31														
Total	*****	34717	*****	25478	42.883	*****	903	*****	*****	1635	*****	*****	*****	*****
	AVG 238	AVG 2893	AVG 177	AVG 2123	AVG 1.429	AVG 6	AVG 75	AVG 97	AVG 11	AVG 136	AVG 93	GEM 28	MIN 6.0	AVG
Permit Limit	*****	**6090**	*****	**5940**	**2.840**	**30**	**711**	**85**	**30**	**711**	**85**	**200**	**6.0**	**0.16**
	MAX 289	MAX 3568	MAX 247	MAX 2759	MXD 1.706	AVW 9	AVW 111	*****	AVW 18	AVW 226	*****	GM7 175	MAX 6.9	MXD
Permit Limit	*****	*****	*****	*****	*****	**45**	**1066**	*****	**45**	**1066**	*****	**400**	**9.0**	**0.28**

AVG=Average **AVW** =Highest Weekly Average **GEM**=Geometric Mean **MAX**=Maximum **MIN**=Minimum **MXD**=Max Daily **GM7**=highest 7-day Geometric Mean

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DONOVAN SHEPPARD WWTP SUPERVISOR

Name and Title (Typed or Printed)

Signature

360-794-6558

Phone Number

WASTEWATER TREATMENT PLANT MONITORING REPORT

Permit No.	WA-002048-6	**Month**	May	**Year**	2010
Facility Name	CITY OF MONROE	**Location**	522 SOUTH SAMS STREET, MONROE		
Receiving Water	SKYKOMISH RIVER				
Plant Type	ACTIVATED SLUDGE			**NO DISCHARGE**	

					EFFLUENT									
Frequency	3/WEEK	3/WEEK	3/WEEK	3/WEEK	CONT	3/WEEK	3/WEEK	1/MONTH	3/WEEK	3/WEEK	1/MONTH	3/WEEK	7/WEEK	2/MONTH
Type	24 HC	CALC	24 HC	CALC	MEAS	24 HC	CALC	CALC	24 HC	CALC	CALC	GRAB	GRAB	GRAB
Day of the Month	BOD 5-DAY mg/l	BOD 5-DAY lbs/day	TSS mg/l	TSS lbs/day	FLOW mgd	BOD 5-DAY mg/l	BOD 5-DAY lbs/day	BOD 5-DAY % removal	TSS mg/l	TSS lbs/day	TSS % removal	FECAL COLIFORM # CFU/100 ml	pH standard units	MERCURY [JULY-OCT] ug/l
1					1.275								6.9	
2					1.370								6.7	
3	228	3394	194	2888	1.352	3	45	99	12	179	94	52	6.7	
4	677	8588	500	6343	1.785	4	51	99	5	63	99	17	6.7	
5	253	3745	354	5240	1.521	4	59	98	4	59	99	6	6.7	
6					1.775								6.8	
7					1.462								6.6	
8					1.318								6.7	
9					1.210								6.3	
10	425	5079	363	4338	1.380	6	72	99	4	48	99	9	6.0	
11	197	2295	120	1398	1.433	4	47	98	6	70	95	56	6.2	
12	272	3131	197	2267	1.397	5	58	98	4	46	98	80	6.6	
13					1.380								6.8	
14					1.378								6.6	
15					1.354								6.5	
16					1.326								6.4	
17	313	3414	244	2662	1.350	14	153	96	18	196	93	340	6.3	
18	294	3602	250	3063	1.308	9	110	97	19	233	92	44	6.5	
19	266	3088	282	3274	1.469	4	46	98	11	128	96	8	6.5	
20					1.392								6.4	
21					1.361								6.3	
22					1.302								6.4	
23					1.320								6.4	
24					1.370							7	6.4	
25	232	2597	240	2686	1.355	5	56	98	8	90	97	12	6.4	
26	256	3158	263	3244	1.342	5	62	98	7	86	97	60	6.3	
27	253	3712	254	3726	1.479	9	132	96	9	132	96		6.3	
28					1.759								6.4	
29					1.581								6.6	
30					1.384								6.5	
31					1.376								6.3	
Total	*****	45803	*****	41130	43.864	*****	890	*****	*****	1330	*****	*****	*****	*****
	AVG 306	AVG 3817	AVG 272	AVG 3427	AVG **1.415**	AVG 6	AVG 74	AVG 98	AVG 9	AVG 111	AVG 96	GEM 27	MIN 6.0	AVG
Permit Limit	*****	**6090**	*****	**5940**	**2.840**	**30**	**711**	**85**	**30**	**711**	**85**	**200**	**6.0**	**0.16**
	MAX 677	MAX 8588	MAX 500	MAX 6343	MXD 1.785	AVW 9	AVW 103	*****	AVW 16	AVW 186	*****	GM7 49	MAX 6.9	MXD
Permit Limit	*****	*****	*****	*****	*****	**45**	**1066**	*****	**45**	**1066**	*****	**400**	**9.0**	**0.28**

AVG=Average **AVW** =Highest Weekly Average **GEM**=Geometric Mean **MAX**=Maximum **MIN**=Minimum **MXD**=Max Daily **GM7**=highest 7-day Geometric Mean

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Donovan Sheppard, WWTP Supervisor
Name and Title (Typed or Printed)

Donovan Sheppard
Signature

360-794-6558
Phone Number

City of Monroe
Public Works Department
806 West Main Street
Monroe, WA 98272-2198
(360) 794-6100 Fax: (360) 863-4601
www.ci.monroe.wa.us

Dear Chris Smith,

Enclosed is an amended DMR for the month of May 2010. The influent and effluent BOD and TSS values were omitted for May 31 on the previous submitted DMR and are now included. If you have any questions feel to call me at 360-794-6558.

Regards,

Donovan Sheppard
WWTP Supervisor

WASTEWATER TREATMENT PLANT MONITORING REPORT

AMENDMENT DS 6/16/10

Permit No.	WA-002048-6	Month	May
		Year	2010
Facility Name	CITY OF MONROE	Location	522 SOUTH SAMS STREET, MONROE
Receiving Water	SKYKOMISH RIVER		
Plant Type	ACTIVATED SLUDGE	NO DISCHARGE	☐

					EFFLUENT									
Frequency	3/WEEK	3/WEEK	3/WEEK	3/WEEK	CONT	3/WEEK	3/WEEK	1/MONTH	3/WEEK	3/WEEK	1/MONTH	3/WEEK	7/WEEK	2/MONTH
Type	24 HC	CALC	24 HC	CALC	MEAS	24 HC	CALC	CALC	24 HC	CALC	CALC	GRAB	GRAB	GRAB
Day of the Month	BOD 5-DAY mg/l	BOD 5-DAY lbs/day	TSS mg/l	TSS lbs/day	FLOW mgd	BOD 5-DAY mg/l	BOD 5-DAY lbs/day	BOD 5-DAY % removal	TSS mg/l	TSS lbs/day	TSS % removal	FECAL COLIFORM # CFU/100 ml	pH standard units	MERCURY [JULY-OCT] ug/l
1					1.275								6.9	
2					1.370								6.7	
3	228	3394	194	2888	1.352	3	45	99	12	179	94	52	6.7	
4	677	8588	500	6343	1.785	4	51	99	5	63	99	17	6.7	
5	253	3745	354	5240	1.521	4	59	98	4	59	99	6	6.7	
6					1.775								6.8	
7					1.462								6.6	
8					1.318								6.7	
9					1.210								6.3	
10	425	5079	363	4338	1.380	6	72	99	4	48	99	9	6.0	
11	197	2295	120	1398	1.433	4	47	98	6	70	95	56	6.2	
12	272	3131	197	2267	1.397	5	58	98	4	46	98	80	6.6	
13					1.380								6.8	
14					1.378								6.6	
15					1.354								6.5	
16					1.326								6.4	
17	313	3414	244	2662	1.350	14	153	96	18	196	93	340	6.3	
18	294	3602	250	3063	1.308	9	110	97	19	233	92	44	6.5	
19	266	3088	282	3274	1.469	4	46	98	11	128	96	8	6.5	
20					1.392								6.4	
21					1.361								6.3	
22					1.302								6.4	
23					1.320								6.4	
24					1.370							7	6.4	
25	232	2597	240	2686	1.355	5	56	98	8	90	97	12	6.4	
26	256	3158	263	3244	1.342	5	62	98	7	86	97	60	6.3	
27	253	3712	254	3726	1.479	9	132	96	9	132	96		6.3	
28					1.759								6.4	
29					1.581								6.6	
30					1.384								6.5	
31	176	2353	134	1791	1.376	13	174	93	17	227	87		6.3	
Total	*****	48156	*****	42921	43.864	*****	1063	*****	*****	1557.	*****	*****	*****	*****
	AVG 296	AVG 3704	AVG 261	AVG 3302	AVG 1.415	AVG 7	AVG 82	AVG 97	AVG 10	AVG 120	AVG 96	GEM 27	MIN 6.0	AVG
Permit Limit	*****	6090	*****	5940	2.840	30	711	85	30	711	85	200	6.0	0.16
	MAX 677	MAX 8588	MAX 500	MAX 6343	MXD 1.785	AVW 9	AVW 103	*****	AVW 16	AVW 186	*****	GM7 49	MAX 6.9	MXD
Permit Limit	*****	*****	*****	*****	*****	45	1066	*****	45	1066	*****	400	9.0	0.28

AVG=Average **AVW** =Highest Weekly Average **GEM**=Geometric Mean **MAX**=Maximum **MIN**=Minimum **MXD**=Max Daily **GM7**=highest 7-day Geometric Mean

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Donovan Sheppard, WWTP Supervisor
Name and Title (Typed or Printed)

Donovan Sheppard
Signature

360-794-6558
Phone Number

WASTEWATER TREATMENT PLANT MONITORING REPORT

Permit No.	WA-002048-6	Month June	Year 2010
Facility Name	CITY OF MONROE	Location	522 SOUTH SAMS STREET, MONROE
Receiving Water	SKYKOMISH RIVER		
Plant Type	ACTIVATED SLUDGE	NO DISCHARGE	

					EFFLUENT									
Frequency	3/WEEK	3/WEEK	3/WEEK	3/WEEK	CONT	3/WEEK	3/WEEK	1/MONTH	3/WEEK	3/WEEK	1/MONTH	3/WEEK	7/WEEK	2/MONTH
Type	24 HC	CALC	24 HC	CALC	MEAS	24 HC	CALC	CALC	24 HC	CALC	CALC	GRAB	GRAB	GRAB
Day of the Month	BOD 5-DAY mg/l	BOD 5-DAY lbs/day	TSS mg/l	TSS lbs/day	FLOW mgd	BOD 5-DAY mg/l	BOD 5-DAY lbs/day	BOD 5-DAY % removal	TSS mg/l	TSS lbs/day	TSS % removal	FECAL COLIFORM #CFU/100 ml	pH standard units	MERCURY [JULY-OCT] ug/l
1	266	3638	194	2653	1.603	18	246	93	25	342	87	14	6.3	
2	290	4058	334	4674	1.640	26	364	91	24	336	93	2000	6.3	
3					1.678							6	6.2	
4					1.572								6.2	
5					1.831								6.3	
6					1.604								6.2	
7	240	3287	194	2657	1.711	7	96	97	13	178	93	12	6.1	
8	209	3580	226	3871	1.642	12	206	94	19	325	92	4	6.2	
9	158	2378	117	1761	2.054	4	60	97	5	75	96	4	6.4	
10					1.805								6.5	
11					1.792								6.6	
12					1.671								6.6	
13					1.622								6.7	
14	230	2969	191	2466	1.629	4	52	98	14	181	93	117	6.7	
15	263	3542	154	2074	1.548	3	40	99	6	81	96	89	6.7	
16	199	2551	135	1731	1.615	11	141	94	14	179	90	82	6.6	
17					1.537								6.4	
18					1.533								6.4	
19					1.366								6.3	
20					1.444								6.4	
21	293	3631	338	4189	1.513	6	74	98	18	223	95	30	6.1	
22	167	2092	106	1328	1.486	9	113	95	15	188	86	316	6.0	
23	289	3497	259	3134	1.502	6	73	98	9	109	97	27	6.0	
24					1.451								6.5	
25					1.295								6.6	
26					1.566								6.6	
27					1.476								6.4	
28					1.478							80	6.2	
29	247	3061	209	2590	1.498	7	87	97	8	99	96	131	6.4	
30	174	1955	108	1213	1.486	7	79	96	9	101	92	312	6.3	
Total	*****	40241	*****	34342	48.995	*****	1630	*****	*****	2418	*****	*****	*****	*****
	AVG 233	AVG 3095	AVG 197	AVG 2642	AVG 1.580	AVG 9	AVG 125	AVG 96	AVG 14	AVG 186	AVG 93	GEM 49	MIN 6.0	AVG
Permit Limit	*****	**6090**	*****	**5940**	**2.840**	**30**	**711**	**85**	**30**	**711**	**85**	**200**	**6.0**	**0.16**
	MAX 293	MAX 4058	MAX 338	MAX 4674	MXD 2.054	AVW 19	AVW 261	*****	AVW 22	AVW 302	*****	GM7 148	MAX 6.7	MXD
Permit Limit	*****	*****	*****	*****	*****	**45**	**1066**	*****	**45**	**1066**	*****	**400**	**9.0**	**0.28**

AVG=Average **AVW** =Highest Weekly Average **GEM**=Geometric Mean **MAX**=Maximum **MIN**=Minimum **MXD**=Max Daily **GM7**=highest 7-day Geometric Mean

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Donovan Sheppard, WWTP Supervisor
Name and Title (Typed or Printed)

Donovan Sheppard
Signature

360-794-6558
Phone Number

WASTEWATER TREATMENT PLANT MONITORING REPORT

Permit No.	WA-002048-6		Month July	Year 2010
Facility Name	CITY OF MONROE		Location	522 SOUTH SAMS STREET, MONROE
Receiving Water	SKYKOMISH RIVER			
Plant Type	ACTIVATED SLUDGE		NO DISCHARGE	

					EFFLUENT									
Frequency	3/WEEK	3/WEEK	3/WEEK	3/WEEK	CONT	3/WEEK	3/WEEK	1/MONTH	3/WEEK	3/WEEK	1/MONTH	3/WEEK	7/WEEK	2/MONTH
Type	24 HC	CALC	24 HC	CALC	MEAS	24 HC	CALC	CALC	24 HC	CALC	CALC	GRAB	GRAB	GRAB
Day of the Month	BOD 5-DAY mg/l	BOD 5-DAY lbs/day	TSS mg/l	TSS lbs/day	FLOW mgd	BOD 5-DAY mg/l	BOD 5-DAY lbs/day	BOD 5-DAY % removal	TSS mg/l	TSS lbs/day	TSS % removal	FECAL COLIFORM # CFU/100 ml	pH standard units	MERCURY [JULY-OCT] ug/l
1					1.347								6.4	
2					1.617								6.9	
3					1.407								6.9	
4					1.227								6.9	
5	210	2166	218	2249	1.162	8	83	96	14	144	94		6.8	
6	231	2479	221	2372	1.237	9	97	96	15	161	93	211	6.9	
7	261	2969	229	2605	1.287	10	114	96	16	182	93	24	6.9	
8					1.364							27	7.0	0.00508
9					1.409								7.0	0.00363
10					1.394								7.1	
11					1.351								7.0	
12	205	2484	229	2775	1.359	14	170	93	6	73	97	14	7.1	
13	168	1953	133	1546	1.453	7	81	96	9	105	93	27	7.0	
14	228	2637	185	2140	1.394	6	69	97	6	69	97	10	7.1	
15					1.387								6.7	
16					1.381								6.9	
17					1.335								6.8	
18					1.332								6.5	
19	246	2770	258	2905	1.340	6	68	98	16	180	94	40	6.5	
20	218	2405	218	2405	1.350	6	66	97	9	99	96	132	6.6	
21	254	2752	200	2167	1.323	5	54	98	6	65	97	172	6.6	
22					1.299								6.5	
23					1.250								6.3	
24					1.224								6.6	
25					1.196								6.3	
26	282	3152	253	2827	1.220	8	89	97	13	145	95	112	6.2	
27	238	2644	156	1733	1.340	6	67	97	10	111	94	156	6.5	
28	295	3211	225	2449	1.332	4	44	99	12	131	95	14	6.6	
29					1.305								6.5	
30					1.291								6.8	
31					1.270								6.8	
Total	*****	31623	*****	28174	41.183	*****	1001	*****	*****	1466	*****	*****	*****	*****
	AVG 236	AVG 2635	AVG 210	AVG 2348	AVG 1.328	AVG 7	AVG 83	AVG 97	AVG 11	AVG 122	AVG 95	GEM 47	MIN 6.2	AVG 0.00436
Permit Limit	*****	**6090**	*****	**5940**	**2.840**	**30**	**711**	**85**	**30**	**711**	**85**	**200**	**6.0**	**0.16**
	MAX 295	MAX 3211	MAX 258	MAX 2905	MXD 1.617	AVW 9	AVW 107	*****	AVW 15	AVW 162	*****	GM7 97	MAX 7.1	MXD 0.00508
Permit Limit	*****	*****	*****	*****	*****	**45**	**1066**	*****	**45**	**1066**	*****	**400**	**9.0**	**0.28**

AVG=Average **AVW** =Highest Weekly Average **GEM**=Geometric Mean **MAX**=Maximum **MIN**=Minimum **MXD**=Max Daily **GM7**=highest 7-day Geometric Mean

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Donovan Sheppard, WWTP Supervisor
Name and Title (Typed or Printed)

Donovan Sheppard
Signature

360-794-6558
Phone Number

WASTEWATER TREATMENT PLANT MONITORING REPORT

Permit No.	WA-002048-6	Month	AUGUST	Year 2010
Facility Name	CITY OF MONROE	Location	522 SOUTH SAMS STREET, MONROE	
Receiving Water	SKYKOMISH RIVER			
Plant Type	ACTIVATED SLUDGE		NO DISCHARGE	☐

					EFFLUENT									
Frequency	3/WEEK	3/WEEK	3/WEEK	3/WEEK	CONT	3/WEEK	3/WEEK	1/MONTH	3/WEEK	3/WEEK	1/MONTH	3/WEEK	7/WEEK	2/MONTH
Type	24 HC	CALC	24 HC	CALC	MEAS	24 HC	CALC	CALC	24 HC	CALC	CALC	GRAB	GRAB	GRAB
Day of the Month	BOD 5-DAY mg/l	BOD 5-DAY lbs/day	TSS mg/l	TSS lbs/day	FLOW mgd	BOD 5-DAY mg/l	BOD 5-DAY lbs/day	BOD 5-DAY % removal	TSS mg/l	TSS lbs/day	TSS % removal	FECAL COLIFORM # CFU/100 ml	pH standard units	MERCURY [JULY-OCT] ug/l
1					1.215								6.5	
2	284	2918	267	2743	1.244	5	51	98	10	103	96	2	6.4	0.00397
3	262	2640	250	2519	1.232	4	40	98	10	101	96	3	6.3	0.00765
4	320	3504	283	3099	1.208	3	33	99	8	88	97	17	6.5	
5					1.313								6.8	
6					1.177								6.5	
7					1.199								6.6	
8					1.231								6.5	
9	326	3445	467	4935	1.228	4	42	99	3	32	99	4	6.4	
10	223	2414	158	1710	1.267	5	54	98	7	76	96	5	6.4	
11	268	2872	200	2143	1.298	6	64	98	9	96	96	12	6.4	
12					1.285								6.4	
13					1.293								6.6	
14					1.278								6.6	
15					1.252								6.5	
16	456	4739	471	4894	1.254	6	62	99	13	135	97	10	6.4	
17	401	3950	342	3369	1.246	11	108	97	16	158	95	86	6.5	
18	241	2492	162	1675	1.181	6	62	98	6	62	96	16	6.7	
19					1.240								6.7	
20					0.879								6.4	
21					1.252								6.5	
22					1.210								6.3	
23	354	4139	362	4233	1.236	7	82	98	11	129	97	2000	6.0	
24	254	2718	138	1477	1.402	8	86	97	10	107	93	17	6.3	
25	364	3858	354	3752	1.283	5	53	99	7	74	98	22	6.0	
26					1.271								6.4	
27					1.696								6.3	
28					1.330								6.6	
29					1.311								6.2	
30					1.306							2	6.3	
31	344	7063	171	3511	1.368	4	82	99	17	349	90	233	6.0	
Total	*****	46752	*****	40061	41.647	*****	821	*****	*****	1509	*****	*****	*****	*****
	AVG 315	AVG 3596	AVG 279	AVG 3082	AVG 1.264	AVG 6	AVG 63	AVG 98	AVG 10	AVG 116	AVG 96	GEM 17	MIN 6.0	AVG 0.00581
Permit Limit	*****	**6090**	*****	**5940**	**2.840**	**30**	**711**	**85**	**30**	**711**	**85**	**200**	**6.0**	**0.16**
	MAX 456	MAX 7063	MAX 471	MAX 4935	MXD 1.696	AVW 8	AVW 77	*****	AVW 12	AVW 118	*****	GM7 91	MAX 6.8	MXD 0.00765
Permit Limit	*****	*****	*****	*****	*****	**45**	**1066**	*****	**45**	**1066**	*****	**400**	**9.0**	**0.28**

AVG=Average **AVW** =Highest Weekly Average **GEM**=Geometric Mean **MAX**=Maximum **MIN**=Minimum **MXD**=Max Daily **GM7**=highest 7-day Geometric Mean

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Signature

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Phone Number

WASTEWATER TREATMENT PLANT MONITORING REPORT

Permit No.	WA-002048-6	Month	SEPTEMBER Year 2010
Facility Name	CITY OF MONROE	Location	522 SOUTH SAMS STREET, MONROE
Receiving Water	SKYKOMISH RIVER		
Plant Type	ACTIVATED SLUDGE	NO DISCHARGE	

					EFFLUENT									
Frequency	3/WEEK	3/WEEK	3/WEEK	3/WEEK	CONT	3/WEEK	3/WEEK	1/MONTH	3/WEEK	3/WEEK	1/MONTH	3/WEEK	7/WEEK	2/MONTH
Type	24 HC	CALC	24 HC	CALC	MEAS	24 HC	CALC	CALC	24 HC	CALC	CALC	GRAB	GRAB	GRAB
Day of the Month	BOD 5-DAY mg/l	BOD 5-DAY lbs/day	TSS mg/l	TSS lbs/day	FLOW mgd	BOD 5-DAY mg/l	BOD 5-DAY lbs/day	BOD 5-DAY % removal	TSS mg/l	TSS lbs/day	TSS % removal	FECAL COLIFORM # CFU/100 ml	pH standard units	MERCURY [JULY-OCT] ug/l
1	410	4985	212	2578	2.432	3	36	99	11	134	95	6	6.1	0.00261
2	322	3875	333	4008	1.458	20	241	94	23	277	93		6.8	0.00406
3					1.443								6.8	
4					1.403								6.6	
5					1.352								6.4	
6					1.345								6.3	
7	265	3163	226	2697	1.548	15	179	94	16	191	93	80	6.4	
8	382	4760	354	4411	1.431	15	187	96	17	212	95	43	6.2	
9	360	4122	354	4054	1.494	12	137	97	13	149	96	4	6.3	
10					1.373								6.4	
11					1.306								6.6	
12					1.321								6.5	
13	499	5647	504	5704	1.325	11	124	98	14	158	97	2	6.6	
14	382	4234	258	2860	1.357	11	122	97	15	166	94	2	6.5	
15	304	3301	300	3258	1.329	10	109	97	14	152	95	4	6.5	
16					1.302								6.4	
17					1.461								6.4	
18					1.477								6.7	
19					1.760								6.1	
20	213	2721	159	2032	1.543	12	153	94	19	243	88	17	6.2	
21	329	3776	279	3202	1.532	8	92	98	15	172	95	25	6.8	
22	316	3608	212	2421	1.376	8	91	97	13	148	94		6.6	
23					1.369							20	6.4	
24					1.408								6.5	
25					1.347								6.6	
26					1.337								6.5	
27	290	3427	224	2647	1.403	11	130	96	24	284	89	31	6.4	
28	224	2442	129	1406	1.417	8	87	96	19	207	85	12	6.2	
29	260	2934	212	2392	1.307	8	90	97	20	226	91	30	6.4	
30					1.353								6.5	
31														
Total	*****	52995	*****	43668	43.309	*****	1779	*****	*****	2719	*****	*****	*****	*****
	AVG 325	AVG 3785	AVG 268	AVG 3119	AVG 1.444	AVG 11	AVG 127	AVG 96	AVG 17	AVG 194	AVG 93	GEM 12	MIN 6.1	AVG 0.00334
Permit Limit	*****	**6090**	*****	**5940**	**2.840**	**30**	**711**	**85**	**30**	**711**	**85**	**200**	**6.0**	**0.16**
	MAX 499	MAX 5647	MAX 504	MAX 5704	MXD 2.432	AVW 14	AVW 168	*****	AVW 21	AVW 239	*****	GM7 24	MAX 6.8	MXD 0.00406
Permit Limit	*****	*****	*****	*****	*****	**45**	**1066**	*****	**45**	**1066**	*****	**400**	**9.0**	**0.28**

AVG=Average **AVW** =Highest Weekly Average **GEM**=Geometric Mean **MAX**=Maximum **MIN**=Minimum **MXD**=Max Daily **GM7**=highest 7-day Geometric Mean

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Signature

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Phone Number

WASTEWATER TREATMENT PLANT MONITORING REPORT

Permit No.	WA-002048-6	Month October	Year 2010
Facility Name	CITY OF MONROE	Location	522 SOUTH SAMS STREET, MONROE
Receiving Water	SKYKOMISH RIVER		
Plant Type	ACTIVATED SLUDGE	NO DISCHARGE	☐

					EFFLUENT									
Frequency	3/WEEK	3/WEEK	3/WEEK	3/WEEK	CONT	3/WEEK	3/WEEK	1/MONTH	3/WEEK	3/WEEK	1/MONTH	3/WEEK	7/WEEK	2/MONTH
Type	24 HC	CALC	24 HC	CALC	MEAS	24 HC	CALC	CALC	24 HC	CALC	CALC	GRAB	GRAB	GRAB
Day of the Month	BOD 5-DAY mg/l	BOD 5-DAY lbs/day	TSS mg/l	TSS lbs/day	FLOW mgd	BOD 5-DAY mg/l	BOD 5-DAY lbs/day	BOD 5-DAY % removal	TSS mg/l	TSS lbs/day	TSS % removal	FECAL COLIFORM # CFU/100 ml	pH standard units	MERCURY [JULY-OCT] ug/l
1					1.326								6.5	
2					1.345								6.6	
3					1.344								6.5	
4	292	3178	250	2721	1.338	10	109	97	26	283	90	300	6.8	
5	277	2969	208	2229	1.305	9	96	97	27	289	87	32	6.4	0.00516
6					1.285							24	6.4	0.0191
7	240	2618	192	2094	1.281	12	131	95	28	305	85		6.6	
8					1.308								6.1	
9					1.374								6.5	
10					1.853								6.3	
11	390	4589	712	8379	1.722	11	129	97	30	353	96	15	6.0	
12	260	2899	246	2743	1.411	14	156	95	30	335	88	182	6.5	
13	330	2978	188	1696	1.337	9	81	97	20	180	89	23	7.0	
14					1.082								6.9	
15					1.250								6.7	
16					1.228								7.0	
17					1.226								6.7	
18	316	3365	192	2045	1.247	8	85	97	23	245	88	15	6.2	
19	394	4180	317	3363	1.277	8	85	98	22	233	93	22	6.4	
20	393	3959	396	3990	1.272	9	91	98	20	201	95	31	6.2	
21					1.208								6.5	
22					1.262								7.2	
23					1.221								6.5	
24					1.451								6.4	
25	215	2620	197	2400	1.491	9	110	96	21	256	89	8	6.2	
26	233	2767	179	2126	1.461	10	119	96	23	273	87	2	6.2	
27	294	3396	244	2818	1.424	7	81	98	24	277	90	8	6.1	
28					1.385								6.1	
29					1.499								6.2	
30					1.491								6.5	
31					1.761								6.4	
Total	*****	39519	*****	36605	42.465	*****	1273	*****	*****	3232	*****	*****	*****	*****
	AVG 303	AVG 3293	AVG 277	AVG 3050	AVG 1.370	AVG 10	AVG 106	AVG 97	AVG 25	AVG 269	AVG 90	GEM 23	MIN 6.0	AVG 0.00955
Permit Limit	*****	**6090**	*****	**5940**	**2.840**	**30**	**711**	**85**	**30**	**711**	**85**	**200**	**6.0**	**0.16**
	MAX 394	MAX 4589	MAX 712	MAX 8379	MXD 1.853	AVW 11	AVW 122	*****	AVW 27	AVW 292	*****	GM7 61	MAX 7.2	MXD 0.0191
Permit Limit	*****	*****	*****	*****	*****	**45**	**1066**	*****	**45**	**1066**	*****	**400**	**9.0**	**0.28**

AVG=Average **AVW** =Highest Weekly Average **GEM**=Geometric Mean **MAX**=Maximum **MIN**=Minimum **MXD**=Max Daily **GM7**=highest 7-day Geometric Mean

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Donovan Sheppard, WWTP Supervisor
Name and Title (Typed or Printed)

Donovan Sheppard
Signature

360-794-6558
Phone Number

WASTEWATER TREATMENT PLANT MONITORING REPORT

Permit No.	WA-002048-6	Month	November	Year	2010
Facility Name	CITY OF MONROE	Location	522 SOUTH SAMS STREET, MONROE
Receiving Water	SKYKOMISH RIVER		
Plant Type	ACTIVATED SLUDGE	NO DISCHARGE	

					EFFLUENT									
Frequency	3/WEEK	3/WEEK	3/WEEK	3/WEEK	CONT	3/WEEK	3/WEEK	1/MONTH	3/WEEK	3/WEEK	1/MONTH	3/WEEK	7/WEEK	2/MONTH
Type	24 HC	CALC	24 HC	CALC	MEAS	24 HC	CALC	CALC	24 HC	CALC	CALC	GRAB	GRAB	GRAB
Day of the Month	BOD 5-DAY mg/l	BOD 5-DAY lbs/day	TSS mg/l	TSS lbs/day	FLOW mgd	BOD 5-DAY mg/l	BOD 5-DAY lbs/day	BOD 5-DAY % removal	TSS mg/l	TSS lbs/day	TSS % removal	FECAL COLIFORM # CFU/100 ml	pH standard units	MERCURY [JULY-OCT] ug/l
1	174	2838	106	1729	1.466	9	147	95	17	277	84	17	6.4	
2	257	3200	232	2889	1.956	6	75	98	12	149	95		6.2	
3	338	3820	324	3661	1.493	8	90	98	8	90	98	2	6.4	
4					1.355							2	6.5	
5					1.355								6.5	
6					1.418								6.5	
7	358	4096	320	3662	1.622	11	126	97	11	126	97		6.3	
8	327	3704	338	3828	1.372	6	68	98	12	136	96	2	6.1	
9	391	4608	375	4419	1.358	8	94	98	8	94	98	2000	6.0	
10					1.413							50	6.0	
11					1.380								6.4	
12					1.414								6.3	
13					1.373								6.3	
14					1.475								6.4	
15	331	4558	153	2107	1.428	7	96	98	14	193	91	215	6.0	
16	280	3498	194	2424	1.651	10	125	96	13	162	93	187	6.5	
17	275	4117	179	2680	1.498	8	120	97	13	195	93	136	6.2	
18					1.795								6.4	
19					1.565								6.1	
20					1.521								6.3	
21	279	3611	247	3197	1.541	11	142	96	16	207	94		6.5	
22	237	3060	185	2388	1.552	12	155	95	17	219	91	302	6.1	
23	348	4072	300	3510	1.548	12	140	97	23	269	92	3	6.1	
24					1.403							16	6.8	
25					1.406								6.7	
26					1.406								6.7	
27					1.485								6.6	
28					1.609								6.6	
29	290	3633	324	4059	1.505	9	113	97	22	276	93	2	6.5	
30	196	2970	176	2667	1.502	7	106	96	11	167	94	7	6.6	
Total	*****	51784	*****	43220	46.682	*****	1598	*****	*****	2561	*****	*****	*****	*****
	AVG 292	AVG 3699	AVG 247	AVG 3087	AVG 1.506	AVG 9	AVG 114	AVG 97	AVG 14	AVG 183	AVG 93	GEM 23	MIN 6.0	AVG
Permit Limit	*****	6090	*****	5940	2.840	30	711	85	30	711	85	200	6.0	0.16
	MAX 391	MAX 4608	MAX 375	MAX 4419	MXD 1.956	AVW 12	AVW 146	*****	AVW 19	AVW 232	*****	GM7 176	MAX 6.8	MXD
Permit Limit	*****	*****	*****	*****	*****	45	1066	*****	45	1066	*****	400	9.0	0.28

AVG=Average **AVW** =Highest Weekly Average **GEM**=Geometric Mean **MAX**=Maximum **MIN**=Minimum **MXD**=Max Daily **GM7**=highest 7-day Geometric Mean

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Donovan Sheppard, WWTP Supervisor
Name and Title (Typed or Printed)

Donovan Sheppard
Signature

360-794-6558
Phone Number

WASTEWATER TREATMENT PLANT MONITORING REPORT

Permit No.	WA-002048-6	Month	December	Year 2010
Facility Name	CITY OF MONROE	Location	522 SOUTH SAMS STREET, MONROE	
Receiving Water	SKYKOMISH RIVER			
Plant Type	ACTIVATED SLUDGE		NO DISCHARGE	

						EFFLUENT								
Frequency	3/WEEK	3/WEEK	3/WEEK	3/WEEK	CONT	3/WEEK	3/WEEK	1/MONTH	3/WEEK	3/WEEK	1/MONTH	3/WEEK	7/WEEK	2/MONTH
Type	24 HC	CALC	24 HC	CALC	MEAS	24 HC	CALC	CALC	24 HC	CALC	CALC	GRAB	GRAB	GRAB
Day of the Month	BOD 5-DAY mg/l	BOD 5-DAY lbs/day	TSS mg/l	TSS lbs/day	FLOW mgd	BOD 5-DAY mg/l	BOD 5-DAY lbs/day	BOD 5-DAY % removal	TSS mg/l	TSS lbs/day	TSS % removal	FECAL COLIFORM # CFU/100 ml	pH standard units	MERCURY [JULY-OCT] ug/l
1	350	3331	200	1903	1.817	6	57	98	13	124	94	2	6.7	
2					1.141								6.8	
3					1.384								6.7	
4					1.521								6.7	
5					1.466								6.8	
6	248	2867	225	2601	1.404	3	35	99	21	243	91	3	6.7	
7	226	3692	225	3676	1.386	4	65	98	24	392	89	4	6.6	
8	230	3975	191	3301	1.959	6	104	97	26	449	86	208	6.6	
9					2.072								6.6	
10					1.829								6.7	
11					1.619								6.7	
12					2.545								6.5	
13	200	3871	169	3271	3.191	5	97	98	6	116	96	5	6.5	
14	199	3228	185	3001	2.321	4	65	98	4	65	98	22	6.5	
15	450	7033	400	6252	1.945	9	141	98	8	125	98	2	6.6	
16					1.874								6.7	
17					1.743								6.7	
18					1.683								6.7	
19					1.720								6.7	
20	450	5772	290	3720	1.608	6	77	99	13	167	96	4	6.7	
21	280	3486	180	2241	1.538	2	25	99	11	137	94	4	6.9	
22	270	3549	170	2234	1.493	2	26	99	10	131	94	8	6.8	
23					1.576								6.9	
24					1.787								6.8	
25					1.927								6.8	
26					1.536								6.7	
27	385	5455	256	3627	1.482	5	71	99	12	170	95	2	6.5	
28	460	6284	392	5355	1.699	5	68	99	9	123	98	2	6.5	
29	321	4345	271	3668	1.638	10	135	97	17	230	94	9	6.6	
30					1.623								6.6	
31					1.477								6.7	
Total	*****	56889	*****	44851	54.004	*****	966	*****	*****	2472	*****	*****	*****	*****
	AVG 313	AVG 4376	AVG 243	AVG 3450	AVG 1.742	AVG 5	AVG 74	AVG 98	AVG 13	AVG 190	AVG 94	GEM 6	MIN 6.5	AVG
Permit Limit	*****	6090	*****	5940	2.840	30	711	85	30	711	85	200	6.0	0.16
	MAX 460	MAX 7033	MAX 400	MAX 6252	MXD 3.191	AVW 7	AVW 91	*****	AVW 24	AVW 361	*****	GM7 14	MAX 6.9	MXD
Permit Limit	*****	*****	*****	*****	*****	45	1066	*****	45	1066	*****	400	9.0	0.28

AVG=Average **AVW** =Highest Weekly Average **GEM**=Geometric Mean **MAX**=Maximum **MIN**=Minimum **MXD**=Max Daily **GM7**=highest 7-day Geometric Mean

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Donovan Sheppard, WWTP Supervisor
Name and Title (Typed or Printed)

Donovan Sheppard
Signature

360-794-6558
Phone Number

2011

Month	Avg Mo Flow	Max Daily Flow	Design Avg	% Design	Avg Mo BOD	Max Inf BOD	BOD Design	% Design	TSS Avg	max TSS	Design Avg	% Design
	MGD	MG	MGD	FLOW	lb/day	lbs	lb/day	BOD	lb/day	lb	lb/day	TSS
January	1.885	2.887	2.84	66.4	4405	7902	6090	72.3	4426	10392	5940	74.5
February	1.631	2.181	2.84	57.4	3057	6511	6090	50.2	4447	7870	5940	74.9
March	1.784	2.720	2.84	62.8	3446	6994	6090	56.6	3718	6916	5940	62.6
April	1.768	2.742	2.84	62.3	2399	3960	6090	39.4	4187	8403	5940	70.5
May	1.590	2.139	2.84	56.0	2729	4312	6090	44.8	2776	5286	5940	46.7
June	1.372	1.673	2.84	48.3	2677	3657	6090	44.0	2423	4162	5940	40.8
July	1.302	1.576	2.84	45.8	2846	4796	6090	46.7	3137	9887	5940	52.8
August	1.208	1.706	2.84	42.5	3353	5948	6090	55.1	3974	11042	5940	66.9
September	1.256	1.613	2.84	44.2	3071	4731	6090	50.4	3242	11453	5940	54.6
October	1.323	1.969	2.84	46.6	3402	4702	6090	55.9	3328	5566	5940	56.0
November	1.510	2.608	2.84	53.2	3451	5807	6090	56.7	3199	4481	5940	53.9
December	1.358	1.740	2.84	47.8	3257	4603	6090	53.5	3366	8265	5940	56.7
2011	**1.499**	**2.130**	**2.84**	**52.8**	**3174**	**5327**	**6090**	**52.1**	**3519**	**7810**	**5940**	**59.2**

Permit Number: WA0020486 **Permittee:** MONROE STP
Facility County: Snohomish **Receiving Waterbody:** Skykomish R.
Monitoring Period: 12/01/2012 - 12/31/2012 **Outfall:** 001 **Version:** 1

Week	Monitoring Point	Flow MGD Continuous Measurement	Total BOD5 Total Milligrams/L (mg/L) 3/Week Composite Sample (24 HR Time Proportional comp)	Total BOD5 Total Lbs/Day 3/Week Calculated	Total Suspended Solids (TSS) Total suspended (TSS) Milligrams/L (mg/L) 3/Week Composite Sample (24 HR Time Proportional comp)	Total Suspended Solids (TSS) Total suspended (TSS) Lbs/Day 3/Week Calculated	Fecal Coliform #/100ml 3/Week Grab	pH Standard Units 1/Day Grab	Temperature Measured Degrees C 1/Day Measurement	Temperature Calculated Degrees C 1/Day Calculated	Total BOD5 Total Percent Monthly Calculated	Total Suspended Solids (TSS) Total suspended (TSS) Percent Monthly Calculated
		001	001	001	001	001	001	001	001	001	001C	001C
1-Sa	**12/1/12**	2.893						6.8	12.8	14.1		
2-Su	**12/2/12**	2.308						6.7	13.3	13.8		
2-M	**12/3/12**	2.188	7	130	17	315		6.8	13.7	13.5	97	93
2-T	**12/4/12**	2.220	7	186	12	318	1	6.7	13.8	13.4	96	95
2-W	**12/5/12**	3.180	6	92	10	154	1	6.8	13.9	13.4	97	95
2-Th	**12/6/12**	1.847					1	6.6	13.9	13.5		
2-F	**12/7/12**	1.675						6.8	14.1	13.6		
2-Sa	**12/8/12**	1.793						6.8	13.8	13.8		
3-Su	**12/9/12**	1.829						6.7	13.3	13.8		
3-M	**12/10/12**	1.972	8	118	10	147	1	6.6	13.6	13.8	96	97
3-T	**12/11/12**	1.767	6	118	11	217	1	6.6	13.6	13.7	97	94
3-W	**12/12/12**	2.362	7	113	12	193	1	6.6	12.8	13.6	97	96
3-Th	**12/13/12**	1.930						6.7	13.0	13.5		
3-F	**12/14/12**	2.098						6.6	12.9	13.3		
3-Sa	**12/15/12**	1.821						6.7	12.9	13.2		
4-Su	**12/16/12**	1.986						6.6	12.6	13.1		
4-M	**12/17/12**	2.568	10	269	12	323	2	6.6	11.0	12.7	94	93
4-T	**12/18/12**	3.225	8	162	12	244	1	6.6	11.1	12.3	97	95
4-W	**12/19/12**	2.434	7	201	12	344	2	6.8	11.6	12.2	95	92
4-Th	**12/20/12**	3.437						6.4	10.3	11.8		
4-F	**12/21/12**	3.221						6.6	11.2	11.5		
4-Sa	**12/22/12**	2.344						6.4	11.9	11.4		
5-Su	**12/23/12**	2.193						6.5	12.2	11.3		
5-M	**12/24/12**	2.245	8	128	14	224		6.5	12.2	11.5	97	93
5-T	**12/25/12**	1.920	7	126	16	289	1	6.8	12.1	11.6	98	93
5-W	**12/26/12**	2.166	6	104	12	207	3	6.4	11.9	11.7	98	96
5-Th	**12/27/12**	2.070					1	6.7	12.4	12.0		
5-F	**12/28/12**	1.800						6.7	12.8	12.2		
5-Sa	**12/29/12**	1.759						6.8	12.8	12.3		
6-Su	**12/30/12**	1.768						6.7	12.7	12.4		
6-M	**12/31/12**	1.670	18	270	39	585		6.7	12.7	12.5	92	86
Minimum								6.4				
								>= 6.0				
Average		2.216	8	155	15	274					96	94
		DL: 2.84	<= 30	<= 711	<= 30	<= 711					>= 85	>= 85
Weekly Average			8	211	14	304						
			<= 45	<= 1066	<= 45	<= 1066						

Maximum							6.8				
							<= 9.0				
Daily Maximum	3.437							14.1			
	Report Only							Report Only			
Monthly geometric mean						1					
						<= 200					
Weekly Geometric Mean						2					
						<= 400					
7-DADMax									14.1		
									Report Only		

Permit Number: WA0020486 **Permittee:** MONROE STP
Facility County: Snohomish **Receiving Waterbody:**
Monitoring Period: 12/01/2012 - 12/31/2012 **Outfall:** IN1 **Version:** 1

Week	Monitoring Point	Total BOD5 Total Milligrams/L (mg/L) 3/Week Composite Sample (24 HR Time Proportional comp)	Total BOD5 Total Lbs/Day 3/Week Calculated	Total Suspended Solids (TSS) Total suspended (TSS) Milligrams/L (mg/L) 3/Week Composite Sample (24 HR Time Proportional comp)	Total Suspended Solids (TSS) Total suspended (TSS) Lbs/Day 3/Week Calculated
		INF	INF	INF	INF
1-Sa	12/1/12				
2-Su	12/2/12				
2-M	12/3/12	206	3814	245	4536
2-T	12/4/12	185	4906	220	5835
2-W	12/5/12	209	3219	196	3019
2-Th	12/6/12				
2-F	12/7/12				
2-Sa	12/8/12				
3-Su	12/9/12				
3-M	12/10/12	201	2962	324	4775
3-T	12/11/12	213	4196	196	3861
3-W	12/12/12	224	3606	278	4475
3-Th	12/13/12				
3-F	12/14/12				
3-Sa	12/15/12				
4-Su	12/16/12				
4-M	12/17/12	156	4196	160	4303
4-T	12/18/12	266	5400	230	4669
4-W	12/19/12	149	4271	150	4300
4-Th	12/20/12				
4-F	12/21/12				
4-Sa	12/22/12				
5-Su	12/23/12				
5-M	12/24/12	300	4804	200	3203
5-T	12/25/12	300	5419	240	4335
5-W	12/26/12	290	5007	270	4661
5-Th	12/27/12				
5-F	12/28/12				
5-Sa	12/29/12				
6-Su	12/30/12				
6-M	12/31/12	228	3419	274	4109
Average		225	4248	229	4314
		Report Only	DL: 6090	Report Only	DL: 5940
Maximum		300	5419	324	5835
		Report Only	Report Only	Report Only	Report Only

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 gather and evaluate 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.

Monroe WWTP	1/8/2013 9:41:55 AM
Signature	**Date**

Washington State Department of Ecology — Discharge Monitoring Report (DMR)

Permit Number: WA0020486 **Permittee:** MONROE STP
Facility County: Snohomish **Receiving Waterbody:**
Monitoring Period: 01/01/2012 - 01/31/2012 **Outfall:** IN1 **Version:** 1

Week	Monitoring Point	Biochemical Oxygen Demand (BOD5) Milligrams/L (mg/L) 3/Week Composite Sample (24 Hour Time composite)	Biochemical Oxygen Demand (BOD5) Lbs/Day 3/Week Composite Sample (24 Hour Time composite)	Solids (Residue) Total suspended (TSS) Milligrams/L (mg/L) 3/Week Composite Sample (24 Hour Time composite)	Solids (Residue) Total suspended (TSS) Lbs/Day 3/Week Composite Sample (24 Hour Time composite)
		IN1	IN1	IN1	IN1
1-Su	1/1/12				
1-M	1/2/12	222	3425	150	2314
1-T	1/3/12	218	2569	197	2322
1-W	1/4/12	282	4163	241	3558
1-Th	1/5/12				
1-F	1/6/12				
1-Sa	1/7/12				
2-Su	1/8/12				
2-M	1/9/12				
2-T	1/10/12	259	3162	183	2234
2-W	1/11/12	203	2089	129	1328
2-Th	1/12/12	220	2249	267	2730
2-F	1/13/12				
2-Sa	1/14/12				
3-Su	1/15/12				
3-M	1/16/12	312	3450	258	2853
3-T	1/17/12	690	8028	350	4072
3-W	1/18/12	249	3030	106	1290
3-Th	1/19/12				
3-F	1/20/12				
3-Sa	1/21/12				
4-Su	1/22/12				
4-M	1/23/12	321	4278	409	5451
4-T	1/24/12	179	2405	146	1962
4-W	1/25/12	236	3313	203	2849
4-Th	1/26/12				
4-F	1/27/12				
4-Sa	1/28/12				
5-Su	1/29/12				
5-M	1/30/12	231	3514	248	3773
5-T	1/31/12	197	3015	208	3183
Average		273	3478	221	2851
		Report Only	DL: 6090 <= 6090	Report Only	DL: 5940
Maximum		690	8028	409	5451
		Report Only	Report Only	Report Only	Report Only

Permit Number: WA0020486 **Permittee:** MONROE STP
Facility County: Snohomish **Receiving Waterbody:** Skykomish R.
Monitoring Period: 01/01/2012 - 01/31/2012 **Outfall:** 001 **Version:** 1

Week	Monitoring Point	Flow MGD Continuous Measurement	Biochemical Oxygen Demand (BOD5) Milligrams/L (mg/L) 3/Week Composite Sample (24 Hour Time composite)	Biochemical Oxygen Demand (BOD5) Lbs/Day 3/Week Composite Sample (24 Hour Time composite)	Solids (Residue) Total suspended (TSS) Milligrams/L (mg/L) 3/Week Composite Sample (24 Hour Time composite)	Solids (Residue) Total suspended (TSS) Lbs/Day 3/Week Composite Sample (24 Hour Time composite)	Fecal Coliform #/100ml 3/Week Grab	pH (Hydrogen Ion) Daily Min Standard Units 1/Day Grab	pH (Hydrogen Ion) Daily Max Standard Units 1/Day Grab	Biochemical Oxygen Demand (BOD5) Percent Monthly Calculated	Solids (Residue) Total suspended (TSS) Percent Monthly Calculated
		001	001	001	001	001	001	001	001	001C	001C
1-Su	**1/1/12**	1.528						6.8	6.8		
1-M	**1/2/12**	1.506	9	139	15	231		6.8	6.8	96	90
1-T	**1/3/12**	1.850	8	94	13	153	4	6.8	6.8	96	93
1-W	**1/4/12**	1.413	12	177	14	207	1	6.7	6.7	96	94
1-Th	**1/5/12**	1.770					1	6.8	6.8		
1-F	**1/6/12**	1.446						6.7	6.7		
1-Sa	**1/7/12**	1.811						6.8	6.8		
2-Su	**1/8/12**	1.460						6.7	6.7		
2-M	**1/9/12**	1.453					1	6.7	6.7		
2-T	**1/10/12**	1.399	6	73	8	98	2	6.7	6.7	98	96
2-W	**1/11/12**	1.464	7	72	13	134	1	6.7	6.7	97	90
2-Th	**1/12/12**	1.234	5	51	14	143		6.6	6.6	98	95
2-F	**1/13/12**	1.226						6.7	6.7		
2-Sa	**1/14/12**	1.269						6.7	6.7		
3-Su	**1/15/12**	1.525						6.8	6.8		
3-M	**1/16/12**	1.384	9	100	14	155		6.7	6.7	97	95
3-T	**1/17/12**	1.326	8	93	14	163	1	6.6	6.6	99	96
3-W	**1/18/12**	1.395	10	122	7	85	1	6.6	6.6	96	93
3-Th	**1/19/12**	1.459					1	6.5	6.5		
3-F	**1/20/12**	1.614						6.6	6.6		
3-Sa	**1/21/12**	2.548						6.7	6.7		
4-Su	**1/22/12**	2.255						6.8	6.8		
4-M	**1/23/12**	2.108	13	173	14	187	2	6.6	6.6	96	97
4-T	**1/24/12**	1.598	35	470	6	81	1	6.7	6.7	80	96
4-W	**1/25/12**	1.611	6	84	8	112	1	6.5	6.5	97	96
4-Th	**1/26/12**	1.683						6.5	6.5		
4-F	**1/27/12**	1.500						6.8	6.8		
4-Sa	**1/28/12**	1.539						6.8	6.8		
5-Su	**1/29/12**	1.628						6.8	6.8		
5-M	**1/30/12**	2.202	6	91	6	91	1	6.8	6.8	97	98
5-T	**1/31/12**	1.824	6	92	12	184	1	6.9	6.9	97	94
Minimum								6.5			
								>= 6.0			
Average		1.614	10	131	11	145				96	94
		DL: 2.84 <= 2.84	<= 30	<= 711	<= 30	<= 711				>= 85	>= 85
Weekly Average			18	242	14	197					
			<= 45	<= 1066	<= 45	<= 1066					
Maximum		2.548							6.9		
		Report Only							<= 9.0		

Geometric Mean						1				
						<= 200				
Weekly Geometric Mean						2				
						<= 400				

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 gather and evaluate 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.

Monroe WWTP
Signature

2/7/2012 10:43:38 AM
Date

Washington State Department of Ecology — Discharge Monitoring Report (DMR)

Permit Number: WA0020486 **Permittee:** MONROE STP

Facility County: Snohomish **Receiving Waterbody:**

Monitoring Period: 02/01/2012 - 02/29/2012 **Outfall:** IN1 **Version:** 1

Week	Monitoring Point	Biochemical Oxygen Demand (BOD5) Milligrams/L (mg/L) 3/Week Composite Sample (24 Hour Time composite)	Biochemical Oxygen Demand (BOD5) Lbs/Day 3/Week Composite Sample (24 Hour Time composite)	Solids (Residue) Total suspended (TSS) Milligrams/L (mg/L) 3/Week Composite Sample (24 Hour Time composite)	Solids (Residue) Total suspended (TSS) Lbs/Day 3/Week Composite Sample (24 Hour Time composite)
		IN1	IN1	IN1	IN1
1-W	2/1/12	241	3851	242	3867
1-Th	2/2/12				
1-F	2/3/12				
1-Sa	2/4/12				
2-Su	2/5/12				
2-M	2/6/12	269	3545	332	4375
2-T	2/7/12	227	2641	146	1699
2-W	2/8/12	281	3211	291	3325
2-Th	2/9/12				
2-F	2/10/12				
2-Sa	2/11/12				
3-Su	2/12/12				
3-M	2/13/12				
3-T	2/14/12	303	3591	354	4195
3-W	2/15/12	295	3641	296	3654
3-Th	2/16/12	238	2924	183	2248
3-F	2/17/12				
3-Sa	2/18/12				
4-Su	2/19/12				
4-M	2/20/12				
4-T	2/21/12	97	2073	135	2885
4-W	2/22/12	177	3218	125	2273
4-Th	2/23/12	270	4535	365	6131
4-F	2/24/12				
4-Sa	2/25/12				
5-Su	2/26/12				
5-M	2/27/12	251	3433	244	3337
5-T	2/28/12	199	2752	165	2282
5-W	2/29/12	298	4178	271	3799
Average		242	3353	242	3390
		Report Only	DL: 6090 <= 6090	Report Only	DL: 5940
Maximum		303	4535	365	6131
		Report Only	Report Only	Report Only	Report Only

Permit Number: WA0020486 **Permittee:** MONROE STP
Facility County: Snohomish **Receiving Waterbody:** Skykomish R.
Monitoring Period: 02/01/2012 - 02/29/2012 **Outfall:** 001 **Version:** 1

Week	Monitoring Point	Flow MGD Continuous Measurement	Biochemical Oxygen Demand (BOD5) Milligrams/L (mg/L) 3/Week Composite Sample (24 Hour Time composite)	Biochemical Oxygen Demand (BOD5) Lbs/Day 3/Week Composite Sample (24 Hour Time composite)	Solids (Residue) Total suspended (TSS) Milligrams/L (mg/L) 3/Week Composite Sample (24 Hour Time composite)	Solids (Residue) Total suspended (TSS) Lbs/Day 3/Week Composite Sample (24 Hour Time composite)	Fecal Coliform #/100ml 3/Week Grab	pH (Hydrogen Ion) Daily Min Standard Units 1/Day Grab	pH (Hydrogen Ion) Daily Max Standard Units 1/Day Grab	Biochemical Oxygen Demand (BOD5) Percent Monthly Calculated	Solids (Residue) Total suspended (TSS) Percent Monthly Calculated
		001	001	001	001	001	001	001	001	001C	001C
1-W	**2/1/12**	1.835	5	80	6	96	1	6.9	6.9	98	98
1-Th	**2/2/12**	1.916						6.7	6.7		
1-F	**2/3/12**	1.652						6.7	6.7		
1-Sa	**2/4/12**	1.541						6.8	6.8		
2-Su	**2/5/12**	1.642						6.8	6.8		
2-M	**2/6/12**	1.600	6	79	6	79	2	6.8	6.8	98	98
2-T	**2/7/12**	1.580	6	70	6	70	2	6.9	6.9	97	96
2-W	**2/8/12**	1.395	4	46	6	69	2	6.9	6.9	99	98
2-Th	**2/9/12**	1.370						6.8	6.8		
2-F	**2/10/12**	1.599						6.8	6.8		
2-Sa	**2/11/12**	1.574						6.7	6.7		
3-Su	**2/12/12**	1.414						6.7	6.7		
3-M	**2/13/12**	1.510					1	6.7	6.7		
3-T	**2/14/12**	1.487	6	71	8	95	2	6.7	6.7	98	98
3-W	**2/15/12**	1.421	8	99	13	160	2	6.6	6.6	97	96
3-Th	**2/16/12**	1.480	5	61	11	135		6.6	6.6	98	94
3-F	**2/17/12**	1.473						6.7	6.7		
3-Sa	**2/18/12**	1.770						6.9	6.9		
4-Su	**2/19/12**	1.798						6.8	6.8		
4-M	**2/20/12**	1.543						6.8	6.8		
4-T	**2/21/12**	2.289	6	128	6	128	2	6.5	6.5	94	96
4-W	**2/22/12**	2.562	5	91	7	127	1	6.7	6.7	97	94
4-Th	**2/23/12**	2.180	6	101	6	101	2	6.7	6.7	98	98
4-F	**2/24/12**	2.014						6.7	6.7		
4-Sa	**2/25/12**	2.358						6.6	6.6		
5-Su	**2/26/12**	2.156						6.6	6.6		
5-M	**2/27/12**	2.056	7	96	10	137	1	6.6	6.6	97	96
5-T	**2/28/12**	1.640	5	69	3	41	1	6.6	6.6	97	98
5-W	**2/29/12**	1.658	5	70	9	126	1	6.6	6.6	98	97
Minimum								6.5			
								>= 6.0			
Average		1.742	6	82	7	105				97	97
		DL: 2.84 <= 2.84	<= 30	<= 711	<= 30	<= 711				>= 85	>= 85
Weekly Average			6	107	11	130					
			<= 45	<= 1066	<= 45	<= 1066					
Maximum		2.562							6.9		
		Report Only							<= 9.0		
Geometric Mean							1				
							<= 200				

Weekly Geometric Mean						2				
						<= 400				

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 gather and evaluate 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.

Monroe WWTP	3/6/2012 1:37:58 PM
Signature	**Date**

Washington State Department of Ecology **Discharge Monitoring Report (DMR)**

Permit Number: WA0020486 **Permittee:** MONROE STP

Facility County: Snohomish **Receiving Waterbody:**

Monitoring Period: 03/01/2012 - 03/31/2012 **Outfall:** IN1 **Version:** 1

Week	Monitoring Point	Biochemical Oxygen Demand (BOD5) Milligrams/L (mg/L) 3/Week Composite Sample (24 Hour Time composite) IN1	Biochemical Oxygen Demand (BOD5) Lbs/Day 3/Week Composite Sample (24 Hour Time composite) IN1	Solids (Residue) Total suspended (TSS) Milligrams/L (mg/L) 3/Week Composite Sample (24 Hour Time composite) IN1	Solids (Residue) Total suspended (TSS) Lbs/Day 3/Week Composite Sample (24 Hour Time composite) IN1
1-Th	**3/1/12**				
1-F	**3/2/12**				
1-Sa	**3/3/12**				
2-Su	**3/4/12**				
2-M	**3/5/12**	249	4486	412	7422
2-T	**3/6/12**	301	4358	253	3663
2-W	**3/7/12**	319	4233	309	4100
2-Th	**3/8/12**				
2-F	**3/9/12**				
2-Sa	**3/10/12**				
3-Su	**3/11/12**				
3-M	**3/12/12**	146	2663	115	2098
3-T	**3/13/12**	181	2337	92	1188
3-W	**3/14/12**	190	3789	194	3869
3-Th	**3/15/12**				
3-F	**3/16/12**				
3-Sa	**3/17/12**				
4-Su	**3/18/12**				
4-M	**3/19/12**	205	3243	150	2373
4-T	**3/20/12**	179	2344	182	2383
4-W	**3/21/12**	201	2880	156	2235
4-Th	**3/22/12**				
4-F	**3/23/12**				
4-Sa	**3/24/12**				
5-Su	**3/25/12**				
5-M	**3/26/12**	198	2555	190	2451
5-T	**3/27/12**	249	3169	160	2036
5-W	**3/28/12**	225	3355	166	2475
5-Th	**3/29/12**				
5-F	**3/30/12**				
5-Sa	**3/31/12**				
Average		220	3284	198	3024
		Report Only	DL: 6090 <= 6090	Report Only	DL: 5940
Maximum		319	4486	412	7422
		Report Only	Report Only	Report Only	Report Only

Permit Number: WA0020486 **Permittee:** MONROE STP
Facility County: Snohomish **Receiving Waterbody:** Skykomish R.
Monitoring Period: 03/01/2012 - 03/31/2012 **Outfall:** 001 **Version:** 1

Week	Monitoring Point	Flow MGD Continuous Measurement 001	Biochemical Oxygen Demand (BOD5) Milligrams/L (mg/L) 3/Week Composite Sample (24 Hour Time composite) 001	Biochemical Oxygen Demand (BOD5) Lbs/Day 3/Week Composite Sample (24 Hour Time composite) 001	Solids (Residue) Total suspended (TSS) Milligrams/L (mg/L) 3/Week Composite Sample (24 Hour Time composite) 001	Solids (Residue) Total suspended (TSS) Lbs/Day 3/Week Composite Sample (24 Hour Time composite) 001	Fecal Coliform #/100ml 3/Week Grab 001	pH (Hydrogen Ion) Daily Min Standard Units 1/Day Grab 001	pH (Hydrogen Ion) Daily Max Standard Units 1/Day Grab 001	Biochemical Oxygen Demand (BOD5) Percent Monthly Calculated 001C	Solids (Residue) Total suspended (TSS) Percent Monthly Calculated 001C
1-Th	**3/1/12**	1.681						6.7	6.7		
1-F	**3/2/12**	1.868						6.7	6.7		
1-Sa	**3/3/12**	2.026						6.6	6.6		
2-Su	**3/4/12**	1.832						6.7	6.7		
2-M	**3/5/12**	1.820	5	90	8	144	1	6.7	6.7	98	98
2-T	**3/6/12**	2.160	7	101	7	101	1	6.7	6.7	98	97
2-W	**3/7/12**	1.736	7	93	12	159	3	6.8	6.8	98	96
2-Th	**3/8/12**	1.591						6.8	6.8		
2-F	**3/9/12**	1.523						6.9	6.9		
2-Sa	**3/10/12**	1.686						6.9	6.9		
3-Su	**3/11/12**	1.824						6.8	6.8		
3-M	**3/12/12**	1.638	6	109	7	128	6	7.0	7.0	96	94
3-T	**3/13/12**	2.187	5	65	6	77	1	6.9	6.9	97	93
3-W	**3/14/12**	1.548	4	80	5	100	1	6.8	6.8	98	97
3-Th	**3/15/12**	2.391						6.6	6.6		
3-F	**3/16/12**	2.680						6.7	6.7		
3-Sa	**3/17/12**	2.450						6.6	6.6		
4-Su	**3/18/12**	2.251						6.5	6.5		
4-M	**3/19/12**	2.172	5	79	8	127	1	6.8	6.8	98	95
4-T	**3/20/12**	1.897	9	118	14	183	1	6.9	6.9	95	92
4-W	**3/21/12**	1.570	7	100	9	129	1	6.8	6.8	97	94
4-Th	**3/22/12**	1.718						6.9	6.9		
4-F	**3/23/12**	1.679						6.9	6.9		
4-Sa	**3/24/12**	1.631						6.8	6.8		
5-Su	**3/25/12**	1.639						6.7	6.7		
5-M	**3/26/12**	1.662	8	103	8	103	1	6.7	6.7	96	96
5-T	**3/27/12**	1.547	9	115	6	76	1	6.7	6.7	96	96
5-W	**3/28/12**	1.526	5	75	6	89	1	6.9	6.9	98	96
5-Th	**3/29/12**	1.788						6.9	6.9		
5-F	**3/30/12**	2.174						6.9	6.9		
5-Sa	**3/31/12**	1.905						6.7	6.7		
Minimum								6.5			
								>= 6.0			
Average		1.865	6	94	8	118				97	95
		DL: 2.84 <= 2.84	<= 30	<= 711	<= 30	<= 711				>= 85	>= 85
Weekly Average			7	98	10	146					
			<= 45	<= 1066	<= 45	<= 1066					
Maximum		2.680							7.0		
		Report Only							<= 9.0		

Discharge Monitoring Report (DMR)

Geometric Mean						1				
						<= 200				
Weekly Geometric Mean						2				
						<= 400				

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 gather and evaluate 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.

Monroe WWTP

Signature

4/3/2012 1:41:57 PM

Date

WASTEWATER TREATMENT PLANT MONITORING REPORT

Permit No.	WA-002048-6	Month May	Year 2012
Facility Name	CITY OF MONROE	Location	522 SOUTH SAMS STREET, MONROE
Receiving Water	SKYKOMISH RIVER		
Plant Type	ACTIVATED SLUDGE	NO DISCHARGE	☐

					EFFLUENT									
Frequency	3/WEEK	3/WEEK	3/WEEK	3/WEEK	CONT	3/WEEK	3/WEEK	1/MONTH	3/WEEK	3/WEEK	1/MONTH	3/WEEK	7/WEEK	2/MONTH
Type	24 HC	CALC	24 HC	CALC	MEAS	24 HC	CALC	CALC	24 HC	CALC	CALC	GRAB	GRAB	GRAB
Day of the Month	BOD 5-DAY mg/l	BOD 5-DAY lbs/day	TSS mg/l	TSS lbs/day	FLOW mgd	BOD 5-DAY mg/l	BOD 5-DAY lbs/day	BOD 5-DAY % removal	TSS mg/l	TSS lbs/day	TSS % removal	FECAL COLIFORM # CFU/100 ml	pH standard units	MERCURY [JULY-OCT] ug/l
1	347	5296	212	3236	1.836	10	153	97	24	366	89	3	6.9	
2	309	3711	164	1970	1.830	16	192	95	24	288	85	1	6.7	
3					1.440								6.8	
4					1.767								6.8	
5					1.702								6.7	
6					1.447								6.9	
7	285	3470	208	2533	1.485	8	97	97	15	183	93	1	6.8	
8	179	2668	116	1729	1.460	6	89	97	12	179	90	1	6.8	
9	340	5263	322	4984	1.787	5	77	99	14	217	96	1	6.7	
10					1.856								6.6	
11					1.882								6.6	
12					1.552								6.6	
13					1.323								6.7	
14	310	3449	194	2158	1.317	7	78	98	10	111	95	1	6.9	
15	248	3423	188	2595	1.334	6	83	98	8	110	96	1	6.8	
16	179	2450	140	1916	1.655	6	82	97	11	151	92	1	6.7	
17					1.641								6.5	
18					1.618								6.6	
19					1.693								6.6	
20					1.219								6.6	
21					1.371							1	6.6	
22	264	8021	174	5287	1.666	8	243	97	8	243	95	1	6.9	
23	200	3211	124	1991	3.643	5	80	98	6	96	95	1	6.8	
24	229	3346	172	2513	1.925	1	15	100	8	117	95		6.8	
25					1.752								6.6	
26					1.741								6.6	
27					1.629								6.6	
28	244	3492	298	4265	1.600	7	100	97	12	172	96		6.5	
29	462	5078	389	4276	1.716	4	44	99	11	121	97	1	6.5	
30	279	3076	224	2470	1.318	7	77	97	6	66	97	1	6.6	
31					1.322							1	6.6	
Total	*****	55954	*****	41921	52.968	*****	1411	*****	*****	2420	*****	*****	*****	*****
	AVG 277	AVG 3997	AVG 209	AVG 2994	AVG 1.662	AVG 7	AVG 101	AVG 97	AVG 12	AVG 173	AVG 94	GEM 1	MIN 6.5	AVG
Permit Limit	*****	**6090**	*****	**5940**	**2.840**	**30**	**711**	**85**	**30**	**711**	**85**	**200**	**6.0**	**0.16**
	MAX 462	MAX 8021	MAX 408	MAX 5287	MXD 3.643	AVW 10	AVW 181	*****	AVW 31	AVW 448	*****	GM7 2	MAX 6.9	MXD
Permit Limit	*****	*****	*****	*****	*****	**45**	**1066**	*****	**45**	**1066**	*****	**400**	**9.0**	**0.28**

AVG=Average **AVW** =Highest Weekly Average **GEM**=Geometric Mean **MAX**=Maximum **MIN**=Minimum **MXD**=Max Daily **GM7**=highest 7-day Geometric Mean

COMMENT AND EXPLANATION OF ANY VIOLATIONS MUST BE ATTACHED ON A SEPARATE SHEET.

Mail to: Department of Ecology, Northwest Regional Office, Water Quality, 3190 160th Ave SE Bellevue, WA 98008

I certify under penalty of law that I have personally examined the information submitted herein; and based on my inquiry of those individuals immediately responsible, I believe the information to be accurate and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fines and/or imprisonment. (Penalties under statutes 18 & 33 U.S.C. may include fines up to $10,000 and/or maximum imprisonmentof five years.)

Donovan Sheppard, WWTP Supervisor
Name and Title (Typed or Printed)

Donovan Sheppard
Signature

360-794-6558
Phone Number

Discharge Monitoring Report (DMR)

Permit Number: WA0020486 **Permittee:** MONROE STP
Facility County: Snohomish **Receiving Waterbody:**
Monitoring Period: 04/01/2012 - 04/30/2012 **Outfall:** IN1 **Version:** 1

Week	Monitoring Point	Biochemical Oxygen Demand (BOD5) Milligrams/L (mg/L) 3/Week Composite Sample (24 HR Time Proportional comp) IN1	Biochemical Oxygen Demand (BOD5) Lbs/Day 3/Week Composite Sample (24 HR Time Proportional comp) IN1	Solids (Residue) Total suspended (TSS) Milligrams/L (mg/L) 3/Week Composite Sample (24 HR Time Proportional comp) IN1	Solids (Residue) Total suspended (TSS) Lbs/Day 3/Week Composite Sample (24 HR Time Proportional comp) IN1
1-Su	4/1/12				
1-M	4/2/12	242	3484	276	3973
1-T	4/3/12	182	2819	168	2602
1-W	4/4/12	239	3644	234	3567
1-Th	4/5/12				
1-F	4/6/12				
1-Sa	4/7/12				
2-Su	4/8/12				
2-M	4/9/12	238	3376	212	3008
2-T	4/10/12	301	4135	192	2637
2-W	4/11/12	180	2800	138	2146
2-Th	4/12/12				
2-F	4/13/12				
2-Sa	4/14/12				
3-Su	4/15/12				
3-M	4/16/12	278	3710	234	3122
3-T	4/17/12	371	3660	268	2644
3-W	4/18/12	356	3343	222	2085
3-Th	4/19/12				
3-F	4/20/12				
3-Sa	4/21/12				
4-Su	4/22/12				
4-M	4/23/12	361	4787	228	3023
4-T	4/24/12	281	4061	194	2804
4-W	4/25/12	208	3612	170	2952
4-Th	4/26/12				
4-F	4/27/12				
4-Sa	4/28/12				
5-Su	4/29/12				
5-M	4/30/12	428	6554	408	6247
Average		282	3845	226	3139
		Report Only	DL: 6090 <= 6090	Report Only	DL: 5940
Maximum		428	6554	408	6247
		Report Only	Report Only	Report Only	Report Only

Permit Number: WA0020486 **Permittee:** MONROE STP
Facility County: Snohomish **Receiving Waterbody:** Skykomish R.
Monitoring Period: 04/01/2012 - 04/30/2012 **Outfall:** 001 **Version:** 1

Week	Monitoring Point	Flow MGD Continuous Measurement	Biochemical Oxygen Demand (BOD5) Milligrams/L (mg/L) 3/Week Composite Sample (24 HR Time Proportional comp)	Biochemical Oxygen Demand (BOD5) Lbs/Day 3/Week Composite Sample (24 HR Time Proportional comp)	Solids (Residue) Total suspended (TSS) Milligrams/L (mg/L) 3/Week Composite Sample (24 HR Time Proportional comp)	Solids (Residue) Total suspended (TSS) Lbs/Day 3/Week Composite Sample (24 HR Time Proportional comp)	Fecal Coliform #/100ml 3/Week Grab	pH (Hydrogen Ion) Daily Min Standard Units 1/Day Grab	pH (Hydrogen Ion) Daily Max Standard Units 1/Day Grab	Biochemical Oxygen Demand (BOD5) Percent Monthly Calculated	Solids (Residue) Total suspended (TSS) Percent Monthly Calculated
		001	001	001	001	001	001	001	001	001C	001C
1-Su	**4/1/12**	1.711						6.8	6.8		
1-M	**4/2/12**	1.621	9	130	8	115	1	6.7	6.7	96	97
1-T	**4/3/12**	1.726	6	93	10	155	1	6.8	6.8	97	94
1-W	**4/4/12**	1.857	6	91	8	122	1	6.8	6.8	97	97
1-Th	**4/5/12**	1.828						6.8	6.8		
1-F	**4/6/12**	1.665						6.7	6.7		
1-Sa	**4/7/12**	1.661						6.7	6.7		
2-Su	**4/8/12**	1.718						6.8	6.8		
2-M	**4/9/12**	1.653	8	113	8	113	2	6.7	6.7	97	96
2-T	**4/10/12**	1.701	7	96	10	137	2	6.7	6.7	98	95
2-W	**4/11/12**	1.647	7	109	12	187	1	6.6	6.6	96	91
2-Th	**4/12/12**	1.865						6.6	6.6		
2-F	**4/13/12**	1.715						6.4	6.4		
2-Sa	**4/14/12**	1.585						6.4	6.4		
3-Su	**4/15/12**	1.559						6.4	6.4		
3-M	**4/16/12**	1.584	8	107	11	147	1	6.3	6.3	97	95
3-T	**4/17/12**	1.600	8	79	10	99	3	6.4	6.4	98	96
3-W	**4/18/12**	1.183	9	85	10	94	1	6.6	6.6	97	95
3-Th	**4/19/12**	1.126						6.8	6.8		
3-F	**4/20/12**	1.485						6.8	6.8		
3-Sa	**4/21/12**	1.263						6.8	6.8		
4-Su	**4/22/12**	1.141						6.8	6.8		
4-M	**4/23/12**	1.168	11	146	13	172	1	6.8	6.8	97	94
4-T	**4/24/12**	1.590	12	173	18	260	3	6.8	6.8	96	91
4-W	**4/25/12**	1.733	8	139	15	260	3	6.8	6.8	96	91
4-Th	**4/26/12**	2.082						6.7	6.7		
4-F	**4/27/12**	2.079						6.7	6.7		
4-Sa	**4/28/12**	1.750						6.8	6.8		
5-Su	**4/29/12**	1.757						6.7	6.7		
5-M	**4/30/12**	2.106	13	199	45	689	3	6.7	6.7	97	89
Minimum								6.3			
								>= 6.0			
Average		1.645	9	120	14	196				97	94
		DL: 2.84 <= 2.84	<= 30	<= 711	<= 30	<= 711				>= 85	>= 85
Weekly Average			10	153	15	231					
			<= 45	<= 1066	<= 45	<= 1066					

Maximum	2.106							6.8		
	Report Only							<= 9.0		
Geometric Mean						2				
						<= 200				
Weekly Geometric Mean						2				
						<= 400				

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 gather and evaluate 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.

Monroe WWTP
Signature

5/7/2012 2:00:18 PM
Date

Washington State Department of Ecology — Discharge Monitoring Report (DMR)

Permit Number: WA0020486 **Permittee:** MONROE STP
Facility County: Snohomish **Receiving Waterbody:** Skykomish R.
Monitoring Period: 06/01/2012 - 06/30/2012 **Outfall:** 001 **Version:** 1

Week	Monitoring Point	Flow MGD Continuous Measurement	Total BOD5 Total Milligrams/L (mg/L) 3/Week Composite Sample (24 HR Time Proportional comp)	Total BOD5 Total Lbs/Day 3/Week Calculated	Total Suspended Solids (TSS) Total suspended (TSS) Milligrams/L (mg/L) 3/Week Composite Sample (24 HR Time Proportional comp)	Total Suspended Solids (TSS) Total suspended (TSS) Lbs/Day 3/Week Calculated	Fecal Coliform #/100ml 3/Week Grab	pH Standard Units 1/Day Grab	Temperature Measured Degrees C 1/Day Measurement	Temperature Calculated Degrees C 1/Day Calculated	Total BOD5 Total Percent Monthly Calculated	Total Suspended Solids (TSS) Total suspended (TSS) Percent Monthly Calculated
		001	001	001	001	001	001	001	001	001	001C	001C
1-F	**6/1/12**	1.441						6.7	18.4	O*		
1-Sa	**6/2/12**	1.281						6.7	18.4	O*		
2-Su	**6/3/12**	1.267						6.8	18.2	O*		
2-M	**6/4/12**	1.300	10	134	12	161	1	6.7	18.0	O*	96	95
2-T	**6/5/12**	1.605	22	360	9	147	2	6.7	17.7	O*	91	96
2-W	**6/6/12**	1.960	6	86	10	143	1	6.7	17.6	O*	98	96
2-Th	**6/7/12**	1.713						6.6	17.5	18.0		
2-F	**6/8/12**	2.071						6.5	17.7	17.9		
2-Sa	**6/9/12**	1.694						6.6	17.6	17.8		
3-Su	**6/10/12**	1.678						6.4	18.0	17.7		
3-M	**6/11/12**	1.717	11	125	14	159	1	6.3	19.2	17.9	96	93
3-T	**6/12/12**	1.366	11	171	12	186	1	6.6	18.5	18.0	97	96
3-W	**6/13/12**	1.859	7	82	10	117	200	6.6	18.5	18.1	98	96
3-Th	**6/14/12**	1.407					1	6.6	17.9	18.2		
3-F	**6/15/12**	1.706						6.5	20.2	18.6		
3-Sa	**6/16/12**	1.420						6.6	18.4	18.7		
4-Su	**6/17/12**	1.351						6.7	18.6	18.8		
4-M	**6/18/12**	1.553	15	188	18	225	1	6.7	18.3	18.6	96	94
4-T	**6/19/12**	1.500	11	125	9	102	1	6.7	18.4	18.6	96	97
4-W	**6/20/12**	1.364	12	141	15	176	1	6.6	18.5	18.6	96	94
4-Th	**6/21/12**	1.409						6.7	18.7	18.7		
4-F	**6/22/12**	1.710						6.7	18.7	18.5		
4-Sa	**6/23/12**	2.098						6.7	18.5	18.5		
5-Su	**6/24/12**	1.919						6.7	18.3	18.5		
5-M	**6/25/12**	1.703	11	167	13	197	1	6.6	18.4	18.5	95	90
5-T	**6/26/12**	1.806	6	86	10	144	1	6.8	18.5	18.5	98	94
5-W	**6/27/12**	1.723	1	14	11	153	1	6.7	18.6	18.5	100	93
5-Th	**6/28/12**	1.669						6.7	19.1	18.6		
5-F	**6/29/12**	1.422						6.8	19.1	18.6		
5-Sa	**6/30/12**	1.614						6.7	19.4	18.8		
Minimum								6.3				
								>= 6.0				
Average		1.611	10	140	12	159					96	94
		DL: 2.84	<= 30	<= 711	<= 30	<= 711					>= 85	>= 85
Weekly Average			13	193	14	168						
			<= 45	<= 1066	<= 45	<= 1066						
Maximum								6.8				
								<= 9.0				

Daily Maximum	2.098							20.2			
	Report Only							Report Only			
Monthly geometric mean						2					
						<= 200					
Weekly Geometric Mean						4					
						<= 400					
7-DADMax									18.8		
									Report Only		

Reporting Codes Used: O - Other

Outfall: 001 -

Monitoring Point	Parameter	Sample Date/ Statistical Base	Value	Notes/Comment
001	Temperature Calculated Degrees C	6/1/2012	O	Started on new permit and Temp was not measure during previous permit. The first day of reporting 7-DAD Max will be June 7 per Ken Ziebart.
001	Temperature Calculated Degrees C	6/2/2012	O	Started on new permit and Temp was not measure during previous permit. The first day of reporting 7-DAD Max will be June 7 per Ken Ziebart.
001	Temperature Calculated Degrees C	6/3/2012	O	Started on new permit and Temp was not measure during previous permit. The first day of reporting 7-DAD Max will be June 7 per Ken Ziebart.
001	Temperature Calculated Degrees C	6/4/2012	O	Started on new permit and Temp was not measure during previous permit. The first day of reporting 7-DAD Max will be June 7 per Ken Ziebart.
001	Temperature Calculated Degrees C	6/5/2012	O	Started on new permit and Temp was not measure during previous permit. The first day of reporting 7-DAD Max will be June 7 per Ken Ziebart.
001	Temperature Calculated Degrees C	6/6/2012	O	Started on new permit and Temp was not measure during previous permit. The first day of reporting 7-DAD Max will be June 7 per Ken Ziebart.

Permit Number: WA0020486 **Permittee:** MONROE STP
Facility County: Snohomish **Receiving Waterbody:**
Monitoring Period: 06/01/2012 - 06/30/2012 **Outfall:** IN1 **Version:** 1

Week	Monitoring Point	Total BOD5 Total Milligrams/L (mg/L) 3/Week Composite Sample (24 HR Time Proportional comp) INF	Total BOD5 Total Lbs/Day 3/Week Calculated INF	Total Suspended Solids (TSS) Total suspended (TSS) Milligrams/L (mg/L) 3/Week Composite Sample (24 HR Time Proportional comp) INF	Total Suspended Solids (TSS) Total suspended (TSS) Lbs/Day 3/Week Calculated INF
1-F	6/1/12				
1-Sa	6/2/12				
2-Su	6/3/12				
2-M	6/4/12	267	3574	240	3213
2-T	6/5/12	233	3809	204	3335
2-W	6/6/12	258	3686	280	4000
2-Th	6/7/12				
2-F	6/8/12				
2-Sa	6/9/12				
3-Su	6/10/12				
3-M	6/11/12	282	3213	208	2370
3-T	6/12/12	319	4946	282	4372
3-W	6/13/12	281	3297	228	2675
3-Th	6/14/12				
3-F	6/15/12				
3-Sa	6/16/12				
4-Su	6/17/12				
4-M	6/18/12	363	4541	286	3578
4-T	6/19/12	269	3060	294	3344
4-W	6/20/12	271	3185	252	2961
4-Th	6/21/12				
4-F	6/22/12				
4-Sa	6/23/12				
5-Su	6/24/12				
5-M	6/25/12	206	3120	126	1908
5-T	6/26/12	253	3636	172	2472
5-W	6/27/12	342	4760	158	2199
5-Th	6/28/12				
5-F	6/29/12				
5-Sa	6/30/12				
Average		279	3736	228	3036
		Report Only	DL: 6090	Report Only	DL: 5940
Maximum		363	4946	294	4372
		Report Only	Report Only	Report Only	Report Only

Reporting Codes Used: O - Other

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 gather and evaluate 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.

Monroe WWTP	7/5/2012 1:12:21 PM
Signature	**Date**

Washington State Department of Ecology

Discharge Monitoring Report (DMR)

Permit Number: WA0020486 **Permittee:** MONROE STP
Facility County: Snohomish **Receiving Waterbody:** Skykomish R.
Monitoring Period: 07/01/2012 - 07/31/2012 **Outfall:** 001 **Version:** 2

Week	Monitoring Point	Flow MGD Continuous Measurement	Total BOD5 Total Milligrams/L (mg/L) 3/Week Composite Sample (24 HR Time Proportional comp)	Total BOD5 Total Lbs/Day 3/Week Calculated	Total Suspended Solids (TSS) Total suspended (TSS) Milligrams/L (mg/L) 3/Week Composite Sample (24 HR Time Proportional comp)	Total Suspended Solids (TSS) Total suspended (TSS) Lbs/Day 3/Week Calculated	Fecal Coliform #/100ml 3/Week Grab	pH Standard Units 1/Day Grab	Temperature Measured Degrees C 1/Day Measurement	Temperature Calculated Degrees C 1/Day Calculated	Total BOD5 Total Percent Monthly Calculated	Total Suspended Solids (TSS) Total suspended (TSS) Percent Monthly Calculated
		001	001	001	001	001	001	001	001	001	001C	001C
1-Su	7/1/12	1.311						6.8	19.2	18.9		
1-M	7/2/12	1.546					2	6.7	19.1	19.0		
1-T	7/3/12	1.589	13	182	21	294	1	6.7	19.1	19.1	96	92
1-W	7/4/12	1.677	10	114	16	182		6.7	19.2	19.2	96	92
1-Th	7/5/12	1.362	24	307	52	665	2	6.6	19.1	19.2	91	72
1-F	7/6/12	1.534						6.6	19.7	19.3		
1-Sa	7/7/12	1.334						6.7	19.9	19.3		
2-Su	7/8/12	1.529						6.6	20.2	19.5		
2-M	7/9/12	1.307	15	196	26	340	5	6.6	20.1	19.6	95	90
2-T	7/10/12	1.568	16	175	30	328	3	6.6	20.8	19.9	93	88
2-W	7/11/12	1.310	8	101	10	127	2	7.2	20.8	20.1	96	93
2-Th	7/12/12	1.521						7.0	21.2	20.4		
2-F	7/13/12	1.260						6.8	20.9	20.6		
2-Sa	7/14/12	1.538						6.8	21.3	20.8		
3-Su	7/15/12	1.200						6.9	21.0	20.9		
3-M	7/16/12	1.449	14	152	11	120	1	6.8	21.3	21.0	95	93
3-T	7/17/12	1.304					1	7.0	21.7	21.2		
3-W	7/18/12	1.260	5	58	9	104	1	6.8	21.2	21.2	98	96
3-Th	7/19/12	1.387	6	73	6	73		6.9	21.3	21.2	97	97
3-F	7/20/12	1.463						7.0	21.2	21.3		
3-Sa	7/21/12	1.167						6.9	21.7	21.3		
4-Su	7/22/12	1.008						6.6	21.0	21.3		
4-M	7/23/12	1.047	22	307	9	126	1	6.5	20.8	21.3	92	98
4-T	7/24/12	1.674	20	281	5	70	1	6.6	20.8	21.1	92	97
4-W	7/25/12	1.682	4	47	5	59	2	6.5	21.2	21.1	98	98
4-Th	7/26/12	1.409						6.6	21.3	21.1		
4-F	7/27/12	1.502						6.8	21.5	21.2		
4-Sa	7/28/12	1.519						6.7	22.0	21.2		
5-Su	7/29/12	1.466						6.6	21.8	21.3		
5-M	7/30/12	1.512	15	135	23	207	5	6.4	21.5	21.4	97	93
5-T	7/31/12	1.078					1	6.5	23.4	21.8		
Minimum								6.4				
								>= 6.0				
Average		1.404	13	164	17	207					95	92
		DL: 2.84	<= 30	<= 711	<= 30	<= 711					>= 85	>= 85
Weekly Average			16	212	30	380						
			<= 45	<= 1066	<= 45	<= 1066						

Maximum							7.2				
							<= 9.0				
Daily Maximum	1.682							23.4			
	Report Only							Report Only			
Monthly geometric mean						2					
						<= 200					
Weekly Geometric Mean						3					
						<= 400					
7-DADMax									21.8		
									Report Only		

Permit Number: WA0020486 **Permittee:** MONROE STP
Facility County: Snohomish **Receiving Waterbody:**
Monitoring Period: 07/01/2012 - 07/31/2012 **Outfall:** IN1 **Version:** 2

Week	Monitoring Point	Total BOD5 Total Milligrams/L (mg/L) 3/Week Composite Sample (24 HR Time Proportional comp)	Total BOD5 Total Lbs/Day 3/Week Calculated	Total Suspended Solids (TSS) Total suspended (TSS) Milligrams/L (mg/L) 3/Week Composite Sample (24 HR Time Proportional comp)	Total Suspended Solids (TSS) Total suspended (TSS) Lbs/Day 3/Week Calculated
		INF	INF	INF	INF
1-Su	7/1/12				
1-M	7/2/12				
1-T	7/3/12	311	4350	278	3888
1-W	7/4/12	245	2783	210	2385
1-Th	7/5/12	278	3557	186	2380
1-F	7/6/12				
1-Sa	7/7/12				
2-Su	7/8/12				
2-M	7/9/12	274	3583	256	3348
2-T	7/10/12	220	2404	240	2622
2-W	7/11/12	214	2715	144	1827
2-Th	7/12/12				
2-F	7/13/12				
2-Sa	7/14/12				
3-Su	7/15/12				
3-M	7/16/12	259	2817	162	1762
3-T	7/17/12				
3-W	7/18/12	256	2961	212	2452
3-Th	7/19/12	235	2867	210	2562
3-F	7/20/12				
3-Sa	7/21/12				
4-Su	7/22/12				
4-M	7/23/12	280	3909	376	5249
4-T	7/24/12	247	3465	192	2693
4-W	7/25/12	262	3079	296	3478
4-Th	7/26/12				
4-F	7/27/12				
4-Sa	7/28/12				
5-Su	7/29/12				
5-M	7/30/12	464	4172	332	2985
5-T	7/31/12				
Average		273	3282	238	2895
		Report Only	DL: 6090	Report Only	DL: 5940
Maximum		464	4350	376	5249
		Report Only	Report Only	Report Only	Report Only

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 gather and evaluate 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.

Monroe WWTP	8/7/2012 7:42:17 AM
Signature	**Date**

Washington State Department of Ecology **Discharge Monitoring Report (DMR)**

Permit Number: WA0020486 **Permittee:** MONROE STP
Facility County: Snohomish **Receiving Waterbody:** Skykomish R.
Monitoring Period: 08/01/2012 - 08/31/2012 **Outfall:** 001 **Version:** 1

Week	Monitoring Point	Flow MGD Continuous Measurement	Total BOD5 Total Milligrams/L (mg/L) 3/Week Composite Sample (24 HR Time Proportional comp)	Total BOD5 Total Lbs/Day 3/Week Calculated	Total Suspended Solids (TSS) Total suspended (TSS) Milligrams/L (mg/L) 3/Week Composite Sample (24 HR Time Proportional comp)	Total Suspended Solids (TSS) Total suspended (TSS) Lbs/Day 3/Week Calculated	Fecal Coliform #/100ml 3/Week Grab	pH Standard Units 1/Day Grab	Temperature Measured Degrees C 1/Day Measurement	Temperature Calculated Degrees C 1/Day Calculated	Total BOD5 Total Percent Monthly Calculated	Total Suspended Solids (TSS) Total suspended (TSS) Percent Monthly Calculated
		001	001	001	001	001	001	001	001	001	001C	001C
1-W	**8/1/12**	O|5.465*	5	170	19	644		7.4	21.4	21.8	98	90
1-Th	**8/2/12**	O|4.065*	6	229	14	535	2	7.0	21.4	21.9	97	92
1-F	**8/3/12**	O|4.580*						6.7	21.7	21.9		
1-Sa	**8/4/12**	1.556						6.6	21.9	21.9		
2-Su	**8/5/12**	1.536						6.5	22.5	22.0		
2-M	**8/6/12**	1.452	12	102	12	102	2	6.6	22.8	22.2	97	97
2-T	**8/7/12**	1.022	8	65	10	81	3	6.7	22.4	22.0	98	97
2-W	**8/8/12**	0.970	17	147	10	86	2	6.8	22.6	22.2	95	96
2-Th	**8/9/12**	1.036						6.9	22.4	22.3		
2-F	**8/10/12**	1.158						6.9	22.2	22.4		
2-Sa	**8/11/12**	1.982						6.8	22.4	22.5		
3-Su	**8/12/12**	1.304						6.7	22.4	22.5		
3-M	**8/13/12**	1.394					40	6.6	22.5	22.4		
3-T	**8/14/12**	1.250						6.7	22.6	22.4		
3-W	**8/15/12**	1.263	23	248	47	506	3	6.7	22.9	22.5	93	83
3-Th	**8/16/12**	1.292	20	209	44	460	5	6.8	23.2	22.6	94	82
3-F	**8/17/12**	1.254	9	96	15	160		6.7	23.5	22.8	98	94
3-Sa	**8/18/12**	1.280						6.6	23.4	22.9		
4-Su	**8/19/12**	1.197						6.7	23.1	23.0		
4-M	**8/20/12**	1.266	14	142	14	142	2	6.6	23.0	23.1	96	96
4-T	**8/21/12**	1.212	12	128	9	96	5	6.7	22.6	23.1	97	96
4-W	**8/22/12**	1.275	8	82	10	102	5	6.8	22.4	23.0	98	96
4-Th	**8/23/12**	1.228						6.8	21.9	22.8		
4-F	**8/24/12**	1.342						6.8	21.8	22.6		
4-Sa	**8/25/12**	1.427						6.7	21.6	22.3		
5-Su	**8/26/12**	1.001						6.6	21.7	22.1		
5-M	**8/27/12**	1.043					2	6.5	21.8	22.0		
5-T	**8/28/12**	1.631	4	52	30	393	3	6.8	21.9	21.9	99	89
5-W	**8/29/12**	1.569	2	23	9	103	2	6.7	21.8	21.8	99	96
5-Th	**8/30/12**	1.377	5	57	6	69		6.7	21.9	21.8	98	98
5-F	**8/31/12**	1.372						6.8	21.7	21.8		
Minimum								6.5				
								>= 6.0				
Average		1.639	10	125	18	249					97	93
		DL: 2.84	<= 30	<= 711	<= 30	<= 711					>= 85	>= 85
Weekly Average			17	184	35	462						
			<= 45	<= 1066	<= 45	<= 1066						

Maximum							7.4				
							<= 9.0				
Daily Maximum	5.465							23.5			
	Report Only							Report Only			
Monthly geometric mean						3					
						<= 200					
Weekly Geometric Mean						8					
						<= 400					
7-DADMax									23.1		
									Report Only		

Reporting Codes Used: O - Other

Outfall: 001 -

Monitoring Point	Parameter	Sample Date/ Statistical Base	Value	Notes/Comment
001	Flow Not Applicable MGD	8/1/2012	O|5.465	We believe this value is incorrect due to construction activities. UV plumbing work was being done and mag meter was left empty for a few days.
001	Flow Not Applicable MGD	8/2/2012	O|4.065	We believe this value is incorrect due to construction activities. UV plumbing work was being done and mag meter was left empty for a few days.
001	Flow Not Applicable MGD	8/3/2012	O|4.580	We believe this value is incorrect due to construction activities. UV plumbing work was being done and mag meter was left empty for a few days.

Permit Number: WA0020486 **Permittee:** MONROE STP
Facility County: Snohomish **Receiving Waterbody:**
Monitoring Period: 08/01/2012 - 08/31/2012 **Outfall:** IN1 **Version:** 1

Week	Monitoring Point	Total BOD5 Total Milligrams/L (mg/L) 3/Week Composite Sample (24 HR Time Proportional comp)	Total BOD5 Total Lbs/Day 3/Week Calculated	Total Suspended Solids (TSS) Total suspended (TSS) Milligrams/L (mg/L) 3/Week Composite Sample (24 HR Time Proportional comp)	Total Suspended Solids (TSS) Total suspended (TSS) Lbs/Day 3/Week Calculated
		INF	INF	INF	INF
1-W	8/1/12	269	9120	190	6441
1-Th	8/2/12	221	8442	176	6723
1-F	8/3/12				
1-Sa	8/4/12				
2-Su	8/5/12				
2-M	8/6/12	349	2975	374	3188
2-T	8/7/12	423	3422	322	2605
2-W	8/8/12	346	2990	224	1935
2-Th	8/9/12				
2-F	8/10/12				
2-Sa	8/11/12				
3-Su	8/12/12				
3-M	8/13/12				
3-T	8/14/12				
3-W	8/15/12	316	3405	274	2952
3-Th	8/16/12	319	3336	246	2573
3-F	8/17/12	462	4932	232	2477
3-Sa	8/18/12				
4-Su	8/19/12				
4-M	8/20/12	343	3467	330	3336
4-T	8/21/12	344	3658	226	2403
4-W	8/22/12	473	4844	236	2417
4-Th	8/23/12				
4-F	8/24/12				
4-Sa	8/25/12				
5-Su	8/26/12				
5-M	8/27/12				
5-T	8/28/12	291	3808	274	3585
5-W	8/29/12	318	3652	244	2802
5-Th	8/30/12	316	3616	258	2952
5-F	8/31/12				
Average		342	4405	258	3314
		Report Only	DL: 6090	Report Only	DL: 5940
Maximum		473	9120	374	6723
		Report Only	Report Only	Report Only	Report Only

Reporting Codes Used: O - Other

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 gather and evaluate 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.

Monroe WWTP	9/7/2012 8:34:31 AM
Signature	**Date**

Washington State Department of Ecology

Discharge Monitoring Report (DMR)

Permit Number: WA0020486 **Permittee:** MONROE STP

Facility County: Snohomish **Receiving Waterbody:** Skykomish R.

Monitoring Period: 09/01/2012 - 09/30/2012 **Outfall:** 001 **Version:** 1

Week	Monitoring Point	Flow MGD Continuous Measurement	Total BOD5 Total Milligrams/L (mg/L) 3/Week Composite Sample (24 HR Time Proportional comp)	Total BOD5 Total Lbs/Day 3/Week Calculated	Total Suspended Solids (TSS) Total suspended (TSS) Milligrams/L (mg/L) 3/Week Composite Sample (24 HR Time Proportional comp)	Total Suspended Solids (TSS) Total suspended (TSS) Lbs/Day 3/Week Calculated	Fecal Coliform #/100ml 3/Week Grab	pH Standard Units 1/Day Grab	Temperature Measured Degrees C 1/Day Measurement	Temperature Calculated Degrees C 1/Day Calculated	Total BOD5 Total Percent Monthly Calculated	Total Suspended Solids (TSS) Total suspended (TSS) Percent Monthly Calculated
		001	001	001	001	001	001	001	001	001	001C	001C
1-Sa	**9/1/12**	1.332						6.7	21.7	21.8		
2-Su	**9/2/12**	1.341						6.7	21.5	21.8		
2-M	**9/3/12**	1.254	6	71	12	141		6.5	21.3	21.7	99	97
2-T	**9/4/12**	1.409	4	42	10	105	3	6.6	21.4	21.6	99	96
2-W	**9/5/12**	1.261	4	44	10	109	4	6.6	21.6	21.6	99	97
2-Th	**9/6/12**	1.307					7	6.8	21.9	21.6		
2-F	**9/7/12**	1.287						6.7	21.9	21.6		
2-Sa	**9/8/12**	1.226						6.9	22.1	21.7		
3-Su	**9/9/12**	1.226						7.1	21.8	21.7		
3-M	**9/10/12**	1.425	7	76	9	97	1	6.8	21.6	21.8	97	96
3-T	**9/11/12**	1.298	6	64	6	64	2	6.8	21.3	21.8	98	97
3-W	**9/12/12**	1.288	5	54	8	86	3	6.7	21.2	21.7	98	96
3-Th	**9/13/12**	1.283						6.7	21.5	21.6		
3-F	**9/14/12**	1.274						6.8	21.0	21.5		
3-Sa	**9/15/12**	1.219						6.8	21.1	21.4		
4-Su	**9/16/12**	1.225						6.8	21.0	21.2		
4-M	**9/17/12**	1.274	5	54	9	97	2	6.7	21.1	21.2	98	97
4-T	**9/18/12**	1.294	4	43	9	97	6	6.8	21.4	21.2	98	95
4-W	**9/19/12**	1.293	3	31	8	82	1	6.8	21.5	21.2	99	97
4-Th	**9/20/12**	1.228						6.7	21.3	21.2		
4-F	**9/21/12**	1.239						6.9	21.2	21.2		
4-Sa	**9/22/12**	1.232						6.8	21.2	21.2		
5-Su	**9/23/12**	1.238						6.7	20.9	21.2		
5-M	**9/24/12**	1.311	4	44	6	66	1	6.7	20.7	21.2	99	98
5-T	**9/25/12**	1.325	3	33	6	65	2	6.8	20.7	21.1	99	97
5-W	**9/26/12**	1.302	4	44	8	88	1	6.7	20.4	20.9	99	97
5-Th	**9/27/12**	1.320						6.8	20.5	20.8		
5-F	**9/28/12**	1.243						6.9	20.6	20.7		
5-Sa	**9/29/12**	1.226						7.0	20.6	20.6		
6-Su	**9/30/12**	1.227						6.9	20.4	20.6		
Minimum								6.5				
								>= 6.0				
Average		1.280	5	50	8	92					98	97
		DL: 2.84	<= 30	<= 711	<= 30	<= 711					>= 85	>= 85
Weekly Average			6	65	11	118						
			<= 45	<= 1066	<= 45	<= 1066						
Maximum								7.1				
								<= 9.0				

Daily Maximum	1.425							22.1			
	Report Only							Report Only			
Monthly geometric mean						2					
						<= 200					
Weekly Geometric Mean						4					
						<= 400					
7-DADMax									21.8		
									Report Only		

Permit Number: WA0020486 **Permittee:** MONROE STP
Facility County: Snohomish **Receiving Waterbody:**
Monitoring Period: 09/01/2012 - 09/30/2012 **Outfall:** IN1 **Version:** 1

Week	Monitoring Point	Total BOD5 Total Milligrams/L (mg/L) 3/Week Composite Sample (24 HR Time Proportional comp)	Total BOD5 Total Lbs/Day 3/Week Calculated	Total Suspended Solids (TSS) Total suspended (TSS) Milligrams/L (mg/L) 3/Week Composite Sample (24 HR Time Proportional comp)	Total Suspended Solids (TSS) Total suspended (TSS) Lbs/Day 3/Week Calculated
		INF	INF	INF	INF
1-Sa	9/1/12				
2-Su	9/2/12				
2-M	9/3/12	401	4712	444	5217
2-T	9/4/12	356	3744	268	2818
2-W	9/5/12	393	4284	308	3357
2-Th	9/6/12				
2-F	9/7/12				
2-Sa	9/8/12				
3-Su	9/9/12				
3-M	9/10/12	252	2728	226	2447
3-T	9/11/12	287	3083	196	2105
3-W	9/12/12	282	3017	226	2418
3-Th	9/13/12				
3-F	9/14/12				
3-Sa	9/15/12				
4-Su	9/16/12				
4-M	9/17/12	251	2709	288	3108
4-T	9/18/12	262	2825	180	1941
4-W	9/19/12	344	3523	302	3093
4-Th	9/20/12				
4-F	9/21/12				
4-Sa	9/22/12				
5-Su	9/23/12				
5-M	9/24/12	288	3183	292	3227
5-T	9/25/12	252	2736	228	2476
5-W	9/26/12	298	3281	244	2686
5-Th	9/27/12				
5-F	9/28/12				
5-Sa	9/29/12				
6-Su	9/30/12				
Average		306	3319	267	2908
		Report Only	DL: 6090	Report Only	DL: 5940
Maximum		401	4712	444	5217
		Report Only	Report Only	Report Only	Report Only

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 gather and evaluate 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.

Monroe WWTP	10/2/2012 1:05:36 PM
Signature	**Date**

Washington State Department of Ecology

Discharge Monitoring Report (DMR)

Permit Number: WA0020486 **Permittee:** MONROE STP
Facility County: Snohomish **Receiving Waterbody:** Skykomish R.
Monitoring Period: 10/01/2012 - 10/31/2012 **Outfall:** 001 **Version:** 1

Week	Monitoring Point	Flow MGD Continuous Measurement 001	Total BOD5 Total Milligrams/L (mg/L) 3/Week Composite Sample (24 HR Time Proportional comp) 001	Total BOD5 Total Lbs/Day 3/Week Calculated 001	Total Suspended Solids (TSS) Total suspended (TSS) Milligrams/L (mg/L) 3/Week Composite Sample (24 HR Time Proportional comp) 001	Total Suspended Solids (TSS) Total suspended (TSS) Lbs/Day 3/Week Calculated 001	Fecal Coliform #/100ml 3/Week Grab 001	pH Standard Units 1/Day Grab 001	Temperature Measured Degrees C 1/Day Measurement 001	Temperature Calculated Degrees C 1/Day Calculated 001	Total BOD5 Total Percent Monthly Calculated 001C	Total Suspended Solids (TSS) Total suspended (TSS) Percent Monthly Calculated 001C
1-M	10/1/12	1.227	7	74	15	159	1	6.8	20.3	20.5	99	96
1-T	10/2/12	1.267	4	43	10	107	12	6.7	20.3	20.4	99	97
1-W	10/3/12	1.287	6	62	13	135	1	6.7	20.2	20.4	98	96
1-Th	10/4/12	1.246						6.6	19.9	20.3		
1-F	10/5/12	1.395						6.7	19.4	20.2		
1-Sa	10/6/12	1.210						6.8	19.5	20.0		
2-Su	10/7/12	1.248						6.7	19.1	19.8		
2-M	10/8/12	1.264	4	41	5	52		6.7	19.2	19.7	99	98
2-T	10/9/12	1.239	4	41	9	93	2	6.6	19.2	19.5	99	96
2-W	10/10/12	1.234	4	41	8	82	1	6.6	19.1	19.3	99	97
2-Th	10/11/12	1.227					2	6.6	19.1	19.2		
2-F	10/12/12	1.403						6.6	18.8	19.1		
2-Sa	10/13/12	1.247						6.9	18.5	19.0		
3-Su	10/14/12	1.526						6.9	18.6	18.9		
3-M	10/15/12	1.493	9	140	20	312	2	6.8	18.9	18.9	96	91
3-T	10/16/12	1.868	5	57	11	126	1	6.7	19.0	18.9	98	96
3-W	10/17/12	1.374	7	76	17	184	1	7.1	18.3	18.7	98	95
3-Th	10/18/12	1.299						6.9	18.6	18.7		
3-F	10/19/12	2.554						7.0	18.5	18.6		
3-Sa	10/20/12	1.651						6.8	17.8	18.5		
4-Su	10/21/12	1.468						6.7	17.4	18.4		
4-M	10/22/12	1.555	9	104	18	209	1	6.6	17.3	18.1	97	92
4-T	10/23/12	1.391	6	65	14	151	1	6.6	17.2	17.9	98	94
4-W	10/24/12	1.296	7	79	14	159	1	6.6	17.1	17.7	97	94
4-Th	10/25/12	1.360						6.5	17.2	17.5		
4-F	10/26/12	1.320						6.5	16.9	17.3		
4-Sa	10/27/12	1.301						6.5	16.9	17.1		
5-Su	10/28/12	1.442						6.5	17.3	17.1		
5-M	10/29/12	1.638						6.6	17.5	17.2		
5-T	10/30/12	1.730	8	150	11	206	4	6.6	17.6	17.2	96	96
5-W	10/31/12	2.242	12	199	23	381	1	6.6	17.2	17.2	96	91
Minimum								6.5				
								>= 6.0				
Average		1.452	7	84	13	168					98	95
		DL: 2.84	<= 30	<= 711	<= 30	<= 711					>= 85	>= 85
Weekly Average			11	184	19	320						
			<= 45	<= 1066	<= 45	<= 1066						

Maximum							7.1				
							<= 9.0				
Daily Maximum	2.554							20.3			
	Report Only							Report Only			
Monthly geometric mean						2					
						<= 200					
Weekly Geometric Mean						2					
						<= 400					
7-DADMax									20.5		
									Report Only		

Washington State Department of Ecology **Discharge Monitoring Report (DMR)**

Permit Number: WA0020486 **Permittee:** MONROE STP
Facility County: Snohomish **Receiving Waterbody:**
Monitoring Period: 10/01/2012 - 10/31/2012 **Outfall:** IN1 **Version:** 1

Week	Monitoring Point	Total BOD5 Total Milligrams/L (mg/L) 3/Week Composite Sample (24 HR Time Proportional comp) INF	Total BOD5 Total Lbs/Day 3/Week Calculated INF	Total Suspended Solids (TSS) Total suspended (TSS) Milligrams/L (mg/L) 3/Week Composite Sample (24 HR Time Proportional comp) INF	Total Suspended Solids (TSS) Total suspended (TSS) Lbs/Day 3/Week Calculated INF
1-M	**10/1/12**	474	5009	357	3772
1-T	**10/2/12**	379	4068	338	3628
1-W	**10/3/12**	323	3356	344	3575
1-Th	**10/4/12**				
1-F	**10/5/12**				
1-Sa	**10/6/12**				
2-Su	**10/7/12**				
2-M	**10/8/12**	410	4237	296	3059
2-T	**10/9/12**	311	3201	236	2429
2-W	**10/10/12**	304	3111	256	2620
2-Th	**10/11/12**				
2-F	**10/12/12**				
2-Sa	**10/13/12**				
3-Su	**10/14/12**				
3-M	**10/15/12**	245	3817	220	3427
3-T	**10/16/12**	247	2830	246	2819
3-W	**10/17/12**	296	3207	352	3813
3-Th	**10/18/12**				
3-F	**10/19/12**				
3-Sa	**10/20/12**				
4-Su	**10/21/12**				
4-M	**10/22/12**	270	3132	222	2575
4-T	**10/23/12**	321	3470	236	2551
4-W	**10/24/12**	243	2756	218	2473
4-Th	**10/25/12**				
4-F	**10/26/12**				
4-Sa	**10/27/12**				
5-Su	**10/28/12**				
5-M	**10/29/12**				
5-T	**10/30/12**	221	4132	252	4712
5-W	**10/31/12**	333	5516	245	4058
Average		313	3703	273	3251
		Report Only	DL: 6090	Report Only	DL: 5940
Maximum		474	5516	357	4712
		Report Only	Report Only	Report Only	Report Only

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 gather and evaluate 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.

Monroe WWTP	11/7/2012 1:52:43 PM
Signature	**Date**

Washington State Department of Ecology

Discharge Monitoring Report (DMR)

Permit Number: WA0020486 **Permittee:** MONROE STP
Facility County: Snohomish **Receiving Waterbody:** Skykomish R.
Monitoring Period: 11/01/2012 - 11/30/2012 **Outfall:** 001 **Version:** 1

Week	Monitoring Point	Flow MGD Continuous Measurement	Total BOD5 Total Milligrams/L (mg/L) 3/Week Composite Sample (24 HR Time Proportional comp)	Total BOD5 Total Lbs/Day 3/Week Calculated	Total Suspended Solids (TSS) Total suspended (TSS) Milligrams/L (mg/L) 3/Week Composite Sample (24 HR Time Proportional comp)	Total Suspended Solids (TSS) Total suspended (TSS) Lbs/Day 3/Week Calculated	Fecal Coliform #/100ml 3/Week Grab	pH Standard Units 1/Day Grab	Temperature Measured Degrees C 1/Day Measurement	Temperature Calculated Degrees C 1/Day Calculated	Total BOD5 Total Percent Monthly Calculated	Total Suspended Solids (TSS) Total suspended (TSS) Percent Monthly Calculated
		001	001	001	001	001	001	001	001	001	001C	001C
1-Th	**11/1/12**	1.986	12	203	22	372	2	6.5	17.0	17.2	95	92
1-F	**11/2/12**	2.028						6.5	17.2	17.2		
1-Sa	**11/3/12**	1.519						6.8	17.4	17.3		
2-Su	**11/4/12**	1.565						6.5	17.5	17.3		
2-M	**11/5/12**	1.732					1	6.6	17.6	17.4		
2-T	**11/6/12**	1.515	6	80	11	146	1	6.7	17.5	17.3	98	96
2-W	**11/7/12**	1.596	5	57	10	114	2	6.8	17.5	17.4	98	96
2-Th	**11/8/12**	1.370	5	52	12	124		6.9	16.9	17.4	98	94
2-F	**11/9/12**	1.238						6.8	16.6	17.3		
2-Sa	**11/10/12**	1.496						6.9	16.4	17.1		
3-Su	**11/11/12**	1.343						6.7	16.0	16.9		
3-M	**11/12/12**	1.592	7	86	14	173		6.6	15.5	16.6	97	94
3-T	**11/13/12**	1.480	10	131	18	236	1	6.7	15.4	16.3	96	93
3-W	**11/14/12**	1.575	8	107	12	161	4	6.7	15.4	16.0	94	95
3-Th	**11/15/12**	1.606					2	6.7	15.0	15.8		
3-F	**11/16/12**	1.574						6.7	15.1	15.5		
3-Sa	**11/17/12**	1.467						6.6	15.2	15.4		
4-Su	**11/18/12**	1.593	10	178	18	321		6.6	15.2	15.3	96	93
4-M	**11/19/12**	2.135	10	287	18	517	4	6.8	14.7	15.1	92	86
4-T	**11/20/12**	3.445	8	166	16	332	1	6.8	13.8	14.9	95	89
4-W	**11/21/12**	2.490					4	6.8	14.0	14.7		
4-Th	**11/22/12**	1.589						6.8	15.3	14.8		
4-F	**11/23/12**	1.227						7.1	15.8	14.9		
4-Sa	**11/24/12**	1.877						7.1	15.0	14.8		
5-Su	**11/25/12**	1.287						7.0	15.5	14.9		
5-M	**11/26/12**	1.278	6	92	15	230	1	7.1	15.6	15.0	98	95
5-T	**11/27/12**	1.835	6	104	12	207	1	6.8	14.6	15.1	98	95
5-W	**11/28/12**	2.070	7	117	12	200	1	6.7	13.5	15.0	97	95
5-Th	**11/29/12**	1.997						6.6	13.1	14.7		
5-F	**11/30/12**	1.978						6.8	13.4	14.4		
Minimum								6.5				
								>= 6.0				
Average		1.716	8	128	15	241					96	93
		DL: 2.84	<= 30	<= 711	<= 30	<= 711					>= 85	>= 85
Weekly Average			9	210	18	390						
			<= 45	<= 1066	<= 45	<= 1066						
Maximum								7.1				
								<= 9.0				

Daily Maximum	3.445							17.6			
	Report Only							Report Only			
Monthly geometric mean						2					
						<= 200					
Weekly Geometric Mean						2.5					
						<= 400					
7-DADMax									17.4		
									Report Only		

Permit Number: WA0020486 **Permittee:** MONROE STP
Facility County: Snohomish **Receiving Waterbody:**
Monitoring Period: 11/01/2012 - 11/30/2012 **Outfall:** IN1 **Version:** 1

Week	Monitoring Point	Total BOD5 Total Milligrams/L (mg/L) 3/Week Composite Sample (24 HR Time Proportional comp) INF	Total BOD5 Total Lbs/Day 3/Week Calculated INF	Total Suspended Solids (TSS) Total suspended (TSS) Milligrams/L (mg/L) 3/Week Composite Sample (24 HR Time Proportional comp) INF	Total Suspended Solids (TSS) Total suspended (TSS) Lbs/Day 3/Week Calculated INF
1-Th	**11/1/12**	257	4347	280	4736
1-F	**11/2/12**				
1-Sa	**11/3/12**				
2-Su	**11/4/12**				
2-M	**11/5/12**				
2-T	**11/6/12**	290	3860	274	3647
2-W	**11/7/12**	280	3199	228	2605
2-Th	**11/8/12**	231	2385	192	1982
2-F	**11/9/12**				
2-Sa	**11/10/12**				
3-Su	**11/11/12**				
3-M	**11/12/12**	237	2925	222	2740
3-T	**11/13/12**	266	3494	260	3415
3-W	**11/14/12**	134	1795	240	3215
3-Th	**11/15/12**				
3-F	**11/16/12**				
3-Sa	**11/17/12**				
4-Su	**11/18/12**	281	5003	272	4843
4-M	**11/19/12**	129	3706	126	3620
4-T	**11/20/12**	153	3177	142	2949
4-W	**11/21/12**				
4-Th	**11/22/12**				
4-F	**11/23/12**				
4-Sa	**11/24/12**				
5-Su	**11/25/12**				
5-M	**11/26/12**	375	5739	287	4392
5-T	**11/27/12**	310	5352	230	3971
5-W	**11/28/12**	210	3498	230	3831
5-Th	**11/29/12**				
5-F	**11/30/12**				
Average		243	3729	229	3534
		Report Only	DL: 6090	Report Only	DL: 5940
Maximum		375	5739	287	4843
		Report Only	Report Only	Report Only	Report Only

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 gather and evaluate 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.

Monroe WWTP	12/6/2012 9:31:02 AM
Signature	**Date**

Washington State Department of Ecology **Discharge Monitoring Report (DMR)**

Permit Number: WA0020486 **Permittee:** MONROE STP
Facility County: Snohomish **Receiving Waterbody:** Skykomish R.
Monitoring Period: 12/01/2013 - 12/31/2013 **Outfall:** 001 **Version:** 1

Week	Monitoring Point	Flow MGD Continuous Measurement	Total BOD5 Total Milligrams/L (mg/L) 3/Week Composite Sample (24 HR Time Proportional comp)	Total BOD5 Total Lbs/Day 3/Week Calculated	Total Suspended Solids (TSS) Total suspended (TSS) Milligrams/L (mg/L) 3/Week Composite Sample (24 HR Time Proportional comp)	Total Suspended Solids (TSS) Total suspended (TSS) Lbs/Day 3/Week Calculated	Fecal Coliform #/100ml 3/Week Grab	pH Standard Units 1/Day Grab	Temperature Measured Degrees C 1/Day Measurement	Temperature Calculated Degrees C 1/Day Calculated	Ammonia Total Milligrams/L (mg/L) Monthly Composite Sample (24 HR Time Proportional comp)	Phosphorus Total Milligrams/L (mg/L) Monthly Composite Sample (24 HR Time Proportional comp)
		001	001	001	001	001	001	001	001	001	001	001
1-Su	**12/1/13**	1.497						6.8	14.2	14.1		
1-M	**12/2/13**	2.061	4	57	7	100	1	7.2	14.2	14.1		
1-T	**12/3/13**	1.711	3	39	5	65	5	7.0	13.5	14.0		
1-W	**12/4/13**	1.554	2	25	2	25	1	6.9	13.6	14.0	0.039	3.1
1-Th	**12/5/13**	1.495						6.8	13.5	13.9		
1-F	**12/6/13**	1.465						6.8	13.0	13.7		
1-Sa	**12/7/13**	1.479						6.9	12.7	13.5		
2-Su	**12/8/13**	1.470						6.9	12.3	13.3		
2-M	**12/9/13**	1.480					1	7.0	11.9	12.9		
2-T	**12/10/13**	1.188	6	68	11	125	200	7.1	12.9	12.8		
2-W	**12/11/13**	1.358	4	44	7	76	2	7.0	12.9	12.7		
2-Th	**12/12/13**	1.309	4	46	6	69		7.0	12.8	12.6		
2-F	**12/13/13**	1.381						7.0	12.4	12.6		
2-Sa	**12/14/13**	1.443						6.9	12.4	12.5		
3-Su	**12/15/13**	1.438						6.9	12.3	12.5		
3-M	**12/16/13**	1.460	5	61	7	86	2	6.9	12.6	12.6		
3-T	**12/17/13**	1.465	6	74	8	99	2	6.9	12.8	12.6		
3-W	**12/18/13**	1.486	5	61	6	73	1	6.8	12.9	12.6		
3-Th	**12/19/13**	1.461						6.8	12.8	12.6		
3-F	**12/20/13**	1.106						6.8	13.2	12.7		
3-Sa	**12/21/13**	1.484						6.9	13.0	12.8		
4-Su	**12/22/13**	1.454						6.7	12.8	12.9		
4-M	**12/23/13**	1.651	6	103	6	103	2	6.9	12.6	12.9		
4-T	**12/24/13**	2.053						7.2	12.4	12.8		
4-W	**12/25/13**	1.915	4	58	4	58	3	7.0	12.4	12.7		
4-Th	**12/26/13**	1.731	5	78	2	31	4	6.9	11.8	12.6		
4-F	**12/27/13**	1.875						6.8	11.8	12.4		
4-Sa	**12/28/13**	1.712						6.8	12.2	12.3		
5-Su	**12/29/13**	1.552						6.8	12.3	12.2		
5-M	**12/30/13**	1.508						6.8	12.5	12.2		
5-T	**12/31/13**	1.529	4	43	9	97	2	6.9	13.0	12.3		
Minimum								6.7				
								>= 6.0				
Average		1.541	4	58	6	77					0.039	3.1
		DL: 2.84	<= 30	<= 711	<= 30	<= 711					Report Only	Report Only
Weekly Average			5	80	8	90						
			<= 45	<= 1066	<= 45	<= 1066						

Week	Monitoring Point	Phosphorus Dissolved (soluble) Milligrams/L (mg/L) Monthly Composite Sample (24 HR Time Proportional comp)	Nitrate + Nitrite Total Milligrams/L (mg/L) Monthly Composite Sample (24 HR Time Proportional comp)	TKN Total Milligrams/L (mg/L) Monthly Composite Sample (24 HR Time Proportional comp)	Total BOD5 Total Percent Monthly Calculated	Total Suspended Solids (TSS) Total suspended (TSS) Percent Monthly Calculated
		001	001	001	001C	001C
1-Su	**12/1/13**					
1-M	**12/2/13**				98	96
1-T	**12/3/13**				99	97
1-W	**12/4/13**	3.34	13	1.91	99	99
1-Th	**12/5/13**					
1-F	**12/6/13**					
1-Sa	**12/7/13**					
2-Su	**12/8/13**					
2-M	**12/9/13**					
2-T	**12/10/13**				97	93
2-W	**12/11/13**				98	96
2-Th	**12/12/13**				98	98
2-F	**12/13/13**					
2-Sa	**12/14/13**					
3-Su	**12/15/13**					
3-M	**12/16/13**				98	98
3-T	**12/17/13**				96	95
3-W	**12/18/13**				98	97
3-Th	**12/19/13**					
3-F	**12/20/13**					
3-Sa	**12/21/13**					
4-Su	**12/22/13**					
4-M	**12/23/13**				97	96
4-T	**12/24/13**					
4-W	**12/25/13**				98	96
4-Th	**12/26/13**				97	98
4-F	**12/27/13**					
4-Sa	**12/28/13**					
5-Su	**12/29/13**					
5-M	**12/30/13**					
5-T	**12/31/13**				98	96
Minimum						
Average		3.34	13	1.91	98	97
		Report Only	Report Only	Report Only	>= 85	>= 85
Weekly Average						

Maximum							7.2				
							<= 9.0				
Daily Maximum	2.061							14.2			
	Report Only							Report Only			
Monthly geometric mean						3					
						<= 200					
Weekly Geometric Mean						7					
						<= 400					
7-DADMax									14.1		
									Report Only		

Maximum					
Daily Maximum					
Monthly geometric mean					
Weekly Geometric Mean					
7-DADMax					

Permit Number: WA0020486 **Permittee:** MONROE STP

Facility County: Snohomish **Receiving Waterbody:**

Monitoring Period: 12/01/2013 - 12/31/2013 **Outfall:** IN1 **Version:** 1

Week	Monitoring Point	Total BOD5 Total Milligrams/L (mg/L) 3/Week Composite Sample (24 HR Time Proportional comp)	Total BOD5 Total Lbs/Day 3/Week Calculated	Total Suspended Solids (TSS) Total suspended (TSS) Milligrams/L (mg/L) 3/Week Composite Sample (24 HR Time Proportional comp)	Total Suspended Solids (TSS) Total suspended (TSS) Lbs/Day 3/Week Calculated
		INF	INF	INF	INF
1-Su	**12/1/13**				
1-M	**12/2/13**	218	3111	166	2369
1-T	**12/3/13**	295	3823	164	2125
1-W	**12/4/13**	229	2855	188	2344
1-Th	**12/5/13**				
1-F	**12/6/13**				
1-Sa	**12/7/13**				
2-Su	**12/8/13**				
2-M	**12/9/13**				
2-T	**12/10/13**	185	2095	162	1835
2-W	**12/11/13**	199	2172	176	1921
2-Th	**12/12/13**	203	2338	256	2948
2-F	**12/13/13**				
2-Sa	**12/14/13**				
3-Su	**12/15/13**				
3-M	**12/16/13**	251	3067	322	3934
3-T	**12/17/13**	165	2045	158	1958
3-W	**12/18/13**	283	3448	218	2656
3-Th	**12/19/13**				
3-F	**12/20/13**				
3-Sa	**12/21/13**				
4-Su	**12/22/13**				
4-M	**12/23/13**	220	3767	140	2397
4-T	**12/24/13**				
4-W	**12/25/13**	160	2310	100	1444
4-Th	**12/26/13**	190	2971	120	1877
4-F	**12/27/13**				
4-Sa	**12/28/13**				
5-Su	**12/29/13**				
5-M	**12/30/13**				
5-T	**12/31/13**	193	2073	220	2363
Average		215	2775	184	2321
		Report Only	DL: 6090	Report Only	DL: 5940
Maximum		295	3823	322	3934
		Report Only	Report Only	Report Only	Report Only

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 gather and evaluate 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.

Monroe WWTP	1/10/2014 8:13:27 AM
Signature	**Date**

Washington State Department of Ecology **Discharge Monitoring Report (DMR)**

Permit Number: WA0020486 **Permittee:** MONROE STP
Facility County: Snohomish **Receiving Waterbody:** Skykomish R.
Monitoring Period: 01/01/2013 - 01/31/2013 **Outfall:** 001 **Version:** 1

Week	Monitoring Point	Flow MGD Continuous Measurement	Total BOD5 Total Milligrams/L (mg/L) 3/Week Composite Sample (24 HR Time Proportional comp)	Total BOD5 Total Lbs/Day 3/Week Calculated	Total Suspended Solids (TSS) Total suspended (TSS) Milligrams/L (mg/L) 3/Week Composite Sample (24 HR Time Proportional comp)	Total Suspended Solids (TSS) Total suspended (TSS) Lbs/Day 3/Week Calculated	Fecal Coliform #/100ml 3/Week Grab	pH Standard Units 1/Day Grab	Temperature Measured Degrees C 1/Day Measurement	Temperature Calculated Degrees C 1/Day Calculated	Ammonia Total Milligrams/L (mg/L) Monthly Composite Sample (24 HR Time Proportional comp)	Phosphorus Total Milligrams/L (mg/L) Monthly Composite Sample (24 HR Time Proportional comp)
		001	001	001	001	001	001	001	001	001	001	001
1-T	**1/1/13**	1.798	15	207	33	455		6.8	12.6	12.5		
1-W	**1/2/13**	1.654	10	154	23	354	1	6.8	12.3	12.6		
1-Th	**1/3/13**	1.847					1	6.8	11.1	12.4		
1-F	**1/4/13**	1.789					2	6.8	11.8	12.3		
1-Sa	**1/5/13**	1.711						6.8	12.0	12.2		
2-Su	**1/6/13**	1.735						6.6	12.0	12.1		
2-M	**1/7/13**	2.273	8	131	15	246	1	6.4	12.0	12.0		
2-T	**1/8/13**	1.968	11	241	29	636	1	6.7	11.9	11.9		
2-W	**1/9/13**	2.630	4	106	15	397	1	6.7	12.0	11.8		
2-Th	**1/10/13**	3.175						6.7	10.9	11.8		
2-F	**1/11/13**	2.207						6.5	11.5	11.8		
2-Sa	**1/12/13**	1.992						6.7	11.5	11.7		
3-Su	**1/13/13**	1.945						6.6	11.5	11.6		
3-M	**1/14/13**	1.898					1	6.8	11.6	11.6		
3-T	**1/15/13**	1.631	15	202	24	323	2	6.7	12.0	11.6		
3-W	**1/16/13**	1.612	9	125	22	305	2	6.9	12.2	11.6	0.305	3.24
3-Th	**1/17/13**	1.662	8	107	8	107		6.8	11.9	11.7		
3-F	**1/18/13**	1.601						6.8	11.8	11.8		
3-Sa	**1/19/13**	1.726						6.8	11.6	11.8		
4-Su	**1/20/13**	1.847						6.7	10.9	11.7		
4-M	**1/21/13**	1.817	10	107	14	150		6.7	10.9	11.6		
4-T	**1/22/13**	1.281	7	92	10	131	1	6.7	12.2	11.6		
4-W	**1/23/13**	1.574	6	85	9	128	1	6.8	12.2	11.6		
4-Th	**1/24/13**	1.703					2	6.8	11.6	11.6		
4-F	**1/25/13**	1.696						6.8	11.5	11.6		
4-Sa	**1/26/13**	1.598						6.6	11.6	11.6		
5-Su	**1/27/13**	1.897						6.7	11.4	11.6		
5-M	**1/28/13**	1.915	7	152	5	109	2	6.8	11.6	11.7		
5-T	**1/29/13**	2.604	5	124	5	124	1	6.7	10.8	11.5		
5-W	**1/30/13**	2.974	5	94	5	94	2	6.7	10.9	11.3		
5-Th	**1/31/13**	2.258						6.8	11.5	11.3		
Minimum								6.4				
								>= 6.0				
Average		1.936	9	138	16	254					.305	3.24
		DL: 2.84	<= 30	<= 711	<= 30	<= 711					Report Only	Report Only
Weekly Average			14	210	32	465						
			<= 45	<= 1066	<= 45	<= 1066						

Week	Monitoring Point	Phosphorus Dissolved (soluble) Milligrams/L (mg/L) Monthly Composite Sample (24 HR Time Proportional comp)	Nitrate + Nitrite Total Milligrams/L (mg/L) Monthly Composite Sample (24 HR Time Proportional comp)	TKN Total Milligrams/L (mg/L) Monthly Composite Sample (24 HR Time Proportional comp)	Total BOD5 Total Percent Monthly Calculated	Total Suspended Solids (TSS) Total suspended (TSS) Percent Monthly Calculated
		001	001	001	001C	001C
1-T	**1/1/13**				93	89
1-W	**1/2/13**				96	91
1-Th	**1/3/13**					
1-F	**1/4/13**					
1-Sa	**1/5/13**					
2-Su	**1/6/13**					
2-M	**1/7/13**				97	94
2-T	**1/8/13**				95	88
2-W	**1/9/13**				97	90
2-Th	**1/10/13**					
2-F	**1/11/13**					
2-Sa	**1/12/13**					
3-Su	**1/13/13**					
3-M	**1/14/13**					
3-T	**1/15/13**				95	92
3-W	**1/16/13**	3.15	12	3.88	97	91
3-Th	**1/17/13**				97	97
3-F	**1/18/13**					
3-Sa	**1/19/13**					
4-Su	**1/20/13**					
4-M	**1/21/13**				97	95
4-T	**1/22/13**				98	96
4-W	**1/23/13**				98	97
4-Th	**1/24/13**					
4-F	**1/25/13**					
4-Sa	**1/26/13**					
5-Su	**1/27/13**					
5-M	**1/28/13**				96	98
5-T	**1/29/13**				98	96
5-W	**1/30/13**				98	96
5-Th	**1/31/13**					
Minimum						
Average		3.15	12	3.88	96	94
		Report Only	Report Only	Report Only	>= 85	>= 85
Weekly Average						

Maximum							6.9				
							<= 9.0				
Daily Maximum	3.175							12.6			
	Report Only							Report Only			
Monthly geometric mean						1					
						<= 200					
Weekly Geometric Mean						2					
						<= 400					
7-DADMax									12.6		
									Report Only		

Maximum					
Daily Maximum					
Monthly geometric mean					
Weekly Geometric Mean					
7-DADMax					

Permit Number: WA0020486 **Permittee:** MONROE STP
Facility County: Snohomish **Receiving Waterbody:**
Monitoring Period: 01/01/2013 - 01/31/2013 **Outfall:** IN1 **Version:** 1

Week	Monitoring Point	Total BOD5 Total Milligrams/L (mg/L) 3/Week Composite Sample (24 HR Time Proportional comp) INF	Total BOD5 Total Lbs/Day 3/Week Calculated INF	Total Suspended Solids (TSS) Total suspended (TSS) Milligrams/L (mg/L) 3/Week Composite Sample (24 HR Time Proportional comp) INF	Total Suspended Solids (TSS) Total suspended (TSS) Lbs/Day 3/Week Calculated INF
1-T	**1/1/13**	213	2938	288	3973
1-W	**1/2/13**	227	3497	256	3943
1-Th	**1/3/13**				
1-F	**1/4/13**				
1-Sa	**1/5/13**				
2-Su	**1/6/13**				
2-M	**1/7/13**	232	3808	240	3939
2-T	**1/8/13**	237	5198	244	5352
2-W	**1/9/13**	146	3866	156	4131
2-Th	**1/10/13**				
2-F	**1/11/13**				
2-Sa	**1/12/13**				
3-Su	**1/13/13**				
3-M	**1/14/13**				
3-T	**1/15/13**	279	3751	302	4060
3-W	**1/16/13**	288	3992	242	3354
3-Th	**1/17/13**	233	3111	238	3178
3-F	**1/18/13**				
3-Sa	**1/19/13**				
4-Su	**1/20/13**				
4-M	**1/21/13**	323	3451	304	3248
4-T	**1/22/13**	328	4306	268	3518
4-W	**1/23/13**	272	3863	342	4857
4-Th	**1/24/13**				
4-F	**1/25/13**				
4-Sa	**1/26/13**				
5-Su	**1/27/13**				
5-M	**1/28/13**	190	4126	200	4343
5-T	**1/29/13**	250	6201	130	3224
5-W	**1/30/13**	220	4143	140	2636
5-Th	**1/31/13**				
Average		246	4018	239	3840
		Report Only	DL: 6090	Report Only	DL: 5940
Maximum		328	6201	342	5352
		Report Only	Report Only	Report Only	Report Only

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 gather and evaluate 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.

Monroe WWTP	2/13/2013 7:48:08 AM
Signature	**Date**

Washington State Department of Ecology

Discharge Monitoring Report (DMR)

Permit Number: WA0020486 **Permittee:** MONROE STP
Facility County: Snohomish **Receiving Waterbody:** Skykomish R.
Monitoring Period: 02/01/2013 - 02/28/2013 **Outfall:** 001 **Version:** 1

Week	Monitoring Point	Flow MGD Continuous Measurement	Total BOD5 Total Milligrams/L (mg/L) 3/Week Composite Sample (24 HR Time Proportional comp)	Total BOD5 Total Lbs/Day 3/Week Calculated	Total Suspended Solids (TSS) Total suspended (TSS) Milligrams/L (mg/L) 3/Week Composite Sample (24 HR Time Proportional comp)	Total Suspended Solids (TSS) Total suspended (TSS) Lbs/Day 3/Week Calculated	Fecal Coliform #/100ml 3/Week Grab	pH Standard Units 1/Day Grab	Temperature Measured Degrees C 1/Day Measurement	Temperature Calculated Degrees C 1/Day Calculated	Ammonia Total Milligrams/L (mg/L) Monthly Composite Sample (24 HR Time Proportional comp)	Phosphorus Total Milligrams/L (mg/L) Monthly Composite Sample (24 HR Time Proportional comp)
		001	001	001	001	001	001	001	001	001	001	001
1-F	**2/1/13**	2.443						6.7	12.0	11.4		
1-Sa	**2/2/13**	1.901						6.9	12.0	11.5		
2-Su	**2/3/13**	2.121						6.7	11.9	11.5		
2-M	**2/4/13**	2.121	6	85	11	156	1	6.9	12.2	11.6	0.069	2.58
2-T	**2/5/13**	1.705	6	86	11	158	2	6.7	12.6	11.9		
2-W	**2/6/13**	1.718	4	48	6	71	1	6.8	12.8	12.1		
2-Th	**2/7/13**	1.426						7.0	12.9	12.3		
2-F	**2/8/13**	1.493						7.0	12.8	12.5		
2-Sa	**2/9/13**	1.585						6.9	12.7	12.6		
3-Su	**2/10/13**	1.586						6.9	12.7	12.7		
3-M	**2/11/13**	1.592					1	6.9	12.6	12.7		
3-T	**2/12/13**	1.684	4	57	9	127	2	7.0	12.5	12.7		
3-W	**2/13/13**	1.696	6	73	9	110	1	6.9	12.5	12.7		
3-Th	**2/14/13**	1.461	5	69	8	110		6.7	12.8	12.7		
3-F	**2/15/13**	1.655						6.8	12.8	12.7		
3-Sa	**2/16/13**	1.605						6.5	12.8	12.7		
4-Su	**2/17/13**	1.670						6.7	12.5	12.6		
4-M	**2/18/13**	1.638	6	86	13	186		6.7	12.5	12.6		
4-T	**2/19/13**	1.718	7	99	11	155	2	6.7	12.4	12.6		
4-W	**2/20/13**	1.691	9	124	12	166	1	6.7	12.4	12.6		
4-Th	**2/21/13**	1.656					1	6.5	12.5	12.6		
4-F	**2/22/13**	1.622						6.7	12.4	12.5		
4-Sa	**2/23/13**	1.680						6.5	12.2	12.4		
5-Su	**2/24/13**	1.737						6.3	12.1	12.4		
5-M	**2/25/13**	1.558	7	99	8	113	2	6.6	12.4	12.3		
5-T	**2/26/13**	1.701	7	84	9	108	1	6.9	12.4	12.3		
5-W	**2/27/13**	1.442	7	83	10	119	2	6.9	12.7	12.4		
5-Th	**2/28/13**	1.426						7.0	12.8	12.4		
Minimum								6.3				
								>= 6.0				
Average		1.690	6	83	10	132					0.069	2.58
		DL: 2.84	<= 30	<= 711	<= 30	<= 711					Report Only	Report Only
Weekly Average			7	103	12	169						
			<= 45	<= 1066	<= 45	<= 1066						
Maximum								7.0				
								<= 9.0				
Daily Maximum		2.443							12.9			
		Report Only							Report Only			

Week	Monitoring Point	Phosphorus Dissolved (soluble) Milligrams/L (mg/L) Monthly Composite Sample (24 HR Time Proportional comp)	Nitrate + Nitrite Total Milligrams/L (mg/L) Monthly Composite Sample (24 HR Time Proportional comp)	TKN Total Milligrams/L (mg/L) Monthly Composite Sample (24 HR Time Proportional comp)	Total BOD5 Total Percent Monthly Calculated	Total Suspended Solids (TSS) Total suspended (TSS) Percent Monthly Calculated
		001	001	001	001C	001C
1-F	**2/1/13**					
1-Sa	**2/2/13**					
2-Su	**2/3/13**					
2-M	**2/4/13**	2.55	11.0	2.55	98	96
2-T	**2/5/13**				97	97
2-W	**2/6/13**				98	97
2-Th	**2/7/13**					
2-F	**2/8/13**					
2-Sa	**2/9/13**					
3-Su	**2/10/13**					
3-M	**2/11/13**					
3-T	**2/12/13**				98	95
3-W	**2/13/13**				97	96
3-Th	**2/14/13**				98	95
3-F	**2/15/13**					
3-Sa	**2/16/13**					
4-Su	**2/17/13**					
4-M	**2/18/13**				97	93
4-T	**2/19/13**				97	94
4-W	**2/20/13**				97	95
4-Th	**2/21/13**					
4-F	**2/22/13**					
4-Sa	**2/23/13**					
5-Su	**2/24/13**					
5-M	**2/25/13**				97	97
5-T	**2/26/13**				97	96
5-W	**2/27/13**				98	96
5-Th	**2/28/13**					
Minimum						
Average		2.55	11.0	2.55	98	95
		Report Only	Report Only	Report Only	>= 85	>= 85
Weekly Average						
Maximum						
Daily Maximum						

Monthly geometric mean						1					
						<= 200					
Weekly Geometric Mean						2					
						<= 400					
7-DADMax									12.7		
									Report Only		

Monthly geometric mean					
Weekly Geometric Mean					
7-DADMax					

Permit Number: WA0020486 **Permittee:** MONROE STP
Facility County: Snohomish **Receiving Waterbody:**
Monitoring Period: 02/01/2013 - 02/28/2013 **Outfall:** IN1 **Version:** 1

Week	Monitoring Point	Total BOD5 Total Milligrams/L (mg/L) 3/Week Composite Sample (24 HR Time Proportional comp)	Total BOD5 Total Lbs/Day 3/Week Calculated	Total Suspended Solids (TSS) Total suspended (TSS) Milligrams/L (mg/L) 3/Week Composite Sample (24 HR Time Proportional comp)	Total Suspended Solids (TSS) Total suspended (TSS) Lbs/Day 3/Week Calculated
		INF	INF	INF	INF
1-F	2/1/13				
1-Sa	2/2/13				
2-Su	2/3/13				
2-M	2/4/13	327	4650	298	4237
2-T	2/5/13	226	3238	328	4700
2-W	2/6/13	259	3080	212	2521
2-Th	2/7/13				
2-F	2/8/13				
2-Sa	2/9/13				
3-Su	2/10/13				
3-M	2/11/13				
3-T	2/12/13	218	3084	178	2518
3-W	2/13/13	217	2644	238	2900
3-Th	2/14/13	218	3009	152	2098
3-F	2/15/13				
3-Sa	2/16/13				
4-Su	2/17/13				
4-M	2/18/13	230	3295	182	2608
4-T	2/19/13	212	2990	172	2426
4-W	2/20/13	281	3881	238	3287
4-Th	2/21/13				
4-F	2/22/13				
4-Sa	2/23/13				
5-Su	2/24/13				
5-M	2/25/13	250	3547	248	3518
5-T	2/26/13	270	3247	222	2670
5-W	2/27/13	287	3413	228	2712
5-Th	2/28/13				
Average		250	3340	225	3016
		Report Only	DL: 6090	Report Only	DL: 5940
Maximum		327	4650	328	4700
		Report Only	Report Only	Report Only	Report Only

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 gather and evaluate 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.

Monroe WWTP	3/8/2013 8:41:56 AM
Signature	**Date**

Washington State Department of Ecology **Discharge Monitoring Report (DMR)**

Permit Number: WA0020486 **Permittee:** MONROE STP
Facility County: Snohomish **Receiving Waterbody:** Skykomish R.
Monitoring Period: 03/01/2013 - 03/31/2013 **Outfall:** 001 **Version:** 1

Week	Monitoring Point	Flow MGD Continuous Measurement	Total BOD5 Total Milligrams/L (mg/L) 3/Week Composite Sample (24 HR Time Proportional comp)	Total BOD5 Total Lbs/Day 3/Week Calculated	Total Suspended Solids (TSS) Total suspended (TSS) Milligrams/L (mg/L) 3/Week Composite Sample (24 HR Time Proportional comp)	Total Suspended Solids (TSS) Total suspended (TSS) Lbs/Day 3/Week Calculated	Fecal Coliform #/100ml 3/Week Grab	pH Standard Units 1/Day Grab	Temperature Measured Degrees C 1/Day Measurement	Temperature Calculated Degrees C 1/Day Calculated	Ammonia Total Milligrams/L (mg/L) Monthly Composite Sample (24 HR Time Proportional comp)	Phosphorus Total Milligrams/L (mg/L) Monthly Composite Sample (24 HR Time Proportional comp)
		001	001	001	001	001	001	001	001	001	001	001
1-F	**3/1/13**	1.832						6.7	12.6	12.5		
1-Sa	**3/2/13**	1.550						6.6	12.8	12.5		
2-Su	**3/3/13**	1.903						7.0	12.7	12.6		
2-M	**3/4/13**	1.765	7	116	13	215	2	6.5	12.5	12.6	0.675	2.97
2-T	**3/5/13**	1.981	8	114	11	157	1	6.5	12.5	12.7		
2-W	**3/6/13**	1.710	7	120	14	240	1	6.5	12.6	12.6		
2-Th	**3/7/13**	2.057						6.4	12.5	12.6		
2-F	**3/8/13**	1.931						6.5	12.3	12.6		
2-Sa	**3/9/13**	1.504						6.6	12.8	12.6		
3-Su	**3/10/13**	1.465						6.5	13.1	12.6		
3-M	**3/11/13**	1.510	6	73	12	146	1	6.4	13.3	12.7		
3-T	**3/12/13**	1.456	5	63	9	113	1	6.4	13.5	12.9		
3-W	**3/13/13**	1.502	2	26	11	141	1	6.6	13.8	13.0		
3-Th	**3/14/13**	1.534						6.6	13.9	13.2		
3-F	**3/15/13**	1.439						6.5	14.0	13.5		
3-Sa	**3/16/13**	1.417						6.5	13.9	13.6		
4-Su	**3/17/13**	1.869						6.4	13.6	13.7		
4-M	**3/18/13**	1.722	6	82	12	163	1	6.6	13.0	13.7		
4-T	**3/19/13**	1.629	4	77	12	230	1	6.7	13.3	13.6		
4-W	**3/20/13**	2.303	2	41	14	288	1	6.5	13.2	13.6		
4-Th	**3/21/13**	2.468						6.5	12.4	13.3		
4-F	**3/22/13**	1.935						6.7	12.6	13.1		
4-Sa	**3/23/13**	1.815						6.6	12.6	13.0		
5-Su	**3/24/13**	1.691						6.5	12.8	12.8		
5-M	**3/25/13**	1.812	6	81	12	162	1	6.4	13.2	12.9		
5-T	**3/26/13**	1.618	4	56	6	84	1	6.4	13.6	12.9		
5-W	**3/27/13**	1.676	4	51	4	51	1	6.8	13.8	13.0		
5-Th	**3/28/13**	1.541						6.9	14.1	13.2		
5-F	**3/29/13**	1.541						6.9	14.4	13.5		
5-Sa	**3/30/13**	1.499						6.9	14.5	13.8		
6-Su	**3/31/13**	1.503						6.8	14.9	14.1		
Minimum								6.4				
								>= 6.0				
Average		1.715	5	75	11	166					0.675	2.97
		DL: 2.84	<= 30	<= 711	<= 30	<= 711					Report Only	Report Only
Weekly Average			7	117	13	227						
			<= 45	<= 1066	<= 45	<= 1066						

Week	Monitoring Point	Phosphorus Dissolved (soluble) Milligrams/L (mg/L) Monthly Composite Sample (24 HR Time Proportional comp)	Nitrate + Nitrite Total Milligrams/L (mg/L) Monthly Composite Sample (24 HR Time Proportional comp)	TKN Total Milligrams/L (mg/L) Monthly Composite Sample (24 HR Time Proportional comp)	Total BOD5 Total Percent Monthly Calculated	Total Suspended Solids (TSS) Total suspended (TSS) Percent Monthly Calculated
		001	001	001	001C	001C
1-F	**3/1/13**					
1-Sa	**3/2/13**					
2-Su	**3/3/13**					
2-M	**3/4/13**	3	13	2.98	97	95
2-T	**3/5/13**				97	94
2-W	**3/6/13**				97	94
2-Th	**3/7/13**					
2-F	**3/8/13**					
2-Sa	**3/9/13**					
3-Su	**3/10/13**					
3-M	**3/11/13**				98	96
3-T	**3/12/13**				98	97
3-W	**3/13/13**				99	96
3-Th	**3/14/13**					
3-F	**3/15/13**					
3-Sa	**3/16/13**					
4-Su	**3/17/13**					
4-M	**3/18/13**				98	95
4-T	**3/19/13**				98	95
4-W	**3/20/13**				99	91
4-Th	**3/21/13**					
4-F	**3/22/13**					
4-Sa	**3/23/13**					
5-Su	**3/24/13**					
5-M	**3/25/13**				97	94
5-T	**3/26/13**				98	96
5-W	**3/27/13**				99	99
5-Th	**3/28/13**					
5-F	**3/29/13**					
5-Sa	**3/30/13**					
6-Su	**3/31/13**					
Minimum						
Average		3	13	2.98	98	95
		Report Only	Report Only	Report Only	>= 85	>= 85
Weekly Average						

Maximum							7.0				
							<= 9.0				
Daily Maximum	2.468							14.9			
	Report Only							Report Only			
Monthly geometric mean						1					
						<= 200					
Weekly Geometric Mean						1					
						<= 400					
7-DADMax									14.1		
									Report Only		

Maximum					
Daily Maximum					
Monthly geometric mean					
Weekly Geometric Mean					
7-DADMax					

Permit Number: WA0020486 **Permittee:** MONROE STP
Facility County: Snohomish **Receiving Waterbody:**
Monitoring Period: 03/01/2013 - 03/31/2013 **Outfall:** IN1 **Version:** 1

Week	Monitoring Point	Total BOD5 Total Milligrams/L (mg/L) 3/Week Composite Sample (24 HR Time Proportional comp)	Total BOD5 Total Lbs/Day 3/Week Calculated	Total Suspended Solids (TSS) Total suspended (TSS) Milligrams/L (mg/L) 3/Week Composite Sample (24 HR Time Proportional comp)	Total Suspended Solids (TSS) Total suspended (TSS) Lbs/Day 3/Week Calculated
		INF	INF	INF	INF
1-F	3/1/13				
1-Sa	3/2/13				
2-Su	3/3/13				
2-M	3/4/13	254	4196	246	4064
2-T	3/5/13	243	3466	182	2596
2-W	3/6/13	231	3963	250	4289
2-Th	3/7/13				
2-F	3/8/13				
2-Sa	3/9/13				
3-Su	3/10/13				
3-M	3/11/13	244	2963	298	3619
3-T	3/12/13	279	3495	276	3457
3-W	3/13/13	330	4222	294	3761
3-Th	3/14/13				
3-F	3/15/13				
3-Sa	3/16/13				
4-Su	3/17/13				
4-M	3/18/13	280	3804	258	3505
4-T	3/19/13	254	4879	226	4341
4-W	3/20/13	176	3623	150	3087
4-Th	3/21/13				
4-F	3/22/13				
4-Sa	3/23/13				
5-Su	3/24/13				
5-M	3/25/13	203	2739	218	2942
5-T	3/26/13	251	3508	164	2292
5-W	3/27/13	275	3534	322	4138
5-Th	3/28/13				
5-F	3/29/13				
5-Sa	3/30/13				
6-Su	3/31/13				
Average		252	3699	240	3508
		Report Only	DL: 6090	Report Only	DL: 5940
Maximum		330	4879	322	4341
		Report Only	Report Only	Report Only	Report Only

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 gather and evaluate 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.

Monroe WWTP	4/10/2013 1:56:59 PM
Signature	**Date**

Washington State Department of Ecology **Discharge Monitoring Report (DMR)**

Permit Number: WA0020486 **Permittee:** MONROE STP
Facility County: Snohomish **Receiving Waterbody:** Skykomish R.
Monitoring Period: 04/01/2013 - 04/30/2013 **Outfall:** 001 **Version:** 1

Week	Monitoring Point	Flow MGD Continuous Measurement	Total BOD5 Total Milligrams/L (mg/L) 3/Week Composite Sample (24 HR Time Proportional comp)	Total BOD5 Total Lbs/Day 3/Week Calculated	Total Suspended Solids (TSS) Total suspended (TSS) Milligrams/L (mg/L) 3/Week Composite Sample (24 HR Time Proportional comp)	Total Suspended Solids (TSS) Total suspended (TSS) Lbs/Day 3/Week Calculated	Fecal Coliform #/100ml 3/Week Grab	pH Standard Units 1/Day Grab	Temperature Measured Degrees C 1/Day Measurement	Temperature Calculated Degrees C 1/Day Calculated	Ammonia Total Milligrams/L (mg/L) Monthly Composite Sample (24 HR Time Proportional comp)	Phosphorus Total Milligrams/L (mg/L) Monthly Composite Sample (24 HR Time Proportional comp)
		001	001	001	001	001	001	001	001	001	001	001
1-M	**4/1/13**	1.445	4	50	4	50	1	6.7	15.0	14.3		
1-T	**4/2/13**	1.486	4	49	14	171	1	6.7	15.1	15.4		
1-W	**4/3/13**	1.462	5	60	14	168	1	6.7	15.4	14.8		
1-Th	**4/4/13**	1.440						6.8	15.4	15.0		
1-F	**4/5/13**	1.744						6.8	15.4	15.1		
1-Sa	**4/6/13**	1.713						6.6	15.1	15.2		
2-Su	**4/7/13**	2.101						6.4	14.6	15.1		
2-M	**4/8/13**	2.336	5	79	11	174	1	6.3	13.9	15.0	0.027	2.36
2-T	**4/9/13**	1.897	3	45	4	60	1	6.5	14.4	14.9		
2-W	**4/10/13**	1.787	4	64	7	113	1	6.5	14.5	14.8		
2-Th	**4/11/13**	1.930						6.4	14.4	14.6		
2-F	**4/12/13**	1.892						6.5	14.2	14.4		
2-Sa	**4/13/13**	2.097						6.6	14.0	14.3		
3-Su	**4/14/13**	1.910						6.6	13.6	14.1		
3-M	**4/15/13**	1.870	4	64	18	286	1	6.5	14.1	14.2		
3-T	**4/16/13**	1.908	6	80	15	199	1	6.5	14.3	14.2		
3-W	**4/17/13**	1.593	4	50	14	176	1	6.7	14.7	14.2		
3-Th	**4/18/13**	1.510						6.5	14.8	14.2		
3-F	**4/19/13**	1.698						6.5	14.8	14.3		
3-Sa	**4/20/13**	1.903						6.6	14.6	14.4		
4-Su	**4/21/13**	1.805						6.6	14.6	14.6		
4-M	**4/22/13**	1.768	3	41	15	207	2	6.6	14.7	14.6		
4-T	**4/23/13**	1.656	5	72	10	144	1	6.7	14.9	14.7		
4-W	**4/24/13**	1.726					1	6.6	15.2	14.8		
4-Th	**4/25/13**	1.524	4	57	9	127		7.0	15.6	14.9		
4-F	**4/26/13**	1.697						6.8	15.9	15.1		
4-Sa	**4/27/13**	1.475						6.8	15.9	15.3		
5-Su	**4/28/13**	1.622						6.8	15.9	15.4		
5-M	**4/29/13**	1.695	7	94	18	243	1	6.8	15.9	15.6		
5-T	**4/30/13**	1.616	9	114	22	279	9	6.8	15.7	15.7		
Minimum								6.3				
								>= 6.0				
Average		1.736	5	66	13	171					0.027	2.36
		DL: 2.84	<= 30	<= 711	<= 30	<= 711					Report Only	Report Only
Weekly Average			7	89	22	220						
			<= 45	<= 1066	<= 45	<= 1066						
Maximum								7.0				
								<= 9.0				

Week	Monitoring Point	Phosphorus Dissolved (soluble) Milligrams/L (mg/L) Monthly Composite Sample (24 HR Time Proportional comp)	Nitrate + Nitrite Total Milligrams/L (mg/L) Monthly Composite Sample (24 HR Time Proportional comp)	TKN Total Milligrams/L (mg/L) Monthly Composite Sample (24 HR Time Proportional comp)	Total BOD5 Total Percent Monthly Calculated	Total Suspended Solids (TSS) Total suspended (TSS) Percent Monthly Calculated
		001	001	001	001C	001C
1-M	**4/1/13**				98	97
1-T	**4/2/13**				98	95
1-W	**4/3/13**				98	96
1-Th	**4/4/13**					
1-F	**4/5/13**					
1-Sa	**4/6/13**					
2-Su	**4/7/13**					
2-M	**4/8/13**	2.07	12	1.36	97	94
2-T	**4/9/13**				99	98
2-W	**4/10/13**				98	97
2-Th	**4/11/13**					
2-F	**4/12/13**					
2-Sa	**4/13/13**					
3-Su	**4/14/13**					
3-M	**4/15/13**				98	94
3-T	**4/16/13**				97	95
3-W	**4/17/13**				98	95
3-Th	**4/18/13**					
3-F	**4/19/13**					
3-Sa	**4/20/13**					
4-Su	**4/21/13**					
4-M	**4/22/13**				99	93
4-T	**4/23/13**				98	96
4-W	**4/24/13**					
4-Th	**4/25/13**				98	96
4-F	**4/26/13**					
4-Sa	**4/27/13**					
5-Su	**4/28/13**					
5-M	**4/29/13**				96	95
5-T	**4/30/13**				97	90
Minimum						
Average		2.07	12	1.36	98	95
		Report Only	Report Only	Report Only	>= 85	>= 85
Weekly Average						
Maximum						

Daily Maximum	2.336							15.9			
	Report Only							Report Only			
Monthly geometric mean						1					
						<= 200					
Weekly Geometric Mean						3					
						<= 400					
7-DADMax									15.8		
									Report Only		

Daily Maximum					
Monthly geometric mean					
Weekly Geometric Mean					
7-DADMax					

Permit Number: WA0020486 **Permittee:** MONROE STP
Facility County: Snohomish **Receiving Waterbody:**
Monitoring Period: 04/01/2013 - 04/30/2013 **Outfall:** IN1 **Version:** 1

Week	Monitoring Point	Total BOD5 Total Milligrams/L (mg/L) 3/Week Composite Sample (24 HR Time Proportional comp)	Total BOD5 Total Lbs/Day 3/Week Calculated	Total Suspended Solids (TSS) Total suspended (TSS) Milligrams/L (mg/L) 3/Week Composite Sample (24 HR Time Proportional comp)	Total Suspended Solids (TSS) Total suspended (TSS) Lbs/Day 3/Week Calculated
		INF	INF	INF	INF
1-M	**4/1/13**	225	2788	148	1834
1-T	**4/2/13**	192	2341	306	3731
1-W	**4/3/13**	293	3519	390	4684
1-Th	**4/4/13**				
1-F	**4/5/13**				
1-Sa	**4/6/13**				
2-Su	**4/7/13**				
2-M	**4/8/13**	173	2737	182	2879
2-T	**4/9/13**	218	3249	184	2742
2-W	**4/10/13**	202	3251	210	3380
2-Th	**4/11/13**				
2-F	**4/12/13**				
2-Sa	**4/13/13**				
3-Su	**4/14/13**				
3-M	**4/15/13**	184	2928	288	4583
3-T	**4/16/13**	226	3003	292	3879
3-W	**4/17/13**	248	3123	274	3451
3-Th	**4/18/13**				
3-F	**4/19/13**				
3-Sa	**4/20/13**				
4-Su	**4/21/13**				
4-M	**4/22/13**	208	2873	226	3121
4-T	**4/23/13**	218	3138	226	3253
4-W	**4/24/13**				
4-Th	**4/25/13**	236	3340	218	3085
4-F	**4/26/13**				
4-Sa	**4/27/13**				
5-Su	**4/28/13**				
5-M	**4/29/13**	184	2480	356	4798
5-T	**4/30/13**	261	3306	214	2711
Average		219	3005	251	3438
		Report Only	DL: 6090	Report Only	DL: 5940
Maximum		293	3519	390	4798
		Report Only	Report Only	Report Only	Report Only

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 gather and evaluate 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.

Monroe WWTP	5/13/2013 12:59:28 PM
Signature	**Date**

Washington State Department of Ecology — Discharge Monitoring Report (DMR)

Permit Number: WA0020486 **Permittee:** MONROE STP
Facility County: Snohomish **Receiving Waterbody:** Skykomish R.
Monitoring Period: 05/01/2013 - 05/31/2013 **Outfall:** 001 **Version:** 1

Week	Monitoring Point	Flow MGD Continuous Measurement	Total BOD5 Total Milligrams/L (mg/L) 3/Week Composite Sample (24 HR Time Proportional comp)	Total BOD5 Total Lbs/Day 3/Week Calculated	Total Suspended Solids (TSS) Total suspended (TSS) Milligrams/L (mg/L) 3/Week Composite Sample (24 HR Time Proportional comp)	Total Suspended Solids (TSS) Total suspended (TSS) Lbs/Day 3/Week Calculated	Fecal Coliform #/100ml 3/Week Grab	pH Standard Units 1/Day Grab	Temperature Measured Degrees C 1/Day Measurement	Temperature Calculated Degrees C 1/Day Calculated	Ammonia Total Milligrams/L (mg/L) Monthly Composite Sample (24 HR Time Proportional comp)	Phosphorus Total Milligrams/L (mg/L) Monthly Composite Sample (24 HR Time Proportional comp)
		001	001	001	001	001	001	001	001	001	001	001
1-W	**5/1/13**	1.519	5	60	8	97	4	6.9	16.0	16.0		
1-Th	**5/2/13**	1.450						6.9	16.1	16.1	0.058	2.73
1-F	**5/3/13**	1.413						6.8	16.4	16.2		
1-Sa	**5/4/13**	1.416						7.0	16.7	16.3		
2-Su	**5/5/13**	1.385						6.9	17.0	16.4		
2-M	**5/6/13**	1.433	7	83	16	189	1	6.9	17.5	16.6		
2-T	**5/7/13**	1.420	7	82	18	210	1	6.9	17.9	16.8		
2-W	**5/8/13**	1.398	9	109	23	279	1	7.0	17.9	17.1		
2-Th	**5/9/13**	1.452						6.9	18.3	17.4		
2-F	**5/10/13**	1.534						6.8	18.4	17.7		
2-Sa	**5/11/13**	1.365						6.8	18.5	17.9		
3-Su	**5/12/13**	1.499						6.9	18.6	18.2		
3-M	**5/13/13**	1.486	6	85	15	211	2	7.0	18.7	18.3		
3-T	**5/14/13**	1.689	4	53	9	119	1	7.0	18.6	18.4		
3-W	**5/15/13**	1.581	7	78	28	312	2	6.9	18.4	18.5		
3-Th	**5/16/13**	1.338						6.7	18.7	18.6		
3-F	**5/17/13**	1.295						6.8	18.2	18.5		
3-Sa	**5/18/13**	1.311						6.9	18.2	18.5		
4-Su	**5/19/13**	1.905						6.8	18.2	18.4		
4-M	**5/20/13**	1.381					1	6.8	18.4	18.4		
4-T	**5/21/13**	1.414	2	23	4	46	2	6.9	18.1	18.3		
4-W	**5/22/13**	1.374	3	39	6	78	1	6.9	17.9	18.2		
4-Th	**5/23/13**	1.559	4	54	12	161		6.8	17.8	18.1		
4-F	**5/24/13**	1.613						7.1	17.7	18.0		
4-Sa	**5/25/13**	1.482						7.0	17.9	18.0		
5-Su	**5/26/13**	1.323						7.0	17.9	18.0		
5-M	**5/27/13**	1.328	2	24	4	48		6.9	18.0	17.9		
5-T	**5/28/13**	1.452	3	35	8	93	1	7.0	18.0	17.9		
5-W	**5/29/13**	1.392	2	28	8	113	1	7.0	18.0	17.9		
5-Th	**5/30/13**	1.700					1	7.1	17.7	17.9		
5-F	**5/31/13**	1.693						7.0	17.8	17.9		
Minimum								6.7				
								>= 6.0				
Average		1.471	5	58	12	151					0.058	2.73
		DL: 2.84	<= 30	<= 711	<= 30	<= 711					Report Only	Report Only
Weekly Average			8	91	19	226						
			<= 45	<= 1066	<= 45	<= 1066						

Week	Monitoring Point	Phosphorus Dissolved (soluble) Milligrams/L (mg/L) Monthly Composite Sample (24 HR Time Proportional comp)	Nitrate + Nitrite Total Milligrams/L (mg/L) Monthly Composite Sample (24 HR Time Proportional comp)	TKN Total Milligrams/L (mg/L) Monthly Composite Sample (24 HR Time Proportional comp)	Total BOD5 Total Percent Monthly Calculated	Total Suspended Solids (TSS) Total suspended (TSS) Percent Monthly Calculated
		001	001	001	001C	001C
1-W	**5/1/13**				98	97
1-Th	**5/2/13**	2.15	10	2.59		
1-F	**5/3/13**					
1-Sa	**5/4/13**					
2-Su	**5/5/13**					
2-M	**5/6/13**				97	92
2-T	**5/7/13**				96	96
2-W	**5/8/13**				98	93
2-Th	**5/9/13**					
2-F	**5/10/13**					
2-Sa	**5/11/13**					
3-Su	**5/12/13**					
3-M	**5/13/13**				98	96
3-T	**5/14/13**				98	97
3-W	**5/15/13**				98	92
3-Th	**5/16/13**					
3-F	**5/17/13**					
3-Sa	**5/18/13**					
4-Su	**5/19/13**					
4-M	**5/20/13**					
4-T	**5/21/13**				99	99
4-W	**5/22/13**				99	98
4-Th	**5/23/13**				99	97
4-F	**5/24/13**					
4-Sa	**5/25/13**					
5-Su	**5/26/13**					
5-M	**5/27/13**				99	99
5-T	**5/28/13**				99	99
5-W	**5/29/13**				99	97
5-Th	**5/30/13**					
5-F	**5/31/13**					
Minimum						
Average		2.15	10	2.59	98	96
		Report Only	Report Only	Report Only	>= 85	>= 85
Weekly Average						

Maximum							7.1				
							<= 9.0				
Daily Maximum	1.905							18.7			
	Report Only							Report Only			
Monthly geometric mean						1					
						<= 200					
Weekly Geometric Mean						2					
						<= 400					
7-DADMax									18.6		
									Report Only		

Maximum					
Daily Maximum					
Monthly geometric mean					
Weekly Geometric Mean					
7-DADMax					

Permit Number: WA0020486 **Permittee:** MONROE STP
Facility County: Snohomish **Receiving Waterbody:**
Monitoring Period: 05/01/2013 - 05/31/2013 **Outfall:** IN1 **Version:** 1

Week	Monitoring Point	Total BOD5 Total Milligrams/L (mg/L) 3/Week Composite Sample (24 HR Time Proportional comp)	Total BOD5 Total Lbs/Day 3/Week Calculated	Total Suspended Solids (TSS) Total suspended (TSS) Milligrams/L (mg/L) 3/Week Composite Sample (24 HR Time Proportional comp)	Total Suspended Solids (TSS) Total suspended (TSS) Lbs/Day 3/Week Calculated
		INF	INF	INF	INF
1-W	5/1/13	290	3507	190	2298
1-Th	5/2/13				
1-F	5/3/13				
1-Sa	5/4/13				
2-Su	5/5/13				
2-M	5/6/13	244	2890	208	2463
2-T	5/7/13	175	2040	466	5433
2-W	5/8/13	374	4529	314	3802
2-Th	5/9/13				
2-F	5/10/13				
2-Sa	5/11/13				
3-Su	5/12/13				
3-M	5/13/13	248	3493	352	4958
3-T	5/14/13	254	3349	330	4351
3-W	5/15/13	299	3337	354	3950
3-Th	5/16/13				
3-F	5/17/13				
3-Sa	5/18/13				
4-Su	5/19/13				
4-M	5/20/13				
4-T	5/21/13	300	3438	370	4240
4-W	5/22/13	231	3003	266	3459
4-Th	5/23/13	254	4762	416	5596
4-F	5/24/13				
4-Sa	5/25/13				
5-Su	5/26/13				
5-M	5/27/13	241	2918	360	4359
5-T	5/28/13	288	3343	654	7592
5-W	5/29/13	255	3615	312	4424
5-Th	5/30/13				
5-F	5/31/13				
Average		273	3402	353	4379
		Report Only	DL: 6090	Report Only	DL: 5940
Maximum		374	4762	654	7592
		Report Only	Report Only	Report Only	Report Only

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 gather and evaluate 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.

Monroe WWTP	6/10/2013 8:05:29 AM
Signature	**Date**

Washington State Department of Ecology **Discharge Monitoring Report (DMR)**

Permit Number: WA0020486 **Permittee:** MONROE STP
Facility County: Snohomish **Receiving Waterbody:** Skykomish R.
Monitoring Period: 06/01/2013 - 06/30/2013 **Outfall:** 001 **Version:** 1

Week	Monitoring Point	Flow MGD Continuous Measurement	Total BOD5 Total Milligrams/L (mg/L) 3/Week Composite Sample (24 HR Time Proportional comp)	Total BOD5 Total Lbs/Day 3/Week Calculated	Total Suspended Solids (TSS) Total suspended (TSS) Milligrams/L (mg/L) 3/Week Composite Sample (24 HR Time Proportional comp)	Total Suspended Solids (TSS) Total suspended (TSS) Lbs/Day 3/Week Calculated	Fecal Coliform #/100ml 3/Week Grab	pH Standard Units 1/Day Grab	Temperature Measured Degrees C 1/Day Measurement	Temperature Calculated Degrees C 1/Day Calculated	Ammonia Total Milligrams/L (mg/L) Monthly Composite Sample (24 HR Time Proportional comp)	Phosphorus Total Milligrams/L (mg/L) Monthly Composite Sample (24 HR Time Proportional comp)
		001	001	001	001	001	001	001	001	001	001	001
1-Sa	**6/1/13**	1.336						7.0	18.2	17.9		
2-Su	**6/2/13**	1.446						6.9	18.6	18.0		
2-M	**6/3/13**	1.384	3	33	6	66	4	7.1	19.0	18.2		
2-T	**6/4/13**	1.325	4	47	11	130	2	7.1	19.3	18.4	0.094	4.84
2-W	**6/5/13**	1.417	4	44	8	88	4	7.0	19.7	18.6		
2-Th	**6/6/13**	1.326						6.9	20.3	19.0		
2-F	**6/7/13**	1.259						6.9	19.5	19.2		
2-Sa	**6/8/13**	1.355						6.9	19.8	19.5		
3-Su	**6/9/13**	1.761						6.9	19.8	19.6		
3-M	**6/10/13**	1.364	7	79	14	158	6	6.8	19.8	19.7		
3-T	**6/11/13**	1.352	7	77	21	232	1	6.8	19.7	19.8		
3-W	**6/12/13**	1.322	8	117	18	264	2	6.8	19.8	19.8		
3-Th	**6/13/13**	1.757						6.7	19.7	19.7		
3-F	**6/14/13**	1.261						6.7	19.6	19.7		
3-Sa	**6/15/13**	1.347						6.8	19.8	19.7		
4-Su	**6/16/13**	1.020						6.9	19.8	19.7		
4-M	**6/17/13**	1.355	8	92	12	138	1	6.8	20.2	19.8		
4-T	**6/18/13**	1.380	8	91	15	171	1	7.0	20.5	19.9		
4-W	**6/19/13**	1.370	5	72	15	216	2	7.0	20.5	20.0		
4-Th	**6/20/13**	1.724						6.8	20.1	20.1		
4-F	**6/21/13**	2.553						7.0	19.2	20.0		
4-Sa	**6/22/13**	1.642						7.0	19.6	20.0		
5-Su	**6/23/13**	1.564						6.9	19.7	20.0		
5-M	**6/24/13**	1.549	11	130	32	378	8	7.1	19.9	19.9		
5-T	**6/25/13**	1.418						7.2	20.2	19.9		
5-W	**6/26/13**	1.783	5	50	14	141	8	7.2	20.2	19.8		
5-Th	**6/27/13**	1.205	8	96	22	265	2	7.2	20.1	19.8		
5-F	**6/28/13**	1.445						7.1	20.7	20.1		
5-Sa	**6/29/13**	1.395						7.0	21.5	20.3		
6-Su	**6/30/13**	1.411						7.2	21.9	20.6		
Minimum								6.7				
								>= 6.0				
Average		1.461	7	78	16	187					0.094	4.84
		DL: 2.84	<= 30	<= 711	<= 30	<= 711					Report Only	Report Only
Weekly Average			8	92	23	392						
			<= 45	<= 1066	<= 45	<= 1066						
Maximum								7.2				
								<= 9.0				

Week	Monitoring Point	Phosphorus Dissolved (soluble) Milligrams/L (mg/L) Monthly Composite Sample (24 HR Time Proportional comp) 001	Nitrate + Nitrite Total Milligrams/L (mg/L) Monthly Composite Sample (24 HR Time Proportional comp) 001	TKN Total Milligrams/L (mg/L) Monthly Composite Sample (24 HR Time Proportional comp) 001	Total BOD5 Total Percent Monthly Calculated 001C	Total Suspended Solids (TSS) Total suspended (TSS) Percent Monthly Calculated 001C
1-Sa	6/1/13					
2-Su	6/2/13					
2-M	6/3/13				99	98
2-T	6/4/13	4.8	21	1.56	98	96
2-W	6/5/13				99	99
2-Th	6/6/13					
2-F	6/7/13					
2-Sa	6/8/13					
3-Su	6/9/13					
3-M	6/10/13				97	96
3-T	6/11/13				98	96
3-W	6/12/13				97	94
3-Th	6/13/13					
3-F	6/14/13					
3-Sa	6/15/13					
4-Su	6/16/13					
4-M	6/17/13				97	96
4-T	6/18/13				97	97
4-W	6/19/13				99	97
4-Th	6/20/13					
4-F	6/21/13					
4-Sa	6/22/13					
5-Su	6/23/13					
5-M	6/24/13				95	92
5-T	6/25/13					
5-W	6/26/13				98	97
5-Th	6/27/13				97	95
5-F	6/28/13					
5-Sa	6/29/13					
6-Su	6/30/13					
Minimum						
Average		4.8	21	1.56	98	96
		Report Only	Report Only	Report Only	>= 85	>= 85
Weekly Average						
Maximum						

Daily Maximum	2.553							21.9			
	Report Only							Report Only			
Monthly geometric mean						3					
						<= 200					
Weekly Geometric Mean						8					
						<= 400					
7-DADMax									20.6		
									Report Only		

Daily Maximum					
Monthly geometric mean					
Weekly Geometric Mean					
7-DADMax					

Discharge Monitoring Report (DMR)

Permit Number: WA0020486 **Permittee:** MONROE STP
Facility County: Snohomish **Receiving Waterbody:**
Monitoring Period: 06/01/2013 - 06/30/2013 **Outfall:** IN1 **Version:** 1

Week	Monitoring Point	Total BOD5 Total Milligrams/L (mg/L) 3/Week Composite Sample (24 HR Time Proportional comp)	Total BOD5 Total Lbs/Day 3/Week Calculated	Total Suspended Solids (TSS) Total suspended (TSS) Milligrams/L (mg/L) 3/Week Composite Sample (24 HR Time Proportional comp)	Total Suspended Solids (TSS) Total suspended (TSS) Lbs/Day 3/Week Calculated
		INF	INF	INF	INF
1-Sa	6/1/13				
2-Su	6/2/13				
2-M	6/3/13	229	2531	240	2652
2-T	6/4/13	263	3108	282	3333
2-W	6/5/13	271	2997	722	7984
2-Th	6/6/13				
2-F	6/7/13				
2-Sa	6/8/13				
3-Su	6/9/13				
3-M	6/10/13	247	2785	314	3541
3-T	6/11/13	295	3253	536	5910
3-W	6/12/13	279	4088	320	4689
3-Th	6/13/13				
3-F	6/14/13				
3-Sa	6/15/13				
4-Su	6/16/13				
4-M	6/17/13	260	2992	320	3683
4-T	6/18/13	271	3096	590	6741
4-W	6/19/13	335	4817	474	6815
4-Th	6/20/13				
4-F	6/21/13				
4-Sa	6/22/13				
5-Su	6/23/13				
5-M	6/24/13	213	2519	424	5014
5-T	6/25/13				
5-W	6/26/13	305	3065	404	4060
5-Th	6/27/13	267	3218	426	5134
5-F	6/28/13				
5-Sa	6/29/13				
6-Su	6/30/13				
Average		270	3206	421	4963
		Report Only	DL: 6090	Report Only	DL: 5940
Maximum		335	4817	722	7984
		Report Only	Report Only	Report Only	Report Only

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 gather and evaluate 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.

Monroe WWTP	7/8/2013 1:47:55 PM
Signature	**Date**

Washington State Department of Ecology **Discharge Monitoring Report (DMR)**

Permit Number: WA0020486 **Permittee:** MONROE STP
Facility County: Snohomish **Receiving Waterbody:** Skykomish R.
Monitoring Period: 07/01/2013 - 07/31/2013 **Outfall:** 001 **Version:** 1

Week	Monitoring Point	Flow MGD Continuous Measurement	Total BOD5 Total Milligrams/L (mg/L) 3/Week Composite Sample (24 HR Time Proportional comp)	Total BOD5 Total Lbs/Day 3/Week Calculated	Total Suspended Solids (TSS) Total suspended (TSS) Milligrams/L (mg/L) 3/Week Composite Sample (24 HR Time Proportional comp)	Total Suspended Solids (TSS) Total suspended (TSS) Lbs/Day 3/Week Calculated	Fecal Coliform #/100ml 3/Week Grab	pH Standard Units 1/Day Grab	Temperature Measured Degrees C 1/Day Measurement	Temperature Calculated Degrees C 1/Day Calculated	Ammonia Total Milligrams/L (mg/L) Monthly Composite Sample (24 HR Time Proportional comp)	Phosphorus Total Milligrams/L (mg/L) Monthly Composite Sample (24 HR Time Proportional comp)
		001	001	001	001	001	001	001	001	001	001	001
1-M	7/1/13	1.350	7	75	21	224	3	7.2	22.2	21.0	0.28	5.21
1-T	7/2/13	1.277	14	153	33	360	6	7.1	22.2	21.3		
1-W	7/3/13	1.308					11	7.1	22.2	21.5		
1-Th	7/4/13	1.317	6	65	20	216		7.0	21.9	21.8		
1-F	7/5/13	1.296						7.2	21.7	21.9		
1-Sa	7/6/13	1.316						7.1	21.7	22.0		
2-Su	7/7/13	1.300						7.1	21.7	21.9		
2-M	7/8/13	1.318	6	65	19	206	6	7.2	21.8	21.9		
2-T	7/9/13	1.298						7.0	22.3	21.9		
2-W	7/10/13	1.260	5	53	20	212	1	7.1	22.0	21.9		
2-Th	7/11/13	1.272	4	43	14	151	4	7.2	22.0	21.9		
2-F	7/12/13	1.296						7.0	21.5	21.9		
2-Sa	7/13/13	1.037						7.0	21.6	21.8		
3-Su	7/14/13	1.656						7.1	21.6	21.8		
3-M	7/15/13	1.432	8	90	16	180		7.1	21.9	21.8		
3-T	7/16/13	1.346	13	140	27	291	2	7.2	22.1	21.8		
3-W	7/17/13	1.294	5	54	15	161	1	7.2	21.6	21.8		
3-Th	7/18/13	1.286					1	7.3	22.0	21.8		
3-F	7/19/13	1.304						7.2	22.2	21.9		
3-Sa	7/20/13	1.248						7.2	22.0	21.9		
4-Su	7/21/13	1.244						7.3	21.9	22.0		
4-M	7/22/13	1.291	2	23	20	228	1	7.3	22.0	22.0		
4-T	7/23/13	1.365	3	35	11	127	1	7.1	22.4	22.0		
4-W	7/24/13	1.389	3	32	13	140	1	7.1	22.5	22.1		
4-Th	7/25/13	1.290						7.2	22.6	22.2		
4-F	7/26/13	1.303						7.0	22.8	22.3		
4-Sa	7/27/13	1.205						6.9	22.6	22.4		
5-Su	7/28/13	1.200						7.0	22.4	22.5		
5-M	7/29/13	1.398	5	52	16	165	1	7.1	22.4	22.5		
5-T	7/30/13	1.237	4	43	6	64	1	7.1	22.6	22.6		
5-W	7/31/13	1.274	4	44	4	44	2	7.3	22.4	22.5		
Minimum								6.9				
								>= 6.0				
Average		1.303	6	64	17	185					0.28	5.21
		DL: 2.84	<= 30	<= 711	<= 30	<= 711					Report Only	Report Only
Weekly Average			9	98	25	267						
			<= 45	<= 1066	<= 45	<= 1066						

Week	Monitoring Point	Phosphorus Dissolved (soluble) Milligrams/L (mg/L) Monthly Composite Sample (24 HR Time Proportional comp)	Nitrate + Nitrite Total Milligrams/L (mg/L) Monthly Composite Sample (24 HR Time Proportional comp)	TKN Total Milligrams/L (mg/L) Monthly Composite Sample (24 HR Time Proportional comp)	Total BOD5 Total Percent Monthly Calculated	Total Suspended Solids (TSS) Total suspended (TSS) Percent Monthly Calculated
		001	001	001	001C	001C
1-M	**7/1/13**	4.62	16	3.39	98	95
1-T	**7/2/13**				94	91
1-W	**7/3/13**					
1-Th	**7/4/13**				98	98
1-F	**7/5/13**					
1-Sa	**7/6/13**					
2-Su	**7/7/13**					
2-M	**7/8/13**				98	95
2-T	**7/9/13**					
2-W	**7/10/13**				98	98
2-Th	**7/11/13**				98	96
2-F	**7/12/13**					
2-Sa	**7/13/13**					
3-Su	**7/14/13**					
3-M	**7/15/13**				97	96
3-T	**7/16/13**				95	92
3-W	**7/17/13**				98	94
3-Th	**7/18/13**					
3-F	**7/19/13**					
3-Sa	**7/20/13**					
4-Su	**7/21/13**					
4-M	**7/22/13**				99	95
4-T	**7/23/13**				99	95
4-W	**7/24/13**				99	99
4-Th	**7/25/13**					
4-F	**7/26/13**					
4-Sa	**7/27/13**					
5-Su	**7/28/13**					
5-M	**7/29/13**				98	93
5-T	**7/30/13**				99	97
5-W	**7/31/13**				98	98
Minimum						
Average		4.62	16	3.39	98	95
		Report Only	Report Only	Report Only	>= 85	>= 85
Weekly Average						

Maximum							7.3				
							<= 9.0				
Daily Maximum	1.656							22.8			
	Report Only							Report Only			
Monthly geometric mean						2					
						<= 200					
Weekly Geometric Mean						7					
						<= 400					
7-DADMax									22.6		
									Report Only		

Maximum					
Daily Maximum					
Monthly geometric mean					
Weekly Geometric Mean					
7-DADMax					

Permit Number: WA0020486 **Permittee:** MONROE STP
Facility County: Snohomish **Receiving Waterbody:**
Monitoring Period: 07/01/2013 - 07/31/2013 **Outfall:** IN1 **Version:** 1

Week	Monitoring Point	Total BOD5 Total Milligrams/L (mg/L) 3/Week Composite Sample (24 HR Time Proportional comp)	Total BOD5 Total Lbs/Day 3/Week Calculated	Total Suspended Solids (TSS) Total suspended (TSS) Milligrams/L (mg/L) 3/Week Composite Sample (24 HR Time Proportional comp)	Total Suspended Solids (TSS) Total suspended (TSS) Lbs/Day 3/Week Calculated
		INF	INF	INF	INF
1-M	**7/1/13**	290	3089	382	4068
1-T	**7/2/13**	248	2705	380	4145
1-W	**7/3/13**				
1-Th	**7/4/13**	280	3026	1248	13489
1-F	**7/5/13**				
1-Sa	**7/6/13**				
2-Su	**7/7/13**				
2-M	**7/8/13**	267	2890	356	3854
2-T	**7/9/13**				
2-W	**7/10/13**	233	2472	852	9038
2-Th	**7/11/13**	239	2583	340	3675
2-F	**7/12/13**				
2-Sa	**7/13/13**				
3-Su	**7/14/13**				
3-M	**7/15/13**	264	2964	400	4490
3-T	**7/16/13**	287	3097	320	3453
3-W	**7/17/13**	245	2628	264	2831
3-Th	**7/18/13**				
3-F	**7/19/13**				
3-Sa	**7/20/13**				
4-Su	**7/21/13**				
4-M	**7/22/13**	273	3108	422	4804
4-T	**7/23/13**	262	3035	226	2618
4-W	**7/24/13**	352	3787	948	10199
4-Th	**7/25/13**				
4-F	**7/26/13**				
4-Sa	**7/27/13**				
5-Su	**7/28/13**				
5-M	**7/29/13**	313	3229	232	2393
5-T	**7/30/13**	303	3219	218	2316
5-W	**7/31/13**	239	2645	162	1793
Average		273	2965	450	4878
		Report Only	DL: 6090	Report Only	DL: 5940
Maximum		352	3787	1248	13489
		Report Only	Report Only	Report Only	Report Only

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 gather and evaluate 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.

Monroe WWTP	8/13/2013 10:41:28 AM
Signature	**Date**

Washington State Department of Ecology **Discharge Monitoring Report (DMR)**

Permit Number: WA0020486 **Permittee:** MONROE STP
Facility County: Snohomish **Receiving Waterbody:** Skykomish R.
Monitoring Period: 08/01/2013 - 08/31/2013 **Outfall:** 001 **Version:** 1

Week	Monitoring Point	Flow MGD Continuous Measurement	Total BOD5 Total Milligrams/L (mg/L) 3/Week Composite Sample (24 HR Time Proportional comp)	Total BOD5 Total Lbs/Day 3/Week Calculated	Total Suspended Solids (TSS) Total suspended (TSS) Milligrams/L (mg/L) 3/Week Composite Sample (24 HR Time Proportional comp)	Total Suspended Solids (TSS) Total suspended (TSS) Lbs/Day 3/Week Calculated	Fecal Coliform #/100ml 3/Week Grab	pH Standard Units 1/Day Grab	Temperature Measured Degrees C 1/Day Measurement	Temperature Calculated Degrees C 1/Day Calculated	Ammonia Total Milligrams/L (mg/L) Monthly Composite Sample (24 HR Time Proportional comp)	Phosphorus Total Milligrams/L (mg/L) Monthly Composite Sample (24 HR Time Proportional comp)
		001	001	001	001	001	001	001	001	001	001	001
1-Th	**8/1/13**	1.327						7.3	22.4	22.5		
1-F	**8/2/13**	1.432						7.4	22.0	22.4		
1-Sa	**8/3/13**	1.861						7.3	21.6	22.3		
2-Su	**8/4/13**	1.288						7.2	22.0	22.2		
2-M	**8/5/13**	1.299	4	39	10	96	1	7.0	22.3	22.2		
2-T	**8/6/13**	1.157	3	32	9	97	1	7.0	22.6	22.2	0.065	4.87
2-W	**8/7/13**	1.289	2	23	6	68	1	7.0	22.7	22.2		
2-Th	**8/8/13**	1.355						7.1	23.0	22.3		
2-F	**8/9/13**	1.531						7.0	23.0	22.5		
2-Sa	**8/10/13**	1.218						7.1	23.0	22.7		
3-Su	**8/11/13**	1.178						7.2	22.9	22.8		
3-M	**8/12/13**	1.238	4	40	8	81	1	7.2	23.2	22.9		
3-T	**8/13/13**	1.209	2	31	6	94	1	7.2	23.2	23.0		
3-W	**8/14/13**	1.875	2	28	5	71		7.2	23.1	23.1		
3-Th	**8/15/13**	1.708					4	7.2	22.8	23.0		
3-F	**8/16/13**	1.952						7.2	23.3	23.1		
3-Sa	**8/17/13**	1.465						7.2	23.0	23.1		
4-Su	**8/18/13**	1.130						7.4	23.2	23.1		
4-M	**8/19/13**	0.952	4	54	12	163	3	7.4	22.9	23.1		
4-T	**8/20/13**	1.632	6	68	13	147	2	7.3	23.1	23.1		
4-W	**8/21/13**	1.355	5	50	12	120	2	7.3	23.0	23.0		
4-Th	**8/22/13**	1.204						7.2	22.8	23.0		
4-F	**8/23/13**	1.489						7.2	22.6	22.9		
4-Sa	**8/24/13**	1.466						7.1	22.5	22.9		
5-Su	**8/25/13**	1.414						7.2	22.4	22.8		
5-M	**8/26/13**	1.467					6	7.1	22.2	22.7		
5-T	**8/27/13**	1.288	6	67	16	178	4	7.3	22.4	22.6		
5-W	**8/28/13**	1.332	1	15	9	132	2	7.2	22.6	22.5		
5-Th	**8/29/13**	1.765	3	40	8	105		7.0	22.5	22.5		
5-F	**8/30/13**	1.581						7.3	22.8	22.5		
5-Sa	**8/31/13**	1.507						7.1	22.7	22.5		
Minimum								7.0				
								>= 6.0				
Average		1.418	4	41	10	113					0.065	4.87
		DL: 2.84	<= 30	<= 711	<= 30	<= 711					Report Only	Report Only
Weekly Average			5	57	12	143						
			<= 45	<= 1066	<= 45	<= 1066						

Week	Monitoring Point	Phosphorus Dissolved (soluble) Milligrams/L (mg/L) Monthly Composite Sample (24 HR Time Proportional comp)	Nitrate + Nitrite Total Milligrams/L (mg/L) Monthly Composite Sample (24 HR Time Proportional comp)	TKN Total Milligrams/L (mg/L) Monthly Composite Sample (24 HR Time Proportional comp)	Total BOD5 Total Percent Monthly Calculated	Total Suspended Solids (TSS) Total suspended (TSS) Percent Monthly Calculated
		001	001	001	001C	001C
1-Th	**8/1/13**					
1-F	**8/2/13**					
1-Sa	**8/3/13**					
2-Su	**8/4/13**					
2-M	**8/5/13**				98	95
2-T	**8/6/13**	4.81	18	2.64	99	95
2-W	**8/7/13**				99	97
2-Th	**8/8/13**					
2-F	**8/9/13**					
2-Sa	**8/10/13**					
3-Su	**8/11/13**					
3-M	**8/12/13**				98	95
3-T	**8/13/13**				99	97
3-W	**8/14/13**				99	97
3-Th	**8/15/13**					
3-F	**8/16/13**					
3-Sa	**8/17/13**					
4-Su	**8/18/13**					
4-M	**8/19/13**				98	93
4-T	**8/20/13**				98	94
4-W	**8/21/13**				98	95
4-Th	**8/22/13**					
4-F	**8/23/13**					
4-Sa	**8/24/13**					
5-Su	**8/25/13**					
5-M	**8/26/13**					
5-T	**8/27/13**				98	94
5-W	**8/28/13**				99	95
5-Th	**8/29/13**				98	96
5-F	**8/30/13**					
5-Sa	**8/31/13**					
Minimum						
Average		4.81	18	2.64	99	95
		Report Only	Report Only	Report Only	>= 85	>= 85
Weekly Average						

Maximum							7.4				
							<= 9.0				
Daily Maximum	1.952							23.3			
	Report Only							Report Only			
Monthly geometric mean						2					
						<= 200					
Weekly Geometric Mean						4					
						<= 400					
7-DADMax									23.1		
									Report Only		

Maximum					
Daily Maximum					
Monthly geometric mean					
Weekly Geometric Mean					
7-DADMax					

Permit Number: WA0020486 **Permittee:** MONROE STP
Facility County: Snohomish **Receiving Waterbody:**
Monitoring Period: 08/01/2013 - 08/31/2013 **Outfall:** IN1 **Version:** 1

Week	Monitoring Point	Total BOD5 Total Milligrams/L (mg/L) 3/Week Composite Sample (24 HR Time Proportional comp)	Total BOD5 Total Lbs/Day 3/Week Calculated	Total Suspended Solids (TSS) Total suspended (TSS) Milligrams/L (mg/L) 3/Week Composite Sample (24 HR Time Proportional comp)	Total Suspended Solids (TSS) Total suspended (TSS) Lbs/Day 3/Week Calculated
		INF	INF	INF	INF
1-Th	**8/1/13**				
1-F	**8/2/13**				
1-Sa	**8/3/13**				
2-Su	**8/4/13**				
2-M	**8/5/13**	260	2509	210	2026
2-T	**8/6/13**	247	2655	188	2021
2-W	**8/7/13**	246	2780	198	2238
2-Th	**8/8/13**				
2-F	**8/9/13**				
2-Sa	**8/10/13**				
3-Su	**8/11/13**				
3-M	**8/12/13**	233	2349	174	1754
3-T	**8/13/13**	277	4332	204	3190
3-W	**8/14/13**	257	3661	196	2792
3-Th	**8/15/13**				
3-F	**8/16/13**				
3-Sa	**8/17/13**				
4-Su	**8/18/13**				
4-M	**8/19/13**	203	2763	172	2341
4-T	**8/20/13**	248	2803	206	2328
4-W	**8/21/13**	290	2912	226	2269
4-Th	**8/22/13**				
4-F	**8/23/13**				
4-Sa	**8/24/13**				
5-Su	**8/25/13**				
5-M	**8/26/13**				
5-T	**8/27/13**	304	3377	262	2911
5-W	**8/28/13**	188	2767	186	2738
5-Th	**8/29/13**	191	2518	186	2453
5-F	**8/30/13**				
5-Sa	**8/31/13**				
Average		245	2952	201	2422
		Report Only	DL: 6090	Report Only	DL: 5940
Maximum		304	4332	262	3190
		Report Only	Report Only	Report Only	Report Only

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 gather and evaluate 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.

Monroe WWTP	9/4/2013 1:08:47 PM
Signature	**Date**

Permit Number: WA0020486 **Permittee:** MONROE STP
Facility County: Snohomish **Receiving Waterbody:** Skykomish R.
Monitoring Period: 09/01/2013 - 09/30/2013 **Outfall:** 001 **Version:** 1

Week	Monitoring Point	Flow MGD Continuous Measurement	Total BOD5 Total Milligrams/L (mg/L) 3/Week Composite Sample (24 HR Time Proportional comp)	Total BOD5 Total Lbs/Day 3/Week Calculated	Total Suspended Solids (TSS) Total suspended (TSS) Milligrams/L (mg/L) 3/Week Composite Sample (24 HR Time Proportional comp)	Total Suspended Solids (TSS) Total suspended (TSS) Lbs/Day 3/Week Calculated	Fecal Coliform #/100ml 3/Week Grab	pH Standard Units 1/Day Grab	Temperature Measured Degrees C 1/Day Measurement	Temperature Calculated Degrees C 1/Day Calculated	Ammonia Total Milligrams/L (mg/L) Monthly Composite Sample (24 HR Time Proportional comp)	Phosphorus Total Milligrams/L (mg/L) Monthly Composite Sample (24 HR Time Proportional comp)
		001	001	001	001	001	001	001	001	001	001	001
1-Su	**9/1/13**	1.398						7.1	22.9	22.6		
1-M	**9/2/13**	1.180	3	35	8	94		7.0	22.9	22.7		
1-T	**9/3/13**	1.411	3	37	12	147	15	7.1	22.8	22.7	0.356	4.6
1-W	**9/4/13**	1.471	1	11	6	67	8	7.3	22.7	22.8		
1-Th	**9/5/13**	1.329					5	7.3	22.8	22.8		
1-F	**9/6/13**	2.078						7.4	22.5	22.8		
1-Sa	**9/7/13**	1.590						7.7	22.0	22.7		
2-Su	**9/8/13**	1.493						7.5	22.3	22.6		
2-M	**9/9/13**	1.570						7.4	23.1	22.6		
2-T	**9/10/13**	1.148	3	28	5	47	3	7.4	22.8	22.6		
2-W	**9/11/13**	1.125	2	22	2	22	2	7.5	23.0	22.6		
2-Th	**9/12/13**	1.293	4	40	11	109	3	7.3	22.9	22.7		
2-F	**9/13/13**	1.192						7.3	22.7	22.7		
2-Sa	**9/14/13**	1.242						7.2	22.5	22.8		
3-Su	**9/15/13**	1.277						7.3	22.4	22.8		
3-M	**9/16/13**	1.400	2	29	6	87	2	7.3	22.3	22.7		
3-T	**9/17/13**	1.735	1	13	3	40	2	7.4	21.8	22.5		
3-W	**9/18/13**	1.604	1	13	2	25	1	7.4	21.3	22.3		
3-Th	**9/19/13**	1.510						7.2	21.3	22.0		
3-F	**9/20/13**	1.291						7.2	21.4	21.9		
3-Sa	**9/21/13**	1.265						7.2	21.4	21.7		
4-Su	**9/22/13**	1.286						7.2	21.2	21.5		
4-M	**9/23/13**	1.446	3	41	5	68	2	7.3	20.9	21.3		
4-T	**9/24/13**	1.627	4	51	8	103	2	7.1	20.6	21.2		
4-W	**9/25/13**	1.538	3	34	9	103	1	7.2	20.2	21.0		
4-Th	**9/26/13**	1.377						7.2	20.0	20.8		
4-F	**9/27/13**	1.403						7.2	20.0	20.6		
4-Sa	**9/28/13**	1.420						7.0	19.7	20.4		
5-Su	**9/29/13**	1.984						7.1	18.8	20.0		
5-M	**9/30/13**	1.714	1	12	8	99	1	7.1	18.8	19.7		
Minimum								7.0				
								>= 6.0				
Average		1.448	2	28	7	78					0.356	4.6
		DL: 2.84	<= 30	<= 711	<= 30	<= 711					Report Only	Report Only
Weekly Average			3	42	9	93						
			<= 45	<= 1066	<= 45	<= 1066						
Maximum								7.7				
								<= 9.0				

Week	Monitoring Point	Phosphorus Dissolved (soluble) Milligrams/L (mg/L) Monthly Composite Sample (24 HR Time Proportional comp)	Nitrate + Nitrite Total Milligrams/L (mg/L) Monthly Composite Sample (24 HR Time Proportional comp)	TKN Total Milligrams/L (mg/L) Monthly Composite Sample (24 HR Time Proportional comp)	Total BOD5 Total Percent Monthly Calculated	Total Suspended Solids (TSS) Total suspended (TSS) Percent Monthly Calculated
		001	001	001	001C	001C
1-Su	**9/1/13**					
1-M	**9/2/13**				99	97
1-T	**9/3/13**	4.83	11	2.64	99	94
1-W	**9/4/13**				100	97
1-Th	**9/5/13**					
1-F	**9/6/13**					
1-Sa	**9/7/13**					
2-Su	**9/8/13**					
2-M	**9/9/13**					
2-T	**9/10/13**				99	98
2-W	**9/11/13**				99	99
2-Th	**9/12/13**				99	95
2-F	**9/13/13**					
2-Sa	**9/14/13**					
3-Su	**9/15/13**					
3-M	**9/16/13**				99	97
3-T	**9/17/13**				100	99
3-W	**9/18/13**				100	99
3-Th	**9/19/13**					
3-F	**9/20/13**					
3-Sa	**9/21/13**					
4-Su	**9/22/13**					
4-M	**9/23/13**				99	97
4-T	**9/24/13**				98	94
4-W	**9/25/13**				98	95
4-Th	**9/26/13**					
4-F	**9/27/13**					
4-Sa	**9/28/13**					
5-Su	**9/29/13**					
5-M	**9/30/13**				99	96
Minimum						
Average		4.83	11	2.64	99	97
		Report Only	Report Only	Report Only	>= 85	>= 85
Weekly Average						
Maximum						

Daily Maximum	2.078 Report Only							23.1 Report Only			
Monthly geometric mean						3 <= 200					
Weekly Geometric Mean						8 <= 400					
7-DADMax									22.8 Report Only		

Daily Maximum					
Monthly geometric mean					
Weekly Geometric Mean					
7-DADMax					

Permit Number: WA0020486 **Permittee:** MONROE STP
Facility County: Snohomish **Receiving Waterbody:**
Monitoring Period: 09/01/2013 - 09/30/2013 **Outfall:** IN1 **Version:** 1

Week	Monitoring Point	Total BOD5 Total Milligrams/L (mg/L) 3/Week Composite Sample (24 HR Time Proportional comp) INF	Total BOD5 Total Lbs/Day 3/Week Calculated INF	Total Suspended Solids (TSS) Total suspended (TSS) Milligrams/L (mg/L) 3/Week Composite Sample (24 HR Time Proportional comp) INF	Total Suspended Solids (TSS) Total suspended (TSS) Lbs/Day 3/Week Calculated INF
1-Su	9/1/13				
1-M	9/2/13	254	2989	248	2918
1-T	9/3/13	224	2748	200	2454
1-W	9/4/13	236	2616	182	2017
1-Th	9/5/13				
1-F	9/6/13				
1-Sa	9/7/13				
2-Su	9/8/13				
2-M	9/9/13				
2-T	9/10/13	274	2571	276	2590
2-W	9/11/13	215	2318	218	2351
2-Th	9/12/13	310	3082	230	2286
2-F	9/13/13				
2-Sa	9/14/13				
3-Su	9/15/13				
3-M	9/16/13	162	2344	188	2720
3-T	9/17/13	236	3157	226	3023
3-W	9/18/13	237	2985	260	3274
3-Th	9/19/13				
3-F	9/20/13				
3-Sa	9/21/13				
4-Su	9/22/13				
4-M	9/23/13	210	2850	170	2307
4-T	9/24/13	160	2052	140	1796
4-W	9/25/13	170	1952	170	1952
4-Th	9/26/13				
4-F	9/27/13				
4-Sa	9/28/13				
5-Su	9/29/13				
5-M	9/30/13	143	1771	194	2403
Average		224	2572	208	2469
		Report Only	DL: 6090	Report Only	DL: 5940
Maximum		310	3157	276	3274
		Report Only	Report Only	Report Only	Report Only

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 gather and evaluate 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.

Signature	Date
Monroe WWTP	10/11/2013 10:30:04 AM

Washington State Department of Ecology **Discharge Monitoring Report (DMR)**

Permit Number: WA0020486 **Permittee:** MONROE STP
Facility County: Snohomish **Receiving Waterbody:** Skykomish R.
Monitoring Period: 10/01/2013 - 10/31/2013 **Outfall:** 001 **Version:** 1

Week	Monitoring Point	Flow MGD Continuous Measurement	Total BOD5 Total Milligrams/L (mg/L) 3/Week Composite Sample (24 HR Time Proportional comp)	Total BOD5 Total Lbs/Day 3/Week Calculated	Total Suspended Solids (TSS) Total suspended (TSS) Milligrams/L (mg/L) 3/Week Composite Sample (24 HR Time Proportional comp)	Total Suspended Solids (TSS) Total suspended (TSS) Lbs/Day 3/Week Calculated	Fecal Coliform #/100ml 3/Week Grab	pH Standard Units 1/Day Grab	Temperature Measured Degrees C 1/Day Measurement	Temperature Calculated Degrees C 1/Day Calculated	Ammonia Total Milligrams/L (mg/L) Monthly Composite Sample (24 HR Time Proportional comp)	Phosphorus Total Milligrams/L (mg/L) Monthly Composite Sample (24 HR Time Proportional comp)
		001	001	001	001	001	001	001	001	001	001	001
1-T	**10/1/13**	1.485	1	13	7	92	1	7.2	18.8	19.5		
1-W	**10/2/13**	1.569	2	25	6	74	1	7.2	18.8	19.3	0.055	3.59
1-Th	**10/3/13**	1.478						7.1	18.8	19.1		
1-F	**10/4/13**	1.454						7.2	18.8	18.9		
1-Sa	**10/5/13**	1.337						7.1	18.8	18.8		
2-Su	**10/6/13**	1.352						7.1	18.9	18.8		
2-M	**10/7/13**	1.417	3	38	6	76		7.1	19.0	18.8		
2-T	**10/8/13**	1.518	3	36	5	60	6	7.2	19.0	18.9		
2-W	**10/9/13**	1.442	4	47	5	59	2	7.2	18.7	18.9		
2-Th	**10/10/13**	1.419					1	7.1	18.6	18.8		
2-F	**10/11/13**	1.316						7.1	18.8	18.8		
2-Sa	**10/12/13**	1.370						6.9	18.6	18.8		
3-Su	**10/13/13**	1.400						7.2	18.5	18.7		
3-M	**10/14/13**	1.387	2	23	2	23	2	7.2	18.4	18.7		
3-T	**10/15/13**	1.406	2	19	1	10	2	7.4	18.6	18.6		
3-W	**10/16/13**	1.167	3	29	4	38	1	7.3	18.7	18.6		
3-Th	**10/17/13**	1.140						7.4	18.8	18.6		
3-F	**10/18/13**	1.296						7.2	18.5	18.6		
3-Sa	**10/19/13**	1.296						7.0	18.2	18.5		
4-Su	**10/20/13**	1.267						7.0	18.0	18.5		
4-M	**10/21/13**	1.307	3	35	3	35	1	7.0	17.9	18.4		
4-T	**10/22/13**	1.407	4	43	3	32	200*	6.9	17.9	18.3		
4-W	**10/23/13**	1.278	4	45	4	45	1	6.9	17.9	18.2		
4-Th	**10/24/13**	1.359						7.0	17.9	18.0		
4-F	**10/25/13**	1.203						7.1	17.7	17.9		
4-Sa	**10/26/13**	1.304						7.0	17.7	17.9		
5-Su	**10/27/13**	1.296						7.0	17.6	17.8		
5-M	**10/28/13**	1.370	2	19	7	67	1	7.0	17.5	17.7		
5-T	**10/29/13**	1.156	4	49	9	111	2	7.1	17.6	17.7		
5-W	**10/30/13**	1.480	12	124	18	186	1	6.8	17.3	17.6		
5-Th	**10/31/13**	1.241						6.9	17.0	17.5		
Minimum								6.8				
								>= 6.0				
Average		1.352	4	39	6	65					0.055	3.59
		DL: 2.84	<= 30	<= 711	<= 30	<= 711					Report Only	Report Only
Weekly Average			6	64	11	121						
			<= 45	<= 1066	<= 45	<= 1066						

Week	Monitoring Point	Phosphorus Dissolved (soluble) Milligrams/L (mg/L) Monthly Composite Sample (24 HR Time Proportional comp) 001	Nitrate + Nitrite Total Milligrams/L (mg/L) Monthly Composite Sample (24 HR Time Proportional comp) 001	TKN Total Milligrams/L (mg/L) Monthly Composite Sample (24 HR Time Proportional comp) 001	Total BOD5 Total Percent Monthly Calculated 001C	Total Suspended Solids (TSS) Total suspended (TSS) Percent Monthly Calculated 001C
1-T	**10/1/13**				99	98
1-W	**10/2/13**	3.68	15	2.46	99	97
1-Th	**10/3/13**					
1-F	**10/4/13**					
1-Sa	**10/5/13**					
2-Su	**10/6/13**					
2-M	**10/7/13**				99	97
2-T	**10/8/13**				99	97
2-W	**10/9/13**				98	98
2-Th	**10/10/13**					
2-F	**10/11/13**					
2-Sa	**10/12/13**					
3-Su	**10/13/13**					
3-M	**10/14/13**				99	99
3-T	**10/15/13**				99	99
3-W	**10/16/13**				99	98
3-Th	**10/17/13**					
3-F	**10/18/13**					
3-Sa	**10/19/13**					
4-Su	**10/20/13**					
4-M	**10/21/13**				99	98
4-T	**10/22/13**				98	98
4-W	**10/23/13**				98	98
4-Th	**10/24/13**					
4-F	**10/25/13**					
4-Sa	**10/26/13**					
5-Su	**10/27/13**					
5-M	**10/28/13**				100	97
5-T	**10/29/13**				98	95
5-W	**10/30/13**				95	90
5-Th	**10/31/13**					
Minimum						
Average		3.68	15	2.46	99	97
		Report Only	Report Only	Report Only	>= 85	>= 85
Weekly Average						

Maximum							7.4 <= 9.0				
Daily Maximum	1.569 Report Only							19.0 Report Only			
Monthly geometric mean						2 <= 200					
Weekly Geometric Mean						6 <= 400					
7-DADMax									19.5 Report Only		

Outfall: 001 -

Monitoring Point	Parameter	Sample Date/ Statistical Base	Value	Notes/Comment
001	Fecal Coliform Not Applicable #/100ml	10/22/2013	200	Sample was taken during maintenance on a UV which caused the high value. We changed our maintenance proceedure to prevent this from occuring again.

Maximum					
Daily Maximum					
Monthly geometric mean					
Weekly Geometric Mean					
7-DADMax					

Washington State Department of Ecology **Discharge Monitoring Report (DMR)**

Permit Number: WA0020486 **Permittee:** MONROE STP
Facility County: Snohomish **Receiving Waterbody:**
Monitoring Period: 10/01/2013 - 10/31/2013 **Outfall:** IN1 **Version:** 1

Week	Monitoring Point	Total BOD5 Total Milligrams/L (mg/L) 3/Week Composite Sample (24 HR Time Proportional comp) INF	Total BOD5 Total Lbs/Day 3/Week Calculated INF	Total Suspended Solids (TSS) Total suspended (TSS) Milligrams/L (mg/L) 3/Week Composite Sample (24 HR Time Proportional comp) INF	Total Suspended Solids (TSS) Total suspended (TSS) Lbs/Day 3/Week Calculated INF
1-T	**10/1/13**	149	1950	280	3664
1-W	**10/2/13**	209	2576	220	2712
1-Th	**10/3/13**				
1-F	**10/4/13**				
1-Sa	**10/5/13**				
2-Su	**10/6/13**				
2-M	**10/7/13**	282	3570	200	2532
2-T	**10/8/13**	236	2838	172	2069
2-W	**10/9/13**	236	2793	212	2509
2-Th	**10/10/13**				
2-F	**10/11/13**				
2-Sa	**10/12/13**				
3-Su	**10/13/13**				
3-M	**10/14/13**	255	2990	182	2134
3-T	**10/15/13**	280	2725	198	1927
3-W	**10/16/13**	288	2738	186	1768
3-Th	**10/17/13**				
3-F	**10/18/13**				
3-Sa	**10/19/13**				
4-Su	**10/20/13**				
4-M	**10/21/13**	258	3027	188	2206
4-T	**10/22/13**	255	2718	194	2068
4-W	**10/23/13**	217	2459	210	2380
4-Th	**10/24/13**				
4-F	**10/25/13**				
4-Sa	**10/26/13**				
5-Su	**10/27/13**				
5-M	**10/28/13**	411	3962	248	2391
5-T	**10/29/13**	199	2456	176	2172
5-W	**10/30/13**	257	2660	178	1842
5-Th	**10/31/13**				
Average		252	2819	203	2312
		Report Only	DL: 6090	Report Only	DL: 5940
Maximum		411	3962	280	3664
		Report Only	Report Only	Report Only	Report Only

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 gather and evaluate 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.

Monroe WWTP	11/6/2013 2:23:36 PM
Signature	**Date**

Washington State Department of Ecology **Discharge Monitoring Report (DMR)**

Permit Number: WA0020486 **Permittee:** MONROE STP
Facility County: Snohomish **Receiving Waterbody:** Skykomish R.
Monitoring Period: 11/01/2013 - 11/30/2013 **Outfall:** 001 **Version:** 1

Week	Monitoring Point	Flow MGD Continuous Measurement	Total BOD5 Total Milligrams/L (mg/L) 3/Week Composite Sample (24 HR Time Proportional comp)	Total BOD5 Total Lbs/Day 3/Week Calculated	Total Suspended Solids (TSS) Total suspended (TSS) Milligrams/L (mg/L) 3/Week Composite Sample (24 HR Time Proportional comp)	Total Suspended Solids (TSS) Total suspended (TSS) Lbs/Day 3/Week Calculated	Fecal Coliform #/100ml 3/Week Grab	pH Standard Units 1/Day Grab	Temperature Measured Degrees C 1/Day Measurement	Temperature Calculated Degrees C 1/Day Calculated	Ammonia Total Milligrams/L (mg/L) Monthly Composite Sample (24 HR Time Proportional comp)	Phosphorus Total Milligrams/L (mg/L) Monthly Composite Sample (24 HR Time Proportional comp)
		001	001	001	001	001	001	001	001	001	001	001
1-F	**11/1/13**	1.381						6.9	17.3	17.4		
1-Sa	**11/2/13**	1.357						6.9	17.5	17.4		
2-Su	**11/3/13**	1.579						7.2	16.6	17.3		
2-M	**11/4/13**	1.024					2	7.4	17.1	17.2		
2-T	**11/5/13**	1.630	3	45	5	74	1	7.0	16.9	17.1		
2-W	**11/6/13**	1.782	4	60	5	75	3	6.9	16.0	16.9	1.09	3.81
2-Th	**11/7/13**	1.810	4	76	7	132		6.9	15.7	16.7		
2-F	**11/8/13**	2.269						7.1	15.2	16.4		
2-Sa	**11/9/13**	1.523						7.0	16.1	16.2		
3-Su	**11/10/13**	1.491						7.0	16.2	16.2		
3-M	**11/11/13**	1.377	2	24	3	36		7.0	16.2	16.0		
3-T	**11/12/13**	1.419	2	25	6	75	2	7.0	16.4	16.0		
3-W	**11/13/13**	1.508	2	24	4	47	1	6.9	16.6	16.1		
3-Th	**11/14/13**	1.409					2	6.9	16.6	16.2		
3-F	**11/15/13**	1.457						6.8	16.5	16.4		
3-Sa	**11/16/13**	1.693						7.0	16.0	16.4		
4-Su	**11/17/13**	1.511						6.6	15.7	16.3		
4-M	**11/18/13**	1.507	4	64	3	48	2	6.6	15.9	16.2		
4-T	**11/19/13**	1.923	3	40	5	67	1	7.1	15.8	16.2		
4-W	**11/20/13**	1.612	3	39	2	26	1	7.2	15.3	16.0		
4-Th	**11/21/13**	1.551						6.9	15.2	15.8		
4-F	**11/22/13**	1.496						7.0	14.9	15.5		
4-Sa	**11/23/13**	1.450						7.0	14.4	15.3		
5-Su	**11/24/13**	1.461						6.9	14.1	15.1		
5-M	**11/25/13**	1.478	2	24	1	12	2	7.0	14.0	14.8		
5-T	**11/26/13**	1.464	4	47	5	59	2	7.0	14.0	14.6		
5-W	**11/27/13**	1.406						6.9	14.0	14.4		
5-Th	**11/28/13**	1.395						7.0	14.1	14.2		
5-F	**11/29/13**	1.324	6	66	8	88	2	7.0	14.1	14.1		
5-Sa	**11/30/13**	1.316						6.9	14.0	14.0		
Minimum								6.6				
								>= 6.0				
Average		1.520	3	44	5	62					1.09	3.81
		DL: 2.84	<= 30	<= 711	<= 30	<= 711					Report Only	Report Only
Weekly Average			4	60	6	281						
			<= 45	<= 1066	<= 45	<= 1066						
Maximum								7.4				
								<= 9.0				

Week	Monitoring Point	Phosphorus Dissolved (soluble) Milligrams/L (mg/L) Monthly Composite Sample (24 HR Time Proportional comp)	Nitrate + Nitrite Total Milligrams/L (mg/L) Monthly Composite Sample (24 HR Time Proportional comp)	TKN Total Milligrams/L (mg/L) Monthly Composite Sample (24 HR Time Proportional comp)	Total BOD5 Total Percent Monthly Calculated	Total Suspended Solids (TSS) Total suspended (TSS) Percent Monthly Calculated
		001	001	001	001C	001C
1-F	11/1/13					
1-Sa	11/2/13					
2-Su	11/3/13					
2-M	11/4/13					
2-T	11/5/13				98	98
2-W	11/6/13	3.99	19	4.15	98	97
2-Th	11/7/13				98	95
2-F	11/8/13					
2-Sa	11/9/13					
3-Su	11/10/13					
3-M	11/11/13				99	99
3-T	11/12/13				99	96
3-W	11/13/13				99	98
3-Th	11/14/13					
3-F	11/15/13					
3-Sa	11/16/13					
4-Su	11/17/13					
4-M	11/18/13				97	98
4-T	11/19/13				99	97
4-W	11/20/13				98	99
4-Th	11/21/13					
4-F	11/22/13					
4-Sa	11/23/13					
5-Su	11/24/13					
5-M	11/25/13				99	99
5-T	11/26/13				99	98
5-W	11/27/13					
5-Th	11/28/13					
5-F	11/29/13				98	96
5-Sa	11/30/13					
Minimum						
Average		3.99	19	4.15	98	97
		Report Only	Report Only	Report Only	>= 85	>= 85
Weekly Average						
Maximum						

Daily Maximum	2.269							17.5			
	Report Only							Report Only			
Monthly geometric mean						2					
						<= 200					
Weekly Geometric Mean						2					
						<= 400					
7-DADMax									17.4		
									Report Only		

Daily Maximum					
Monthly geometric mean					
Weekly Geometric Mean					
7-DADMax					

Permit Number: WA0020486 **Permittee:** MONROE STP
Facility County: Snohomish **Receiving Waterbody:**
Monitoring Period: 11/01/2013 - 11/30/2013 **Outfall:** IN1 **Version:** 1

Week	Monitoring Point	Total BOD5 Total Milligrams/L (mg/L) 3/Week Composite Sample (24 HR Time Proportional comp) INF	Total BOD5 Total Lbs/Day 3/Week Calculated INF	Total Suspended Solids (TSS) Total suspended (TSS) Milligrams/L (mg/L) 3/Week Composite Sample (24 HR Time Proportional comp) INF	Total Suspended Solids (TSS) Total suspended (TSS) Lbs/Day 3/Week Calculated INF
1-F	11/1/13				
1-Sa	11/2/13				
2-Su	11/3/13				
2-M	11/4/13				
2-T	11/5/13	198	2943	202	3002
2-W	11/6/13	183	2762	154	2325
2-Th	11/7/13	180	3406	134	2536
2-F	11/8/13				
2-Sa	11/9/13				
3-Su	11/10/13				
3-M	11/11/13	217	2568	208	2462
3-T	11/12/13	183	2302	160	2012
3-W	11/13/13	233	2738	200	2350
3-Th	11/14/13				
3-F	11/15/13				
3-Sa	11/16/13				
4-Su	11/17/13				
4-M	11/18/13	152	2438	138	2213
4-T	11/19/13	245	3294	178	2393
4-W	11/20/13	187	2419	158	2044
4-Th	11/21/13				
4-F	11/22/13				
4-Sa	11/23/13				
5-Su	11/24/13				
5-M	11/25/13	280	3419	180	2198
5-T	11/26/13	320	3752	250	2932
5-W	11/27/13				
5-Th	11/28/13				
5-F	11/29/13	276	3029	208	2283
5-Sa	11/30/13				
Average		221	2922	181	2396
		Report Only	DL: 6090	Report Only	DL: 5940
Maximum		320	3752	250	3002
		Report Only	Report Only	Report Only	Report Only

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 gather and evaluate 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.

Monroe WWTP	12/10/2013 12:51:12 PM
Signature	**Date**

<u>Appendix SS-E</u>

NPDES Permit

Issuance Date: April 26, 2012
Effective Date: June 1, 2012
Expiration Date: May 31, 2017

National Pollutant Discharge Elimination System
Waste Discharge Permit No. WA0020486

State of Washington
DEPARTMENT OF ECOLOGY
Northwest Regional Office
3190 160th Avenue SE
Bellevue, WA 98008-5452

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 MONROE
806 West Main Street
Monroe, WA 98272

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

Plant Location: 522 South Sams Street Monroe, WA 98272	**Receiving Water:** Skykomish River
Treatment Type: Activated Sludge	**Discharge Location:** Latitude: 47.844501 Longitude: -121.974614

Kevin C. Fitzpatrick
Water Quality Section Manager
Northwest Regional Office
Washington State Department of Ecology

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Summary of Permit Report Submittals

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

Permit Section	Submittal	Frequency	First Submittal Date
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S3.A	Annual Effluent Testing	1/year	November 30, 2012
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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 and lasting through the expiration date, the Permittee may discharge treated municipal wastewater to the Skykomish River at the permitted location subject to compliance with the following limits:

Effluent Limits: Outfall 001 Latitude 47.844501, Longitude -121.974614		
Parameter	**Average Monthly [a]**	**Average Weekly [b]**
Biochemical Oxygen Demand (5-day) (BOD_5)	30 milligrams/liter (mg/L) 711 pounds/day (lbs/day) 85% removal of influent BOD_5	45 mg/L 1066 lbs/day
Total Suspended Solids (TSS)	30 mg/L 711 lbs/day 85% removal of influent TSS	45 mg/L 1066 lbs/day
Parameter	**Daily Minimum**	**Daily Maximum**
pH	6.0 standard units	9.0 standard units
Parameter	**Monthly Geometric Mean**	**7-day Geometric Mean**
Fecal Coliform Bacteria [c]	200/100 milliliter (mL)	400/100 mL

a	Average monthly effluent limit means the highest allowable average of daily discharges over a calendar month. To calculate the discharge value to compare to the limit, 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 7-day geometric mean in publication No. 04-10-020, Information Manual for Treatment Plant Operators available at: http://www.ecy.wa.gov/pubs/0410020.pdf

S1.B. Mixing zone authorization

The paragraphs below define the maximum boundaries of the mixing zones.

Chronic mixing zone

The width of the chronic mixing zone is limited to a distance of 81 feet. The length of the chronic mixing zone extends 100 feet upstream and 301 feet downstream of the outfall. The mixing zone extends from the discharge ports 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 acute mixing zone is limited to the most restrictive of the following: 10 feet upstream and 30.1 feet downstream of the outfall, OR 2.5% of the river flow. The mixing zone extends from the discharge ports 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	8.0
Chronic Aquatic Life Criteria	16.8
Human Health Criteria - Carcinogen	16.8
Human Health Criteria - Non-carcinogen	16.8

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.			
Biochemical Oxygen Demand (BOD_5)	mg/L	3/week	24-hour composite [1]
BOD_5	lbs/day	3/week	Calculated [2]
Total Suspended Solids (TSS)	mg/L	3/week	24-hour composite
TSS	lbs/day	3/week	Calculated
(2) Final Wastewater Effluent			
Final Wastewater Effluent means wastewater exiting the last treatment process or operation.			
Flow	MGD	Continuous [3]	Metered/recorded
BOD_5	mg/L	3/week	24-hour composite
BOD_5	lbs/day	3/week	Calculated
BOD_5	% removal [4]	1/month	Calculated
TSS	mg/L	3/week	24-hour composite
TSS	lbs/day	3/week	Calculated
TSS	% removal	1/month	Calculated
Fecal Coliform [5]	#Organisms /100 ml	3/week	Grab [6]
pH [7]	Standard Units	Daily	Grab
Temperature [8]	Degrees centigrade (°C)	Daily OR Continuous	Measurement
7-DAD Max Temperature [9]	°C	Daily	Calculated
(3) Whole Effluent Toxicity Testing – Final Wastewater Effluent			
Acute Toxicity Testing	See Section S10	2/permit cycle (February and August 2016)	24-hour composite
Chronic Toxicity Testing	See Section S11	2/permit cycle (November 2015 and May 2016)	24-hour composite

Parameter	Units & Speciation	Minimum Sampling Frequency	Sample Type
(4) Effluent Characterization – Final Wastewater Effluent			
Total Ammonia	mg/L as N	Monthly (during 2013 and 2014 only)	24-hour composite
Total Phosphorus	mg/L as P	Monthly (during 2013 and 2014 only)	24-hour composite
Soluble Reactive Phosphorus	mg/L as P	Monthly (during 2013 and 2014 only)	24-hour composite
Nitrate-Nitrite Nitrogen	mg/L as N	Monthly (during 2013 and 2014 only)	24-hour composite
Total Kjeldahl Nitrogen (TKN)	mg/L as N	Monthly (during 2013 and 2014 only)	24-hour composite
(5) Permit Renewal Application Requirements – Final Wastewater Effluent [10]			
The Permittee must record and report (on the discharge monitoring report) the wastewater treatment plant flow discharged on the day it collects the sample for priority pollutant testing.			
Dissolved Oxygen	mg/L	Once per year	Grab
Oil and Grease	mg/L	Once per year	Grab
Total Dissolved Solids	mg/L	Once per year	24-hour composite
Total Hardness	mg/L	Once per year	24-hour composite
Cyanide	micrograms/liter (µg/L)	Once per year	Grab
Total Phenolic Compounds	µg/L	Once per year	Grab
Priority Pollutants (PP) – Total Metals	µg/L; nanograms(ng/L) for mercury	Once per year	24-Hour composite Grab for mercury
PP – Volatile Organic Compounds	µg/L	Once per year	Grab
PP – Acid-extractable Compounds	µg/L	Once per year	24-Hour composite
PP – Base-neutral Compounds	µg/L	Once per year	24-Hour composite

1	24-hour composite means a series of individual samples collected over a 24-hour period into a single container, and analyzed as one sample.
2	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
3	Continuous means uninterrupted except for brief lengths of time for calibration, power failure, or unanticipated equipment repair or maintenance.
4	% removal = $\frac{\text{Influent concentration (mg/L)} - \text{Effluent concentration (mg/L)}}{\text{Influent concentration (mg/L)}} \times 100$ Calculate the percent (%) removal of BOD_5 and TSS using the above equation.
5	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).
6	Grab means an individual sample collected over a fifteen (15) minute, or less, period.
7	Report the daily pH and the minimum and maximum for the monitoring period.
8	Temperature grab sampling must occur when the effluent is at or near its daily maximum temperature, which usually occurs in the late afternoon. If measuring temperature continuously, the Permittee must determine and report a daily maximum from half-hour measurements in a 24-hour period. Continuous monitoring instruments must achieve an accuracy of 0.2 degrees C and the Permittee must verify accuracy annually.
9	Calculate a 7-DAD Max for each day by averaging each day's maximum temperature value with the values from the six (6) preceding days.

Parameter		Units & Speciation	Minimum Sampling Frequency	Sample Type
10	See Appendix A for the required detection (DL) or quantitation (QL) levels. Report single analytical values below detection as "less than (detection level)" where (detection level) is the numeric value specified in attachment A. Report single analytical values between the agency-required detection and quantitation levels with qualifier code of j following the value. To calculate the average value: • Use the reported numeric value for all parameters measured between the agency-required detection value and the agency-required quantitation value. • For values reported below detection, use one-half the detection value if the lab detected the parameter in another sample for the reporting period. • For values reported below detection, use zero if the lab did not detect the parameter in another sample for the reporting period. 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.			

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.

S2.C. Flow measurement, field measurement, and continuous monitoring devices

The Permittee must:

1. Select and use appropriate flow measurement, field 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. Calibrate micro-recording temperature devices, known as thermistors, using protocols from Ecology's Quality Assurance Project Plan Development Tool (Continuous Temperature Sampling Protocols for the Environmental

Monitoring and Trends). This document is available online at: http://www.ecy.wa.gov/programs/eap/qa/docs/QAPPtool/Mod6%20Ecology%20SOPs/Protocols/ContinuousTemperatureSampling.pdf
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 these devices at the frequency recommended by the manufacturer.
6. Calibrate flow monitoring devices at a minimum frequency of at least one calibration per year.
7. Maintain calibration records for at least three years.

S2.D. Laboratory accreditation

The Permittee must ensure that all monitoring data required by Ecology 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.

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 a Discharge Monitoring Report (DMR) form provided, or otherwise approved, by Ecology. Include a summary listing daily results for the parameters tabulated in Special Condition S2, including MDLs and QLs (when applicable). If submitting DMRs electronically, report a value for each day sampling occurred and for the summary values (when applicable) included on the form.
2. Submit the form as required with the words "no discharge" entered in place of the monitoring results, if the facility did not discharge during a given monitoring period. If submitting DMRs electronically, you must enter “no discharge” for an entire DMR, for a specific monitoring point, or for a specific parameter as appropriate.

3. Report the test method, the DL, and the QL on the discharge monitoring report or in the required report, if the Permittee used an alternative method not specified in the permit and as allowed in Appendix A.

4. Include the following information (for priority pollutant organic and metal parameters lab reports): sampling date, sample location, date of analysis, parameter name, CAS number, analytical method/number, method detection limit (MDL), laboratory practical quantitation limit (PQL), reporting units, and concentration detected. The Permittee must submit a copy of the contract laboratory report to provide this information. Analytical results from samples sent to a contract laboratory must also include information on the chain of custody, QA/QC results, and documentation of accreditation for the parameter. If the Permittee submits electronic DMRs, then it must attach an electronic file of the lab report to the electronic DMR.

5. Ensure that DMR forms are postmarked or received by Ecology no later than the dates specified below, unless otherwise specified in this permit. If submitting DMRS electronically, submit the DMR no later than the dates specified below, unless otherwise specified in this permit.

6. Submit DMRs for parameters with the monitoring frequencies specified in S2 (monthly, once per year, etc.) at the reporting schedule identified below. The Permittee must:

   a. Submit **monthly** DMRs by the 15th day of the following month.

   b. Submit **annual DMRs** by November 30th for the calendar year. The annual sampling period is the low flow period, July-September.

7. Submit reports to Ecology online using Ecology's electronic DMR submittal forms or send reports to Ecology at:

   Water Quality Permit Coordinator
   Department of Ecology
   Northwest Regional Office
   3190 160th Avenue SE
   Bellevue, WA 98008-5452

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 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.

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 Local Health Jurisdiction (at the numbers listed below), all:

- Failures of the disinfection system.
- Collection system overflows.
- Plant bypasses resulting in a discharge.
- Any other failures of the sewage system (pipe breaks, etc).

Northwest Regional Office	425-649-7000
Snohomish Health District	425-339-5200

b. Twenty-four-hour reporting

The Permittee must report the following occurrences of noncompliance by telephone, to Ecology at the telephone numbers listed above, within 24 hours from the time the Permittee becomes aware of any of the following circumstances:

1. Any noncompliance that may endanger health or the environment, unless previously reported under immediate reporting requirements.
2. Any unanticipated bypass that causes an exceedance of an effluent limit in the permit (See Part S5.F, “Bypass Procedures”).

3. Any upset that causes an exceedance of an effluent limit in the permit (See G.15, “Upset”).
4. Any violation of a maximum daily or instantaneous maximum discharge limit for any of the pollutants in Section S1.A of this permit.
5. Any overflow prior to the treatment works, whether or not such overflow endangers health or the environment or exceeds any effluent limit in the permit.

c. Report within five days

The Permittee must also provide a written submission within five days of the time that the Permittee becomes aware of any reportable event under subparts a or b, above. The written submission 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

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.

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)	2.84 MGD
BOD_5 Influent Loading for Maximum Month	6,090 lb/day
TSS Influent Loading for Maximum Month	5,940 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.

If the Permittee intends to apply for state or federal funding for the design or construction of a facility project, the plan may also need to meet the environmental review requirements as described in 40 CFR 35.3040 and 40 CFR 35.3045, and it may also need to demonstrate cost effectiveness as required by WAC 173-95-730. The plan must specify any contracts, ordinances, methods for financing, or other arrangements necessary to achieve this objective.

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 November 30, 2016.

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 III 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 II 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 II (EPA 430/9-74-001) at the wastewater treatment plant. Reliability Class II requires a backup power source sufficient to operate all vital components and critical lighting and ventilation during peak wastewater flow conditions. Vital components used to support the secondary processes (i.e., mechanical aerators or aeration basin air compressors) need not be operable to full levels of treatment, but must be sufficient to maintain the biota.

S5.E. Prevent connection of inflow

The Permittee must strictly enforce its sewer ordinances and not allow the connection of inflow (roof drains, foundation drains, etc.) to the sanitary sewer system.

S5.F. Bypass procedures

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 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 exceedance 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

The Permittee must:

1. Review the O&M Manual at least annually.
2. Keep the approved O&M Manual at the permitted facility.
3. Follow the instructions and procedures of this manual.

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 an industrial user survey listing all SIUs and potential significant industrial users (PSIUs) discharging to the POTW. The Permittee must submit the survey to Ecology by November 30, 2016. 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.

S8. Application for permit renewal or modification for facility changes

The Permittee must submit an application for renewal of this permit by November 30, 2016. 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 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 November 30, 2016, the Permittee must submit the inspection report to Ecology.

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 during February 2016 and August 2016.
2. Submit the results to Ecology by April 30, 2016, and October 31, 2016.
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

S10.B. Sampling and reporting requirements

1. 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.
2. The Permittee must collect 24-hour composite effluent samples or grab 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.
3. 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*.
4. 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.
5. 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.
6. The Permittee must conduct whole effluent toxicity tests on an unmodified sample of final effluent.
7. The Permittee may choose to conduct a full dilution series test during compliance testing in order to determine dose response. In this case, the series must have a minimum of five effluent concentrations and a control. The series of concentrations must include the acute critical effluent concentration (ACEC). The ACEC equals 12.5% effluent.
8. All whole effluent toxicity tests, effluent screening tests, and rapid screening tests that involve hypothesis testing must comply with the acute statistical power standard of 29% as defined in WAC 173-205-020. If the test does not meet the power standard, the Permittee must repeat the test on a fresh sample with an increased number of replicates to increase the power.

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 during November 2015 and May 2016.
2. Submit the results to Ecology by January 31, 2016, and July 31, 2016.
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 12.5% effluent. The series of dilutions should also contain the CCEC of 6.0% 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

S11.B. Sampling and reporting requirements

1. 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.
2. 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.
3. 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*.
4. 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.

5. 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.
6. The Permittee must conduct whole effluent toxicity tests on an unmodified sample of final effluent.
7. The Permittee may choose to conduct a full dilution series test during compliance testing in order to determine dose response. In this case, the series must have a minimum of five effluent concentrations and a control. The series of concentrations must include the CCEC and the ACEC. The CCEC and the ACEC may either substitute for the effluent concentrations that are closest to them in the dilution series or be extra effluent concentrations. The CCEC equals 6.0% effluent. The ACEC equals 12.5% effluent.
8. All whole effluent toxicity tests that involve hypothesis testing must comply with the chronic statistical power standard of 39% as defined in WAC 173-205-020. If the test does not meet the power standard, the Permittee must repeat the test on a fresh sample with an increased number of replicates to increase the power.

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 2.b, 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 2.b, 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.f. 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 sixty (60) 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 (B) below, this permit may be transferred by the Permittee to a new owner or operator only if this permit has been modified or revoked and reissued under 40 CFR 122.62(b)(2), or a minor modification made under 40 CFR 122.63(d), to identify the new Permittee and incorporate such other requirements as may be necessary under the Clean Water Act.

2. Automatic Transfers

   This permit may be automatically transferred to a new Permittee if:

   a. The Permittee notifies Ecology at least thirty (30) days in advance of the proposed transfer date.

   b. The notice includes a written agreement between the existing and new Permittees containing a specific date transfer of permit responsibility, coverage, and liability between them.

   c. Ecology does not notify the existing Permittee and the proposed new Permittee of its intent to modify or revoke and reissue this permit. A modification under this subparagraph may also be minor modification under 40 CFR 122.63. If this notice is not received, the transfer is effective on the date specified in the written agreement.

G8. Reduced production for compliance

The Permittee, in order to maintain compliance with its permit, must control production and/or all discharges upon reduction, loss, failure, or bypass of the treatment facility until the facility is restored or an alternative method of treatment is provided. This requirement applies in the situation where, among other things, the primary source of power of the treatment facility is reduced, lost, or fails.

G9. Removed substances

Collected screenings, grit, solids, sludges, filter backwash, or other pollutants removed in the course of treatment or control of wastewaters must not be resuspended or reintroduced to the final effluent stream for discharge to state waters.

G10. Duty to provide information

The Permittee must submit to Ecology, within a reasonable time, all information which Ecology may request to determine whether cause exists for modifying, revoking and reissuing, or terminating this permit or to determine compliance with this permit. The Permittee must also submit to Ecology upon request, copies of records required to be kept by this permit.

G11. Other requirements of 40 CFR

All other requirements of 40 CFR 122.41 and 122.42 are incorporated in this permit by reference.

G12. Additional monitoring

Ecology may establish specific monitoring requirements in addition to those contained in this permit by administrative order or permit modification.

G13. Payment of fees

The Permittee must submit payment of fees associated with this permit as assessed by Ecology.

G14. Penalties for violating permit conditions

Any person who is found guilty of willfully violating the terms and conditions of this permit is deemed guilty of a crime, and upon conviction thereof must be punished by a fine of up to ten thousand dollars ($10,000) and costs of prosecution, or by imprisonment in the discretion of the court. Each day upon which a willful violation occurs may be deemed a separate and additional violation.

Any person who violates the terms and conditions of a waste discharge permit may incur, in addition to any other penalty as provided by law, a civil penalty in the amount of up to ten thousand dollars ($10,000) for every such violation. Each and every such violation is a separate and distinct offense, and in case of a continuing violation, every day's continuance is deemed to be a separate and distinct violation.

G15. Upset

Definition – "Upset" means an exceptional incident in which there is unintentional and temporary noncompliance with technology-based permit effluent limits because of factors beyond the reasonable control of the Permittee. An upset does not include noncompliance to the extent caused by operational error, improperly designed treatment facilities, inadequate treatment facilities, lack of preventive maintenance, or careless or improper operation.

An upset constitutes an affirmative defense to an action brought for noncompliance with such technology-based permit effluent limits if the requirements of the following paragraph are met.

A Permittee who wishes to establish the affirmative defense of upset must demonstrate, through properly signed, contemporaneous operating logs, or other relevant evidence that:

1. An upset occurred and that the Permittee can identify the cause(s) of the upset.
2. The permitted facility was being properly operated at the time of the upset.
3. The Permittee submitted notice of the upset as required in Condition S3.E.
4. The Permittee complied with any remedial measures required under S4.C of this permit.

In any enforcement action the Permittee seeking to establish the occurrence of an upset has the burden of proof.

G16. Property rights

This permit does not convey any property rights of any sort, or any exclusive privilege.

G17. Duty to comply

The Permittee must comply with all conditions of this permit. Any permit noncompliance constitutes a violation of the Clean Water Act and is grounds for enforcement action; for permit termination, revocation and reissuance, or modification; or denial of a permit renewal application.

G18. Toxic pollutants

The Permittee must comply with effluent standards or prohibitions established under Section 307(a) of the Clean Water Act for toxic pollutants within the time provided in the regulations that establish those standards or prohibitions, even if this permit has not yet been modified to incorporate the requirement.

G19. Penalties for tampering

The Clean Water Act provides that any person who falsifies, tampers with, or knowingly renders inaccurate any monitoring device or method required to be maintained under this permit must, upon conviction, be punished by a fine of not more than $10,000 per violation, or by imprisonment for not more than two (2) years per violation, or by both. If a conviction of a person is for a violation committed after a first conviction of such person under this condition, punishment must be a fine of not more than $20,000 per day of violation, or by imprisonment of not more than four (4) years, or by both.

G20. Compliance schedules

Reports of compliance or noncompliance with, or any progress reports on, interim and final requirements contained in any compliance schedule of this permit must be submitted no later than fourteen (14) days following each schedule date.

G21. Contract review

The Permittee must submit to Ecology any proposed contract 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. In the event that Ecology does not comment within a thirty (30)-day period, the Permittee may assume consistency and proceed with the contract.

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.

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
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- GH		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 9221D/E,9222	N/A	N/A
Fluoride (16984-48-8)	SM4500-F E	25	100
Nitrate-Nitrite (as N)	SM4500-NO3-E/F/H		100
Nitrogen, Total Kjeldahl (as N)	SM4500-NH3-C/E/FG		300
Ortho-Phosphate (PO_4 as P)	SM4500- PE/PF	3	10
Phosphorus, Total (as P)	SM4500-PE/PF	3	10
Oil and Grease (HEM)	1664A	1,400	5,000
Salinity	SM2520-B		3 PSS
Settleable Solids	SM2540 -F		100
Sulfate (as mg/L SO_4)	SM4110-B		200
Sulfide (as mg/L S)	SM4500-S^2F/D/E/G		200
Sulfite (as mg/L SO_3)	SM4500-SO3B		2000
Total Coliform	SM 9221B, 9222B, 9223B	N/A	N/A
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	Ecology NWTPH Dx	250	250
NWTPH Gx	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) [3]	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) [4]	610/625	0.8	1.6
Benzo(j)fluoranthene (205-82-3) [4]	625	0.5	1.0
Benzo(k)fluoranthene (11,12-benzofluoranthene) (207-08-9) [4]	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,j)acridine (224-42-0)	610M/625M	2.5	10.0
Dibenzo (a,h)acridine (226-36-8)	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)	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) [5]	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[10]
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) [6]	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) [6]	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. 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).

4. Total Benzofluoranthenes - Because Benzo(b)fluoranthene, Benzo(j)fluoranthene and Benzo(k)fluoranthene co-elute you may report these three isomers as total benzofluoranthenes.

5. 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.

6. PCB 1016 & PCB 1242 – You may report these two PCB compounds as one parameter called PCB 1016/1242.

Appendix SS-F

Opinions of Probable Project Costs

City of Monroe
Sewer Comp Plan Update
CIP SS-1
Gravity Main Replacement from DOC effluent to Park Place PS
Preliminary Engineer's Projection of Probable Construction Cost

February 2015

Bid Item No.	Bid Item Description	Unit Bid Price	Quantity	Unit	Total
1	Mobilization	$21,000	1	ls	$21,000
2	Temporary Erosion & Sediment Control	$4,200	1	ls	$4,200
3	Dewatering	$4,200	1	ls	$4,200
4	18-inch PVC Sewer Pipe, C900	$176	1,112	lf	$195,712
5	48-inch Manhole	$5,000		ea	
6	Side Sewer Connections	$500	28	ea	$13,900
7	HMA Trench Patch	$200		tn	
8	Traffic Control	$4,200	1	ls	$4,200
9	General Restoration	$4,200	1	ls	$4,200
	Subtotal				$247,412
	Sales Tax	8.9%			$22,020
	ESTIMATED CONSTRUCTION COST				$269,432
	Construction Contingency	35%			$94,301
	TOTAL ESTIMATED CONSTRUCTION COST				$363,700

Planning	10%	$36,000
Design and Permitting	20%	$73,000
Construction and Construction Management	15%	$55,000
TOTAL ESTIMATED PROJECT COST		$528,000

City of Monroe
Sewer Comp Plan Update
CIP SS-2 and SS-3
Effluent Pump Station Upgrades
Engineer's Opinion of Probable Project Costs

February 2015

Bid Item No.	Bid Item Description	Unit Bid Price	Quantity	Unit	Total
1	Mobilization (5%)	$10,000	1	LS	$10,000
2	Treated Effluent Bypassing	$20,000	1	LS	$20,000
3	Wet well prep and coating system	$20	500	LS	$10,000
4	New Pumps, including Standard Accessories - 6" Discharge Elbow, 2" Stainless Steel Guide Rails and Mounting Brackets, Stainless Steel Lifting Chain/Cable, Grip-Eye Lifting Device, MiniCAS Thermal/Leakage Sensor Relay	$13,282	2	EA	$26,564
5	8" D.I. Class 53 pipe	$48	50	LF	$2,400
6	8" Fittings and Valves	$19,800	1	LS	$19,800
7	12" Fittings, Valves, & Spools	$16,700	1	LS	$16,700
8	Demo standpipe and valve vault top slab	$3,000	1	LS	$3,000
9	H-30 Hatch (60"x84") and top slab	$15,000	1	LS	$15,000
10	Electrical, Instrumentation, and Controls	$31,800	1	LS	$31,800
11	Installation	$31,000	1	LS	$38,816
	Sub-Total				$194,080
	Construction Contingency	30%			$58,200
	Sub-Total				$252,280
	Sales Tax	8.90%			$22,453
	TOTAL ESTIMATED CONSTRUCTION COST				$275,000
	Engineering Design & Services During Construction	40%			$110,000
	General Conditions and Contractor O&P	15%			$41,300
	TOTAL ESTIMATED PROJECT COST				$427,000

City of Monroe
Sewer Comp Plan Update
CIP SS-101
Park Place Pump Station Upgrade
Preliminary Engineer's Projection of Probable Construction Cost

February 2015

Bid Item No.	Bid Item Description	Unit Bid Price	Quantity	Unit	Total
1	Mobilization	$37,700	1	ls	$37,700
2	Temporary Erosion & Sediment Control	$7,500	1	ls	$7,500
3	SST Pump Rails	$5,900	1	LS	$5,900
4	Disch Piping in Wet Well, incl. support/thrust restraint	$17,700	1	LS	$17,700
5	Duplex or Triplex Submersible Pumps	$142,000	1	LS	$142,000
6	Influent Sewer	$500	20	LF	$10,000
7	Electrical Equipment Foundation (6-in gravel & 6-in reinf. conc. pad)	$2,000	1	LS	$2,000
8	Masonry Bldg for Eng-Gen, Elect and Controls (25'x25')	$360		SF	
9	Primary Power Supply	$20,000	1	LS	$20,000
10	UG Power & Controls to Wet Well & Vaults	$7,500	1	LS	$7,500
11	Level Controls in Wet Well	$1,500	1	LS	$1,500
12	Pump Inst. & Controls	$53,100	1	LS	$53,100
13	MCC	$29,500	1	LS	$29,500
14	Eng-Generator Foundation	$7,500	1	LS	$7,500
15	Weather/Acoustical Enclosure w/Eng-Gen, fuel tank, critical silencer, ATS)	$40,000	1	LS	$40,000
16	Telemetry	$17,700	1	LS	$17,700
17	Misc. Yard Piping (water, vault drains, site SD)	$17,700	1	LS	$17,700
18	Minor Landscaping	$5,000	1	LS	$5,000
19	Site Fencing (50' x 50' site)	$35		LF	
20	Traffic Control	$7,500	1	ls	$7,500
21	General Restoration	$7,500	1	ls	$7,500
	Subtotal				$437,300
	Sales Tax	8.9%			$38,920
	ESTIMATED CONSTRUCTION COST				$476,220
	Construction Contingency	35%			$166,677
	TOTAL ESTIMATED CONSTRUCTION COST				$643,000

Preliminary Design	10%	$64,000
Final Design and Permitting	25%	$161,000
Construction and Construction Management	15%	$96,000
TOTAL ESTIMATED PROJECT COST		$964,000

City of Monroe
Sewer Comp Plan Update
CIP SS-102
Fryelands PS Force Main Replacement
Preliminary Engineer's Projection of Probable Construction Cost

February 2015

Bid Item No.	Bid Item Description	Unit Bid Price	Quantity	Unit	Total
1	Mobilization	$55,000	1	ls	$55,000
2	Temporary Erosion & Sediment Control	$11,000	1	ls	$11,000
3	Dewatering	$11,000	1	ls	$11,000
4	8-inch PVC C900 Force Main	$107	4,667	lf	$499,369
5	Air Release/Vacuum Valve Vault	$26,000	1	ea	$26,000
6	Blowoff	$3,200	1	ea	$3,200
7	48-inch Manhole	$5,000		ea	
8	HMA Trench Patch	$200	106	tn	$21,261
9	Traffic Control	$11,000	1	ls	$11,000
10	General Restoration	$11,000	1	ls	$11,000
	Subtotal				$648,830
	Sales Tax	8.9%			$57,746
	ESTIMATED CONSTRUCTION COST				$706,576
	Construction Contingency	35%			$247,301
	TOTAL ESTIMATED CONSTRUCTION COST				$954,000

Preliminary Design	10%	$95,000
Final Design and Permitting	15%	$143,000
Construction and Construction Management	20%	$191,000
TOTAL ESTIMATED PROJECT COST		$1,383,000

City of Monroe
Sewer Comp Plan Update
CIP SS-102
Fryelands Pump Station Upgrade
Preliminary Engineer's Projection of Probable Construction Cost

February 2015

Bid Item No.	Bid Item Description	Unit Bid Price	Quantity	Unit	Total
1	Mobilization	$54,100	1	ls	$54,100
2	Temporary Erosion & Sediment Control	$10,800	1	ls	$10,800
3	SST Pump Rails	$4,800	1	LS	$4,800
4	Disch Piping in Wet Well, incl. support/thrust restraint	$11,800	1	LS	$11,800
5	Duplex or Triplex Submersible Pumps	$100,000	1	LS	$100,000
6	Influent Sewer	$500	20	LF	$10,000
7	Electrical Equipment Foundation (6-in gravel & 6-in reinf. conc. pad)	$2,000	1	LS	$2,000
8	Masonry Bldg for Eng-Gen, Elect and Controls (25'x25')	$360	625	SF	$225,000
9	Primary Power Supply	$10,000	1	LS	$10,000
10	UG Power & Controls to Wet Well & Vaults	$7,500	1	LS	$7,500
11	Level Controls in Wet Well	$1,500	1	LS	$1,500
12	Pump Inst. & Controls	$53,100	1	LS	$53,100
13	MCC	$29,500	1	LS	$29,500
14	Eng-Generator Foundation	$5,000	1	LS	$5,000
15	Weather/Acoustical Enclosure w/Eng-Gen, fuel tank, critical silencer, ATS)	$40,000	1	LS	$40,000
16	Telemetry	$17,700	1	LS	$17,700
17	Misc. Yard Piping (water, vault drains, site SD)	$17,700	1	LS	$17,700
18	Minor Landscaping	$5,000	1	LS	$5,000
19	Site Fencing (50' x 50' site)	$35		LF	
20	Traffic Control	$10,800	1	ls	$10,800
21	General Restoration	$10,800	1	ls	$10,800
	Subtotal				$627,100
	Sales Tax	8.9%			$55,812
	ESTIMATED CONSTRUCTION COST				$682,912
	Construction Contingency	35%			$239,019
	TOTAL ESTIMATED CONSTRUCTION COST				$922,000

Preliminary Design	10%	$92,000
Final Design and Permitting	40%	$369,000
Construction and Construction Management	15%	$138,000
TOTAL ESTIMATED PROJECT COST		$1,521,000

City of Monroe
Sewer Comp Plan Update
CIP SS-103, SS-104, and SS-105
Effluent Pump Station Upgrades
Engineer's Opinion of Probable Project Costs

February 2015

Bid Item No.	Bid Item Description	Unit Bid Price	Quantity	Unit	Total
1	Mobilization (5%)	$10,000	1	LS	$10,000
2	Treated Effluent Bypassing	$20,000	1	LS	$20,000
3	Wet well prep and coating system	$20	500	LS	$10,000
4	New Pumps, including Standard Accessories - 6" Discharge Elbow, 2" Stainless Steel Guide Rails and Mounting Brackets, Stainless Steel Lifting Chain/Cable, Grip-Eye Lifting Device, MiniCAS Thermal/Leakage Sensor Relay	$13,282	2	EA	$26,564
5	8" D.I. Class 53 pipe	$48	50	LF	$2,400
6	8" Fittings and Valves	$19,800	1	LS	$19,800
7	12" Fittings, Valves, & Spools	$16,700	1	LS	$16,700
8	Demo standpipe and valve vault top slab	$3,000	1	LS	$3,000
9	H-30 Hatch (60"x84") and top slab	$15,000	1	LS	$15,000
10	Electrical, Instrumentation, and Controls	$31,800	1	LS	$31,800
11	Installation	$31,000	1	LS	$38,816
	Sub-Total				$194,080
	Construction Contingency	30%			$58,200
	Sub-Total				$252,280
	Sales Tax	8.90%			$22,453
	TOTAL ESTIMATED CONSTRUCTION COST				$275,000
	Engineering Design & Services During Construction	40%			$110,000
	General Conditions and Contractor O&P	15%			$41,300
	TOTAL ESTIMATED PROJECT COST				$427,000

City of Monroe
Sewer Comp Plan Update
CIP SS-106
Valley View Pump Station Upgrade
Preliminary Engineer's Projection of Probable Construction Cost

February 2015

Bid Item No.	Bid Item Description	Unit Bid Price	Quantity	Unit	Total
1	Mobilization	$53,000	1	ls	$53,000
2	Temporary Erosion & Sediment Control	$10,600	1	ls	$10,600
3	SST Pump Rails	$6,000	1	LS	$6,000
4	Disch Piping in Wet Well, incl. support/thrust restraint	$17,500	1	LS	$17,500
5	Duplex or Triplex Submersible Pumps	$150,000	1	LS	$150,000
6	Influent Sewer	$500	35	LF	$17,500
7	Electrical Equipment Foundation (6-in gravel & 6-in reinf. conc. pad)	$2,000	1	LS	$2,000
8	Masonry Bldg for Eng-Gen, Elect and Controls (25'x25')	$360		SF	
9	Primary Power Supply	$24,000	1	LS	$24,000
10	UG Power & Controls to Wet Well & Vaults	$15,000	1	LS	$15,000
11	Level Controls in Wet Well	$2,500	1	LS	$2,500
12	Pump Inst. & Controls	$77,000	1	LS	$77,000
13	MCC	$30,000	1	LS	$30,000
14	Eng-Generator Foundation	$7,500	1	LS	$7,500
15	Weather/Acoustical Enclosure w/Eng-Gen, fuel tank, critical silencer, ATS)	$100,000	1	LS	$100,000
16	Telemetry	$41,300	1	LS	$41,300
17	Misc. Yard Piping (water, vault drains, site SD)	$29,500	1	LS	$29,500
18	Minor Landscaping	$10,000	1	LS	$10,000
19	Site Fencing (50' x 50' site)	$35		LF	
20	Traffic Control	$10,600	1	ls	$10,600
21	General Restoration	$10,600	1	ls	$10,600
	Subtotal				$614,600
	Sales Tax	8.9%			$54,699
	ESTIMATED CONSTRUCTION COST				$669,299
	Construction Contingency	35%			$234,255
	TOTAL ESTIMATED CONSTRUCTION COST				$904,000

Preliminary Design	10%	$90,000
Final Design and Permitting	40%	$362,000
Construction and Construction Management	15%	$136,000

TOTAL ESTIMATED PROJECT COST $1,492,000

City of Monroe
Sewer Comp Plan Update
CIP SS-107
South Fryelands Pump Station Upgrade
Preliminary Engineer's Projection of Probable Construction Cost

February 2015

Bid Item No.	Bid Item Description	Unit Bid Price	Quantity	Unit	Total
1	Mobilization	$30,600	1	ls	$30,600
2	Temporary Erosion & Sediment Control	$6,100	1	ls	$6,100
3	SST Pump Rails	$4,800	1	LS	$4,800
4	Disch Piping in Wet Well, incl. support/thrust restraint	$11,800	1	LS	$11,800
5	Duplex or Triplex Submersible Pumps	$90,000	1	LS	$90,000
6	Influent Sewer	$500	20	LF	$10,000
7	Electrical Equipment Foundation (6-in gravel & 6-in reinf. conc. pad)	$2,000	1	LS	$2,000
8	Masonry Bldg for Eng-Gen, Elect and Controls (25'x25')	$360		SF	
9	Primary Power Supply	$10,000	1	LS	$10,000
10	UG Power & Controls to Wet Well & Vaults	$7,500	1	LS	$7,500
11	Level Controls in Wet Well	$1,500	1	LS	$1,500
12	Pump Inst. & Controls	$53,100	1	LS	$53,100
13	MCC	$29,500	1	LS	$29,500
14	Eng-Generator Foundation	$5,000	1	LS	$5,000
15	Weather/Acoustical Enclosure w/Eng-Gen, fuel tank, critical silencer, ATS)	$40,000	1	LS	$40,000
16	Telemetry	$17,700	1	LS	$17,700
17	Misc. Yard Piping (water, vault drains, site SD)	$17,700	1	LS	$17,700
18	Minor Landscaping	$5,000	1	LS	$5,000
19	Site Fencing (50' x 50' site)	$35		LF	
20	Traffic Control	$6,100	1	ls	$6,100
21	General Restoration	$6,100	1	ls	$6,100
	Subtotal				$354,500
	Sales Tax	8.9%			$31,551
	ESTIMATED CONSTRUCTION COST				$386,051
	Construction Contingency	35%			$135,118
	TOTAL ESTIMATED CONSTRUCTION COST				$521,000

Preliminary Design	10%	$52,000
Final Design and Permitting	40%	$208,000
Construction and Construction Management	15%	$78,000
TOTAL ESTIMATED PROJECT COST		$859,000

City of Monroe
CIP SS-7
Primary Clarifiers Mechanism Replacement
Engineer's Estimate
Prepared by: Kenneth Gray
Reviewed by:
Decemeber 1, 2014
S:\Projects\Monroe\2015 Utility Plans\WWTP\[Monroe WWTP - Cost Estimates_rev.xlsx]Dewatering

Estimate of Dryer Installation Probable Project Costs					
Item No.	Item Description	Unit Bid Price	Quantity	Unit	Total
1	Contractor Mobilization and General Conditions (21%)	$95,000	1	LS	$95,000
2	Primary Clarifier Mechanisms	$100,000	2	EA	$200,000
3	Electrical & Controls (15%)	$68,000	1	LS	$68,000
4	Installation (20%)	$91,000	1	LS	$91,000
			Sub-Total		$454,000
			Contingency	35%	$158,900
	TOTAL ESTIMATED CONSTRUCTION COST				**$613,000**
		Administration	2%		$12,000
		Engineering Design and Construction Services	30%		$184,000
		Inspection	5%		$31,000
				Sub-Total	$840,000
		Sales Tax	9.10%		$76,400
	TOTAL ESTIMATED PROJECT COST				**$917,000**
Notes					

The projection of probable cost herein is based on our perception of current conditions at the project location. This estimate reflects our professional opinion of project costs at this time and is subject to change as the project design matures. BHC Consultants has no control over variances in the cost of labor, materials, equipment; nor services provided by others, contractor's means and methods of executing the work or of determining prices, competitive bidding or market conditions, practices or bidding strategies. BHC Consultants cannot and does not warrant or guarantee that proposals, bids, or actual construction costs will not vary from the costs presented as shown.

City of Monroe
CIP SS-9
Mechanical Sludge Thickener
Engineer's Estimate
Prepared by: Kenneth Gray
Reviewed by:
Decemeber 1, 2014
S:\Projects\Monroe\2015 Utility Plans\WWTP\[Monroe WWTP - Cost Estimates_rev.xlsx]Dewatering

Estimate of Mechanical Sludge Thickener Probable Project Costs

Item No.	Item Description	Unit Bid Price	Quantity	Unit	Total
1	Contractor Mobilization and General Conditions (21%)	$141,000	1	LS	$141,000
2	Thickener, floc tank, control panel	$150,000	1	LS	$150,000
3	Pro Cav pump	$20,000	1	LS	$20,000
4	WAS Storage Tank	$30,000	1	LS	$30,000
5	Polymer sytem	$40,000	1	LS	$40,000
6	Discharge Hopper	$10,000	1	LS	$10,000
7	Piping	$45,000	1	LS	$45,000
8	Electrical & Controls (15%)	$101,000	1	LS	$101,000
9	Installation (20%)	$134,000	1	LS	$134,000
			Sub-Total		$671,000
			Contingency	35%	$234,900
	TOTAL ESTIMATED CONSTRUCTION COST				**$906,000**
		Administration	2%		$18,000
		Engineering Design and Construction Services	30%		$272,000
		Inspection	5%		$45,000
				Sub-Total	$1,241,000
		Sales Tax	9.10%		$112,900
	TOTAL ESTIMATED PROJECT COST				**$1,354,000**

Notes

The projection of probable cost herein is based on our perception of current conditions at the project location. This estimate reflects our professional opinion of project costs at this time and is subject to change as the project design matures. BHC Consultants has no control over variances in the cost of labor, materials, equipment; nor services provided by others, contractor's means and methods of executing the work or of determining prices, competitive bidding or market conditions, practices or bidding strategies. BHC Consultants cannot and does not warrant or guarantee that proposals, bids, or actual construction costs will not vary from the costs presented as shown.

City of Monroe
CIP SS-10
BFP Hood
Engineer's Estimate
Prepared by: Kenneth Gray
Reviewed by:
March 11, 2015

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Estimate of BFP Hood Probable Project Costs

Item No.	Item Description	Unit Bid Price	Quantity	Unit	Total
1	Contractor Mobilization and General Conditions (21%)	$19,000	1	LS	$19,000
2	304 SSTL Hood	$20,000	1	LS	$20,000
3	Support	$5,000	1	LS	$5,000
4	Fan	$4,000	1	LS	$4,000
5	Aluminum duct modications	$2,600	1	EST	$2,600
6	Electrical & Controls (25%)	$23,000	1	LS	$23,000
7	Installation (20%)	$18,000	1	LS	$18,000
			Sub-Total		$91,600
			Contingency	35%	$32,100
	TOTAL ESTIMATED CONSTRUCTION COST				**$124,000**
		Administration	2%		$2,000
		Engineering Design and Construction Services	25%		$31,000
		Inspection	5%		$6,000
				Sub-Total	$163,000
		Sales Tax	8.90%		$14,500
	TOTAL ESTIMATED PROJECT COST				**$178,000**

Notes

The projection of probable cost herein is based on our perception of current conditions at the project location. This estimate reflects our professional opinion of project costs at this time and is subject to change as the project design matures. BHC Consultants has no control over variances in the cost of labor, materials, equipment; nor services provided by others, contractor's means and methods of executing the work or of determining prices, competitive bidding or market conditions, practices or bidding strategies. BHC Consultants cannot and does not warrant or guarantee that proposals, bids, or actual construction costs will not vary from the costs presented as shown.

City of Monroe
CIP SS-11
Main Building Roof Replacement
Engineer's Estimate
Prepared by: Kenneth Gray
Reviewed by:
March 11, 2015
S:\Projects\Monroe\2015 Utility Plans\WWTP\[Monroe WWTP - Cost Estimates_rev.xlsx]New Roof

Estimate of Main Building Roof Replacement Probable Project Costs

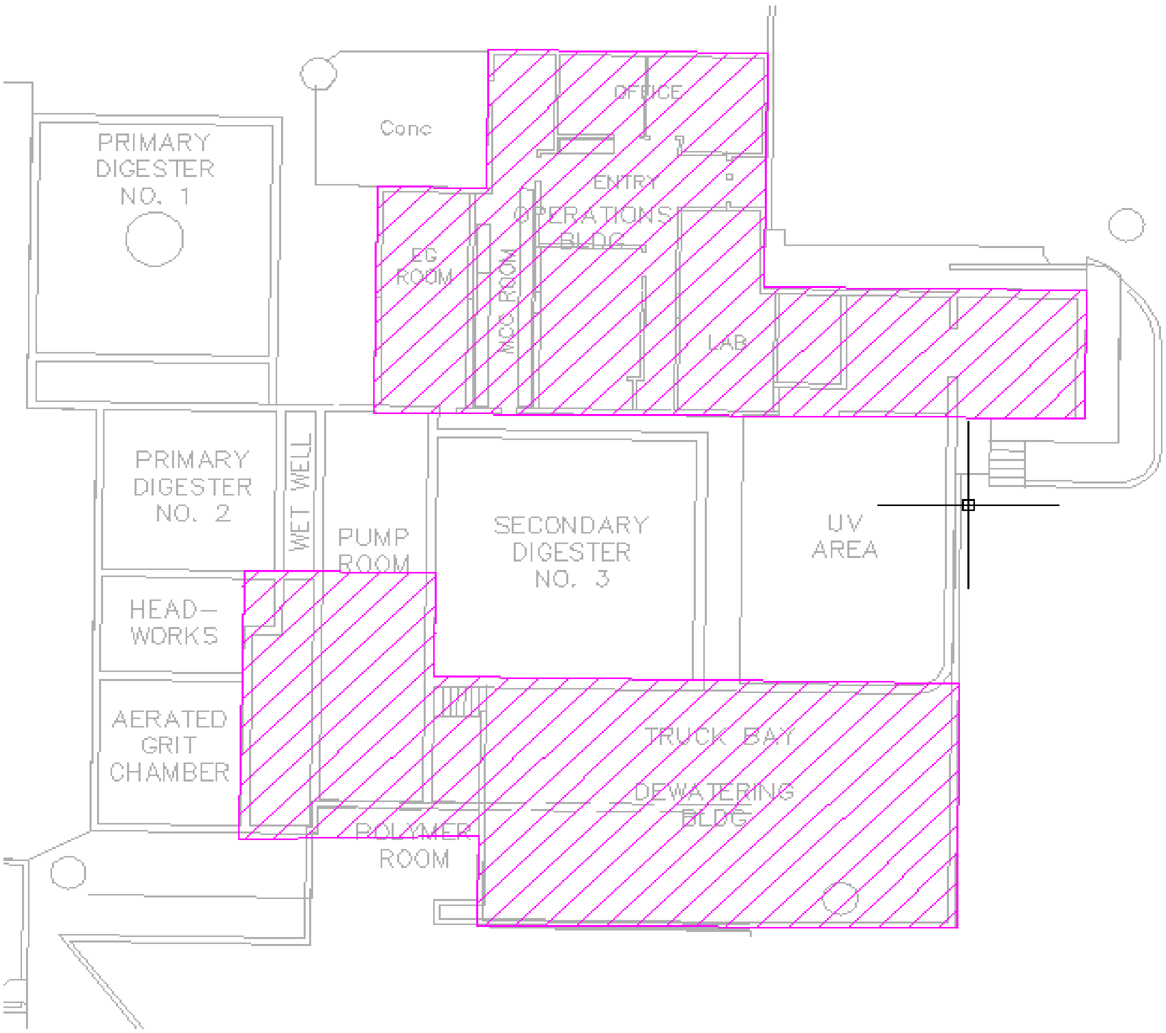
Item No.	Item Description	Unit Bid Price	Quantity	Unit	Total
1	Contractor Mobilization and General Conditions (21%)	$20,000	1	LS	$20,000
2	Demolition and disposal	$1.72	5,100	SF	$8,772
3	Roofing	$8	5,100	SF	$40,800
4	Trim	$10	590	LF	$5,900
5	Gutters	$7.5	183	LF	$1,373
6	Installation (20%)	$19,000	1	LS	$19,000
			Sub-Total		$95,845
			Contingency	35%	$33,500
	TOTAL ESTIMATED CONSTRUCTION COST				**$129,000**
		Administration	2%		$3,000
		Engineering Design and Construction Services	25%		$32,000
		Inspection	5%		$6,000
				Sub-Total	$170,000
		Sales Tax	8.90%		$15,100
	TOTAL ESTIMATED PROJECT COST				**$186,000**

Notes

The projection of probable cost herein is based on our perception of current conditions at the project location. This estimate reflects our professional opinion of project costs at this time and is subject to change as the project design matures. BHC Consultants has no control over variances in the cost of labor, materials, equipment; nor services provided by others, contractor's means and methods of executing the work or of determining prices, competitive bidding or market conditions, practices or bidding strategies. BHC Consultants cannot and does not warrant or guarantee that proposals, bids, or actual construction costs will not vary from the costs presented as shown.

Square Footage

BLDG	SF	
Operations Building	2442	Calculated in CAD
Solids and Dewatering Building	2576	Calculated in CAD
TOTAL	**5018**	



City of Monroe
CIP SS-13
Chemically Enhanced Primary Treatment
Engineer's Estimate
Prepared by: Kenneth Gray
Reviewed by:
Decemeber 1, 2014
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Estimate of Dryer Installation Probable Project Costs

Item No.	Item Description	Unit Bid Price	Quantity	Unit	Total
1	Contractor Mobilization and General Conditions (21%)	$29,000	1	LS	$29,000
2	Coagulant Dosing Pumps	$10,000	2	EA	$20,000
3	Polymer Dosing System	$30,000	1	EA	$30,000
4	Static Mixers	$5,000	2	EA	$10,000
5	Electrical & Controls (15%)	$21,000	1	LS	$21,000
6	Installation (20%)	$28,000	1	LS	$28,000
			Sub-Total		$138,000
			Contingency	35%	$48,300
	TOTAL ESTIMATED CONSTRUCTION COST				**$186,000**
		Administration	2%		$4,000
		Engineering Design and Construction Services	30%		$56,000
		Inspection	5%		$9,000
				Sub-Total	$255,000
		Sales Tax	9.10%		$23,200
	TOTAL ESTIMATED PROJECT COST				**$279,000**

Notes

The projection of probable cost herein is based on our perception of current conditions at the project location. This estimate reflects our professional opinion of project costs at this time and is subject to change as the project design matures. BHC Consultants has no control over variances in the cost of labor, materials, equipment; nor services provided by others, contractor's means and methods of executing the work or of determining prices, competitive bidding or market conditions, practices or bidding strategies. BHC Consultants cannot and does not warrant or guarantee that proposals, bids, or actual construction costs will not vary from the costs presented as shown.

City of Monroe
CIP SS-14
Digester Blower Replacement
Engineer's Estimate
Prepared by: Kenneth Gray
Reviewed by:
Decemeber 1, 2014
S:\Projects\Monroe\2015 Utility Plans\WWTP\[Monroe WWTP - Cost Estimates_rev.xlsx]Dewatering

Estimate of Dryer Installation Probable Project Costs

Item No.	Item Description	Unit Bid Price	Quantity	Unit	Total
1	Contractor Mobilization and General Conditions (21%)	$114,000	1	LS	$114,000
2	Primary Clarifier Mechanisms	$80,000	3	EA	$240,000
3	Electrical & Controls (15%)	$82,000	1	LS	$82,000
4	Installation (20%)	$109,000	1	LS	$109,000
			D		$545,000
			Contingency	35%	$190,800
	TOTAL ESTIMATED CONSTRUCTION COST				**$736,000**
	Administration		2%		$15,000
	Engineering Design and Construction Services		30%		$221,000
	Inspection		5%		$37,000
				Sub-Total	$1,009,000
	Sales Tax		9.10%		$91,800
	TOTAL ESTIMATED PROJECT COST				**$1,101,000**

Notes

The projection of probable cost herein is based on our perception of current conditions at the project location. This estimate reflects our professional opinion of project costs at this time and is subject to change as the project design matures. BHC Consultants has no control over variances in the cost of labor, materials, equipment; nor services provided by others, contractor's means and methods of executing the work or of determining prices, competitive bidding or market conditions, practices or bidding strategies. BHC Consultants cannot and does not warrant or guarantee that proposals, bids, or actual construction costs will not vary from the costs presented as shown.

City of Monroe
CIP SS-15
42' Secondary Clarifier Mechanism Replacement
Engineer's Estimate
Prepared by: Kenneth Gray
Reviewed by:
Decemeber 1, 2014
S:\Projects\Monroe\2015 Utility Plans\WWTP\[Monroe WWTP - Cost Estimates_rev.xlsx]Dewatering

Estimate of Secondary Clarifier Mechanism Replacement Probable Project Costs					
Item No.	Item Description	Unit Bid Price	Quantity	Unit	Total
1	Contractor Mobilization and General Conditions (21%)	$60,000	1	LS	$60,000
2	42' Collector Mechanism	$125,000	1	LS	$125,000
3	Electrical & Controls (15%)	$43,000	1	LS	$43,000
4	Installation (20%)	$57,000	1	LS	$57,000
			Sub-Total		$285,000
			Contingency	35%	$99,800
	TOTAL ESTIMATED CONSTRUCTION COST				**$385,000**
		Administration	2%		$8,000
		Engineering Design and Construction Services	30%		$116,000
		Inspection	5%		$19,000
				Sub-Total	$528,000
		Sales Tax	9.10%		$48,000
	TOTAL ESTIMATED PROJECT COST				**$576,000**
Notes					

The projection of probable cost herein is based on our perception of current conditions at the project location. This estimate reflects our professional opinion of project costs at this time and is subject to change as the project design matures. BHC Consultants has no control over variances in the cost of labor, materials, equipment; nor services provided by others, contractor's means and methods of executing the work or of determining prices, competitive bidding or market conditions, practices or bidding strategies. BHC Consultants cannot and does not warrant or guarantee that proposals, bids, or actual construction costs will not vary from the costs presented as shown.

City of Monroe
CIP SS-108
Dewatering Unit
Engineer's Estimate
Prepared by: Kenneth Gray
Reviewed by:
Decemeber 1, 2014
S:\Projects\Monroe\2015 Utility Plans\WWTP\[Monroe WWTP - Cost Estimates_rev.xlsx]Dewatering

Estimate of Dewatering Unit Probable Project Costs

Item No.	Item Description	Unit Bid Price	Quantity	Unit	Total
1	Contractor Mobilization and General Conditions (21%)	$164,000	1	LS	$164,000
2	Dewatering unit, floc tank, control panel, polymer, conveyor, install	$450,000	1	LS	$450,000
3	Piping	$50,000	1	LS	$50,000
4	Electrical & Controls (15%)	$117,000	1	LS	$117,000
			Sub-Total		$781,000
			Contingency	35%	$273,400
	TOTAL ESTIMATED CONSTRUCTION COST				**$1,054,000**
		Administration	2%		$21,000
		Engineering Design and Construction Services	30%		$316,000
		Inspection	5%		$53,000
				Sub-Total	$1,444,000
		Sales Tax	9.10%		$131,400
	TOTAL ESTIMATED PROJECT COST				**$1,576,000**
Notes					

The projection of probable cost herein is based on our perception of current conditions at the project location. This estimate reflects our professional opinion of project costs at this time and is subject to change as the project design matures. BHC Consultants has no control over variances in the cost of labor, materials, equipment; nor services provided by others, contractor's means and methods of executing the work or of determining prices, competitive bidding or market conditions, practices or bidding strategies. BHC Consultants cannot and does not warrant or guarantee that proposals, bids, or actual construction costs will not vary from the costs presented as shown.

City of Monroe
CIP SS-109
Turbine Blower
Engineer's Estimate
Prepared by: Kenneth Gray
Reviewed by:
Decemeber 1, 2014
S:\Projects\Monroe\2015 Utility Plans\WWTP\[Monroe WWTP - Cost Estimates_rev.xlsx]Dewatering

Estimate of Turbine Blower Probable Project Costs

Item No.	Item Description	Unit Bid Price	Quantity	Unit	Total
1	Contractor Mobilization and General Conditions (21%)	$58,000	1	LS	$58,000
2	Blower	$115,000	1	LS	$115,000
3	Valves, Piping	$15,000	1	LS	$15,000
4	Demo	$5,000	1	LS	$5,000
5	Electrical & Controls (15%)	$28,000	1	LS	$28,000
6	Installation (20%)	$55,000	1	LS	$55,000
			Sub-Total		$276,000
			Contingency	35%	$96,600
	TOTAL ESTIMATED CONSTRUCTION COST				**$373,000**
		Administration	2%		$7,000
		Engineering Design and Construction Services	15%		$56,000
		Inspection	5%		$19,000
				Sub-Total	$455,000
		Sales Tax	9.10%		$41,400
	TOTAL ESTIMATED PROJECT COST				**$497,000**

Notes

The projection of probable cost herein is based on our perception of current conditions at the project location. This estimate reflects our professional opinion of project costs at this time and is subject to change as the project design matures. BHC Consultants has no control over variances in the cost of labor, materials, equipment; nor services provided by others, contractor's means and methods of executing the work or of determining prices, competitive bidding or market conditions, practices or bidding strategies. BHC Consultants cannot and does not warrant or guarantee that proposals, bids, or actual construction costs will not vary from the costs presented as shown.

City of Monroe
CIP SS-110
SCADA & Controls Upgrades
Engineer's Estimate
Prepared by: Kenneth Gray
Reviewed by:
Decemeber 1, 2014
S:\Projects\Monroe\2015 Utility Plans\WWTP\[Monroe WWTP - Cost Estimates_rev.xlsx]Dewatering

Estimate of SCADA & Controls upgrades Probable Projcet Costs					
Item No.	Item Description	Unit Bid Price	Quantity	Unit	Total
1	Contractor Mobilization and General Conditions (21%)	$47,000	1	LS	$47,000
2	SCADA & Controls	$100,000	1	LS	$100,000
3	Electrical (15%)	$33,000	1	LS	$33,000
4	Installation (20%)	$45,000	1	LS	$45,000
			Sub-Total		$225,000
			Contingency	35%	$78,800
	TOTAL ESTIMATED CONSTRUCTION COST				**$304,000**
		Administration	2%		$6,000
		Engineering Design and Construction Services	30%		$91,000
		Programming	30%		$91,000
		Inspection	5%		$15,000
				Sub-Total	$507,000
		Sales Tax	8.90%		$45,100
	TOTAL ESTIMATED PROJECT COST				**$553,000**
Notes					

The projection of probable cost herein is based on our perception of current conditions at the project location. This estimate reflects our professional opinion of project costs at this time and is subject to change as the project design matures. BHC Consultants has no control over variances in the cost of labor, materials, equipment; nor services provided by others, contractor's means and methods of executing the work or of determining prices, competitive bidding or market conditions, practices or bidding strategies. BHC Consultants cannot and does not warrant or guarantee that proposals, bids, or actual construction costs will not vary from the costs presented as shown.

City of Monroe
CIP SS-111
Dryer Installation
Engineer's Estimate
Prepared by: Kenneth Gray
Reviewed by:
Decemeber 1, 2014

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Estimate of Dryer Installation Probable Project Costs					
Item No.	Item Description	Unit Bid Price	Quantity	Unit	Total
1	Contractor Mobilization and General Conditions (21%)	$861,000	1	LS	$861,000
2	Therma-Flite IC - Dryer	$1,250,000	1	LS	$1,250,000
3	Building	$250	1,600	SF	$400,000
4	Conveyor	$80,000	1	LS	$80,000
5	Ex Structure Mods/Demo	$40,000	1	EST	$40,000
6	Scale	$35,000	1	LS	$35,000
7	Electrical & Controls (15%)	$615,000	1	LS	$615,000
8	Installation (20%)	$820,000	1	LS	$820,000
			Sub-Total		$4,101,000
			Contingency	35%	$1,435,400
	TOTAL ESTIMATED CONSTRUCTION COST				**$5,536,000**
		Administration	2%		$111,000
		Engineering Design and Construction Services	30%		$1,661,000
		Inspection	5%		$277,000
				Sub-Total	$7,585,000
		Sales Tax	9.10%		$690,200
	TOTAL ESTIMATED PROJECT COST				**$8,276,000**
Notes					

The projection of probable cost herein is based on our perception of current conditions at the project location. This estimate reflects our professional opinion of project costs at this time and is subject to change as the project design matures. BHC Consultants has no control over variances in the cost of labor, materials, equipment; nor services provided by others, contractor's means and methods of executing the work or of determining prices, competitive bidding or market conditions, practices or bidding strategies. BHC Consultants cannot and does not warrant or guarantee that proposals, bids, or actual construction costs will not vary from the costs presented as shown.

City of Monroe
CIP SS-112
64' Secondary Clarifier Mechanism Replacement
Engineer's Estimate
Prepared by: Kenneth Gray
Reviewed by:
Decemeber 1, 2014
S:\Projects\Monroe\2015 Utility Plans\WWTP\[Monroe WWTP - Cost Estimates_rev.xlsx]Dewatering

Estimate of Secondary Clarifier Mechanism Replacement Probable Project Costs					
Item No.	Item Description	Unit Bid Price	Quantity	Unit	Total
1	Contractor Mobilization and General Conditions (21%)	$84,000	1	LS	$84,000
2	64' Collector Mechanisc	$175,000	1	LS	$175,000
3	Electrical & Controls (15%)	$60,000	1	LS	$60,000
4	Installation (20%)	$80,000	1	LS	$80,000
			Sub-Total		$399,000
			Contingency	35%	$139,700
	TOTAL ESTIMATED CONSTRUCTION COST				**$539,000**
		Administration	2%		$11,000
		Engineering Design and Construction Services	30%		$162,000
		Inspection	5%		$27,000
				Sub-Total	$739,000
		Sales Tax	9.10%		$67,200
	TOTAL ESTIMATED PROJECT COST				**$807,000**
Notes					

The projection of probable cost herein is based on our perception of current conditions at the project location. This estimate reflects our professional opinion of project costs at this time and is subject to change as the project design matures. BHC Consultants has no control over variances in the cost of labor, materials, equipment; nor services provided by others, contractor's means and methods of executing the work or of determining prices, competitive bidding or market conditions, practices or bidding strategies. BHC Consultants cannot and does not warrant or guarantee that proposals, bids, or actual construction costs will not vary from the costs presented as shown.

City of Monroe
CIP SS-113
RAS/WAS Pump Replacement
Engineer's Estimate
Prepared by: Kenneth Gray
Reviewed by:
Decemeber 1, 2014
S:\Projects\Monroe\2015 Utility Plans\WWTP\[Monroe WWTP - Cost Estimates_rev.xlsx]Dewatering

Estimate of RAS/WAS Pump Replacement Probable Project Costs

Item No.	Item Description	Unit Bid Price	Quantity	Unit	Total
1	Contractor Mobilization and General Conditions (21%)	$71,000	1	LS	$71,000
2	7.5 Hp pumps	$12,500	2	EA	$25,000
3	15 Hp pumps	$25,000	4	EA	$100,000
4	Piping modifications	$40,000	1	EA	$40,000
5	Electrical & Controls (10%)	$34,000	1	LS	$34,000
6	Installation (20%)	$68,000	1	LS	$68,000
			Sub-Total		$338,000
			Contingency	35%	$118,300
	TOTAL ESTIMATED CONSTRUCTION COST				**$456,000**
	Administration		2%		$9,000
	Engineering Design and Construction Services		30%		$137,000
	Inspection		5%		$23,000
				Sub-Total	$625,000
	Sales Tax		9.10%		$56,900
	TOTAL ESTIMATED PROJECT COST				**$682,000**

Notes

The projection of probable cost herein is based on our perception of current conditions at the project location. This estimate reflects our professional opinion of project costs at this time and is subject to change as the project design matures. BHC Consultants has no control over variances in the cost of labor, materials, equipment; nor services provided by others, contractor’s means and methods of executing the work or of determining prices, competitive bidding or market conditions, practices or bidding strategies. BHC Consultants cannot and does not warrant or guarantee that proposals, bids, or actual construction costs will not vary from the costs presented as shown.

City of Monroe
CIP SS-114
Replace Effluent Pumps and Mechanical
Engineer's Estimate
Prepared by: Kenneth Gray
Reviewed by:
Decemeber 1, 2014
S:\Projects\Monroe\2015 Utility Plans\WWTP\[Monroe WWTP - Cost Estimates_rev.xlsx]Dewatering

Estimate of Replace Effluent Pumps and Mechanical Probable Project Costs

Item No.	Item Description	Unit Bid Price	Quantity	Unit	Total
1	Contractor Mobilization and General Conditions (21%)	$54,000	1	LS	$54,000
2	Pumps, rails, chains, discharge elbow	$25,000	3	LS	$75,000
3	Valves and Fittings	$30,000	1	LS	$30,000
4	Misc.	$8,000	1	LS	$8,000
5	Electrical & Controls (15%)	$38,000	1	LS	$38,000
6	Installation (20%)	$51,000	1	LS	$51,000
			Sub-Total		$256,000
			Contingency	35%	$89,600
	TOTAL ESTIMATED CONSTRUCTION COST				**$346,000**
		Administration	2%		$7,000
		Engineering Design and Construction Services	30%		$104,000
		Inspection	5%		$17,000
				Sub-Total	$474,000
		Sales Tax	9.10%		$43,100
	TOTAL ESTIMATED PROJECT COST				**$518,000**

Notes

The projection of probable cost herein is based on our perception of current conditions at the project location. This estimate reflects our professional opinion of project costs at this time and is subject to change as the project design matures. BHC Consultants has no control over variances in the cost of labor, materials, equipment; nor services provided by others, contractor's means and methods of executing the work or of determining prices, competitive bidding or market conditions, practices or bidding strategies. BHC Consultants cannot and does not warrant or guarantee that proposals, bids, or actual construction costs will not vary from the costs presented as shown.

Appendix SS-G

Monroe Municipal Code for Sewer

Chapter 13.08
SEWER SYSTEM REGULATIONS

Sections:

13.08.010 Definitions.

Unless the context specifically indicates otherwise, the meaning of terms in this chapter shall be as set forth in this section.

"BOD" (denoting biochemical oxygen demand) means the quantity of oxygen utilized in the biochemical oxidation of organic matter under standard laboratory procedure in five days at twenty degrees centigrade expressed in milligrams per liter.

"Building drain" means that part of the lowest horizontal piping of a drainage system which receives the discharge from soil, waste, and other drainage pipes inside the walls of the building and conveys it to the building sewer, beginning five feet (one and one-half meters) outside the inner face of the building wall.

"Building and/or private sewer" means the extension line from the private property line to the house or building.

"City" means the city of Monroe, Washington.

"Combined sewer" means a sewer receiving both surface runoff and sewage.

"Commercial establishment" means an establishment involving an activity with goods, merchandise, or services for sale or involving a rental fee.

"Garbage" means solid wastes from the domestic and commercial preparation, cooking, and dispensing of food, and the handling, storage, and sale of produce.

"Industrial establishment" means an establishment involving manufacturing, assembling, fabrication, processing, bulk handling of products, large amounts of storage, warehousing, and heavy trucking, in addition to lighter industrial activities consisting of uses involving the processing, handling and creating of products.

"Industrial wastes" means the liquid waste from industrial manufacturing processes, trade, or business as distinct from sanitary sewage, and such wastes shall be divided into the following divisions:

1. Division A – Agriculture, forestry, and fishing;
2. Division B – Mining;
3. Division D – Manufacturing;
4. Division E – Transportation, communication, electric, gas, and sanitary services;
5. Division I – Services.

A user in the divisions listed may be excluded if it is determined that it will introduce primarily segregated domestic wastes or wastes from sanitary conveniences.

"Natural outlet" means outlet into a watercourse, pond, ditch, lake, or other body of surface water or groundwater.

Occupancy Definitions. The following definitions shall pertain to different classes of occupancy for the purposes of this chapter:

1. "Apartment house" means any building consisting of two or more separate apartments or single dwelling units.

2. “Hotel” or “rooming house” means any building in which individual rooms, without cooking facilities, whether with or without bath, are offered for rent or rented for dwelling purposes for any given period.

3. “Residence” means any one-family dwelling unit.

“Person” means any individual, firm, company, association, society, corporation, or group.

“pH” means the logarithm of the reciprocal of the weight of hydrogen ions in grams per liter of solution.

“Properly shredded garbage” means the wastes from the preparation, cooking, and dispensing of food that have been shredded to such a degree that all particles will be carried freely under the flow conditions normally prevailing in public sewers, with no particle greater than one-half inch (one and twenty-seven hundredths centimeters) in any dimension.

“Public sewer” means a sewer in which all owners of abutting properties have equal rights, and is controlled by public authority to include main line sewer.

“Public works director” means the public works director of the city or his authorized deputy, agent or representative.

“Restaurant” or “cafe” means any establishment or place of business where refreshments, meals or foods are prepared, served, sold or offered for sale to the public.

“Sanitary sewer” means a sewer which carries sewage and to which storm water, surface water, and groundwaters are not intentionally admitted.

“School,” “hospital,” “tavern,” “service station,” “garage,” “fountain,” “cleaners,” “bakery,” “machine shop,” “funeral home,” “lockers,” “meat market,” “grocery,” “theater,” “church,” “lodge,” “barbershop,” “beauty parlor,” and “rest home” shall be accorded their ordinary and common usage definitions.

“Sewage” means a combination of the liquid-carried wastes from residences, business buildings, institutions, and industrial establishments, together with such ground, surface, and storm waters as may be present.

“Sewage treatment plant” means any arrangement of devices and structures used for treating sewage.

“Sewage works” means all facilities for collecting, pumping, treating, and disposing of sewage.

"Sewer" means a pipe or conduit for carrying sewage.

"Shall" is mandatory; "may" is permissive.

"Side sewer" means the extension line from the main line sewer to the house or building. (A side sewer shall extend no longer than three hundred feet from the public sewer main excluding that portion of the side sewer in the public right-of-way.)

"Slug" means any discharge of water, sewage, or industrial waste which, in concentration of any given constituent or in quantity of flow, exceeds for any period of duration longer than fifteen minutes more than five times the average twenty-four hour concentration or flows during normal operation.

"Storm drain" (sometimes termed "storm sewer") means a sewer which carries storm and surface waters and drainage, but excludes sewage and industrial wastes, other than unpolluted cooling water.

"Suspended solids" means solids that either float on the surface or are in suspension in water, sewage or other liquids, and which are removable by laboratory filtering as per standard methods testing set forth in the most current publication of the Standard Methods for the Examination of Water and Wastewater.

"Toxicants" means any of the listed substances in 307-A of the Clean Water Act of 1977 (a copy of which list shall be kept at Monroe City Hall).

"Watercourse" means a channel in which a flow of water occurs, either continuously or intermittently. (Ord. 1260, 2002; Ord. 1170, 1999; Ord. 750, 1983; Ord. 722, 1981)

13.08.020 Connection to public sewer required – Disconnection of storm drains.

The owner of all houses, buildings, or properties used for human occupancy, employment, recreation, or other purposes, situated within the city and abutting on any street, alley, or right-of-way in which there is now located or may in the future be located a public sanitary or combined sewer of the city, is required at his expense to install suitable toilet facilities therein, and to connect such facilities directly with the proper public sewer in accordance with the provisions of this chapter, within ninety days after date of official notice to do so; provided, that said public sewer is within two hundred feet (sixty-one meters) of the property line; and provided, where one building is located at the rear of another on the same lot and the building in the rear has no frontage on an alley or street in which a sewer is located, the building sewer from the front buildings may be extended to the rear building and the whole considered as one building sewer, provided a cleanout is constructed to the ground surface beyond the connection from the rear building.

A. Notice. Official notice shall be written notice from the city clerk mailed to the owners of the premises at the street address of such premises (or to the address to which real estate tax statements are mailed as disclosed in the records of the office of the county treasurer) to cause a connection to be made between the sewerage system in each such building or structure.

B. Connection. All connections shall be made to said sewerage system in a permanent and sanitary manner, subject to the approval of the city engineer, and shall be sufficient to carry all sewage and waste fluids of any kind from said buildings into said system, and each toilet, sink, stationary washstand or any other piece or type of equipment having waste fluids shall be connected with said sewerage system.

C. Storm Drains. The owner of any lands, buildings, or premises where there is a direct connection from roof, foundation drains, or area drains to sanitary sewer or where there exists any other opening which allows storm water, groundwater, or surface water to directly drain to sanitary sewer, is required to disconnect or cause to be disconnected, the source or sources of storm water, groundwater, or surface water from the sanitary sewer. The owner or occupant of such lands, buildings, and premises shall also be required to take appropriate measures so as to permanently prevent further entry of storm water, groundwater, or surface water to the sanitary sewer. The city clerk shall so notify, in writing, the owner or occupant of said lands, building, or premises to discontinue the unauthorized discharge within such time as the council may designate. If the owner or occupant fails to comply with the notice within the time designated, the city council shall direct that water service to the premises shall be discontinued until the proper compliance has been made.

All work in response to the written notification shall be inspected by and subject to the approval and acceptance of the city engineer. (Ord. 1260, 2002; Ord. 750, 1983; Ord. 722, 1981)

13.08.030 Accessible – Exceptions.

At such time as a public sewer becomes accessible to property served by a private sewage disposal system, a direct connection shall be made to the public sewer within sixty days in compliance with this chapter, and any septic tanks, cesspools, and similar private sewage disposal facilities shall be abandoned and filled with suitable material.

The city engineer shall have authority to provide for exceptions to this connection requirement on application of the property owner(s) for such exception in circumstances where:

A. The property owner has an existing septic system in proper working condition and the maintenance of such system does not otherwise directly or indirectly affect any other property owner or the city. Maintenance for purposes of this section shall be limited to pumping out of the septic tank.

B. Where the city engineer finds that, irrespective of the distance of the property from a city sewer main, the public sewer is not accessible for practical purposes for the sewer use needed or where extraordinary circumstances exist or where strict application of the connection requirement would cause hardship.

C. These provisions shall not be interpreted so as to bind the city engineer to provide for an exception where circumstances as referenced above exist. The city engineer at his discretion may require a sewer connection under this chapter as the public interests dictate. No exception shall be allowed if any unhealthy or unsanitary condition will exist. (Ord. 003/2003; Ord. 1260, 2002; Ord. 722, 1981)

13.08.035 Maintenance responsibility.

The city of Monroe shall be responsible for the maintenance of the main line sewer. The property owner(s) served by the lateral side sewer shall be responsible for the maintenance of the lateral side sewer from the connection with the main line sewer to the house or building. (Ord. 1170, 1999)

13.08.040 Future systems unlawful.

Except as hereinafter provided, it shall be unlawful to construct or maintain any privy, privy vault, septic tank, cesspool, or other facility intended or used for the disposal of sewage unless the public sewer system is more than two hundred feet from property line except insofar as an exception septic tank as provided under MMC 13.08.030(A) is pumped out. (Ord. 003/2003; Ord. 722, 1981)

13.08.050 Unlawful disposal of wastes.

It is unlawful for any person to place, deposit, or permit to be deposited in any unsanitary manner on public or private property within the city or in any area under the jurisdiction of the city any human or animal excrement, garbage or other objectionable waste. This section is not to be construed as an animal control measure. (Ord. 722, 1981)

13.08.060 Unlawful discharge of wastes.

It is unlawful to discharge to any natural outlet within the city, or in any area under the jurisdiction of the city, any sewage or other polluted waters, except where suitable treatment has been provided in accordance with subsequent provisions of this chapter. (Ord. 722, 1981)

13.08.070 Unlawful discharge of storm water.

No person shall discharge or cause to be discharged any storm water, surface water, groundwater, roof runoff, subsurface drainage, uncontaminated cooling water, or unpolluted industrial process waters to any sanitary sewer. (Ord. 722, 1981)

13.08.080 Discharge of storm water.

Storm water and all other unpolluted drainage shall be discharged to such sewers as are specifically designed as combined sewers or storm sewers, or to unpolluted process waters which may be discharged, on approval of the city engineer, to a storm sewer, combined sewer, or natural outlet. (Ord. 1260, 2002; Ord. 722, 1981)

13.08.090 Discharge prohibited – Outright.

No person shall discharge or cause to be discharged any of the following described waters or wastes to any public sewers:

A. Any gasoline, benzene, naphtha, fuel oil, or other flammable or explosive liquid, solid or gas;

B. Any waters or wastes containing toxic or poisonous solids, liquids, or gases in sufficient quantity, either singly or by interaction with other wastes, to injure or interfere with any sewage treatment process, constitute a hazard to humans or animals, create a public nuisance, or create any hazard in the receiving waters of the sewage treatment plant, including but not limited to the cyanides in excess of two milligrams per liter as CN in the wastes as discharged to the public sewer;

C. Any waters or wastes having a pH lower than 5.5 or having any other corrosive property capable of causing damage or hazard to structures, equipment, and personnel of the sewage works;

D. Solid or viscous substances in quantities or of such size capable of causing obstruction to the flow in sewers, or other interference with the proper operation of the sewage works such as, but not limited to, ashes, cinders, sand, mud, straw, shavings, metal, glass, rags, feathers, tar, plastics, wood, unground garbage, whole milk, paunch manure, hair and fleshings, entrails and paper dishes, cups, milk containers, etc., either whole or ground by garbage grinders. (Ord. 722, 1981)

13.08.100 Discharge prohibited – In general.

No person shall discharge or cause to be discharged the following substances, materials, waters, or wastes if it appears likely in the opinion of the public works director that such wastes can harm either the sewers, sewage treatment process, or equipment, have an adverse effect on the receiving stream, or can otherwise endanger life, limb, public property, or constitute a nuisance. In forming his opinion as to the acceptability of these wastes, the public works director will give consideration to such factors as the quantities of subject wastes in relation to flows and velocities in the sewers, materials of construction in the sewers, nature of the sewage treatment process, capacity of the sewage treatment plant, degree of treatability of wastes in the sewage treatment plant, and other pertinent factors. The substances prohibited are:

A. Any liquid or vapor having a temperature higher than one hundred fifty degrees Fahrenheit or sixty-five degrees centigrade;

B. Any water or waste containing fats, wax, grease, or oils, whether emulsified or not, in excess of one hundred milligrams per liter or containing substances which may solidify or become viscous at temperatures between thirty-two and one hundred fifty degrees Fahrenheit (zero degrees and sixty-five degrees centigrade);

C. Any garbage that has not been properly shredded. The installation and operation of any garbage grinder equipped with a motor of three-fourths horsepower and approval of the public works director;

D. Any waters or wastes containing strong acid, iron pickling wastes or concentrated plating solutions whether neutralized or not;

E. Any waters or wastes containing iron, chromium, copper, zinc, and similar objectionable or toxic substances; or wastes exerting an excessive chlorine requirement, to such degree that any such material received in the composite sewage at the sewage treatment works exceeds the limits established by the public works director for such materials;

F. Any waters or wastes containing phenols or other taste- or odor-producing substances, in such concentrations exceeding limits which may be established by the public works director as necessary, after treatment of the composite sewage, to meet the requirement of state, federal, or other public agencies of jurisdiction for such discharge to the receiving waters;

G. Any radioactive wastes or isotopes of such half-life or concentration as may exceed limits established by the public works director in compliance with applicable state or federal regulations;

H. Any waters or wastes having a pH in excess of 9.5;

I. Materials which exert or cause:

1. Unusual concentrations of inert suspended solids (such as, but not limited to, fuller's earth, lime, slurries, and lime residues) or of dissolved solids (such as, but not limited to, sodium chloride and sodium sulfate),

2. Excessive discoloration (such as, but not limited to, dye wastes and vegetable tanning solutions),

3. Unusual BOD, chemical oxygen demand, or chlorine requirements in such quantities as to constitute a significant load on the sewage treatment works,

4. Unusual volume of flow or concentration of wastes constituting "slugs" as defined in this chapter,

5. Unusual suspended solids, concentration in such quantities as to constitute a significant load on the sewage treatment works;

J. Waters or wastes containing substances which are not amenable to treatment or reduction by the sewage treatment processes employed, or are amenable to treatment only to such degree that the sewage treatment plant effluent cannot meet the requirements of other agencies having jurisdiction over discharge to the receiving waters;

K. In general any toxicant as defined in this chapter. (Ord. 1260, 2002; Ord. 722, 1981)

13.08.110 Remedial actions.

If any waters or wastes are discharged, or are proposed to be discharged to the public sewers, which waters contain the substances or possess the characteristics enumerated in MMC 13.08.100, and which in the judgment of the public works director may have a deleterious effect upon the sewage works, processes, equipment, or receiving waters or which otherwise create a hazard to life or constitute a public nuisance, the public works director may:

A. Reject the wastes;

B. Require pretreatment to an acceptable condition for discharge to the public sewers;

C. Require control over the quantities and rates of discharge; and/or

D. Require payment to cover the added cost of handling and treating the wastes not covered by existing taxes or sewer charges under the provisions of Article VI.

If the public works director permits the pretreatment or equalization of waste flows, the design and installation of the plants and equipment shall be subject to the review and approval of the public works director and subject to the requirements of all applicable codes, ordinances, and laws.

Upon recommendation of the public works director and directive by the city council, the party so in violation of this chapter or seeking connection where such substances or wastes may be introduced to the city sewer system shall be required to construct and operate a wastewater pretreatment facility and/or equalization basin capable of removing and/or decreasing strength or quantity of said restricted waters or wastes prior to discharge to the sewer. At the time the directive to pretreat is issued, the city council shall set limitations on the discharge of restricted waters and wastes to city sewers as to volume, waste strength (BOD and suspended solids), and maximum concentrations on other restricted parameters. (Ord. 003/2003; Ord. 1260, 2002; Ord. 722, 1981)

13.08.120 Substance interceptors.

Grease, oil, sand, heavy metals, or such other needed interceptors shall be provided when, in the opinion of the public works director, they are necessary for the proper handling of liquid wastes containing grease in excessive amounts, or any flammable containing grease in excessive amounts, or any flammable wastes, sand, or other harmful ingredients; except that such interceptors shall be of a type and capacity approved by the public works director and shall be located as to be readily and easily accessible for cleaning and inspections. (Ord. 1260, 2002; Ord. 722, 1981)

13.08.130 Flow equalization.

Where preliminary treatment or flow-equalizing facilities are provided for any waters or wastes, they shall be maintained in continuous, satisfactory and effective operation by the owner at his expense. (Ord. 722, 1981)

13.08.140 Control manholes.

When required by the public works director, the owner of the property serviced by a building sewer carrying industrial wastes shall install a suitable control manhole together with such necessary meters and other appurtenances in the building sewer to facilitate observation, sampling, and measurement of the wastes. Such manhole, when required, shall be accessible and safely located, and shall be constructed in accordance with standards and plans established and approved by the public works director. The manhole shall be maintained by the property owner at his expense, and shall be maintained by him so to be safe and accessible at all times. The manhole and equipment shall be purchased and installed by the property owner at his expense. (Ord. 722, 1981)

13.08.150 Testing standards.

All measurements, tests, and analyses of the characteristics of water and wastes to which reference is made in this chapter shall be determined in accordance with the latest edition of Standard Methods for the Examination of Water and Wastewater, published by the American Public Health Association, and shall be determined at the control manhole provided, or upon suitable samples taken at the control manhole. In the event that no special manhole has been required, the control manhole shall be considered to the nearest downstream manhole in the public sewer to the point at which the building sewer is connected. Sampling shall be carried out by customarily accepted methods to reflect the effect of constituents upon the sewage works and to determine the existence of hazards to life, limb and property. (The particular analysis involved will determine whether a twenty-four-hour composite of all outfalls of a premises is appropriate or whether a grab sample or samples should be taken. Normally, but not always, BOD and suspended solids analyses are obtained from twenty-four-hour composites of all outfalls whereas pHs are determined from periodic grab samples). (Ord. 722, 1981)

13.08.160 Industrial user agreements.

No statement contained in this chapter shall be construed as preventing any special agreement or arrangement between the city and any industrial concern whereby an industrial waste of unusual strength or character may be accepted by the city for treatment, subject to payment therefor, by the industrial concern. (Ord. 722, 1981)

13.08.170 Powers and authority.

The public works director, city engineer and other duly authorized employees of the city shall be permitted to enter all properties for the purposes of inspection, observation, measurement, sampling and testing in accordance with the provisions of this chapter. The public works director, city engineer or their representatives shall have no authority to inquire into any processes including metallurgical, chemical, oil, refining, ceramic, paper, or other industries beyond that point having a direct bearing on the kind and source of discharge to the sewers or waterways or facilities for waste treatment. (Ord. 1260, 2002; Ord. 722, 1981)

13.08.180 Observation of safety rules.

While performing the necessary works on private properties referred to in provisions of this chapter, the public works director, city engineer or duly authorized employees of the city shall observe all safety rules applicable to the premises established by the owners or occupants. (Ord. 1260, 2002; Ord. 722, 1981)

13.08.190 Right of entry.

The public works director, city engineer and other duly authorized employees of the city shall be permitted to enter all private properties through which the city holds a duly negotiated easement for the purpose of, but not limited to, inspection, observation, measurement, sampling, repair and maintenance of any portion of the sewage lying within said easement, said to be done in accordance with the terms of the easement pertaining to the private property involved. (Ord. 1260, 2002; Ord. 722, 1981)

13.08.200 Sewer connection costs – Fee in lieu of assessment.

A sewer connection fee shall be charged against any property for which a side sewer is installed and connection is made to a sanitary sewer line, the construction of which was funded by grant under PL92-500. (Ord. 750, 1983; Ord. 722, 1981)

13.08.210 Fee in lieu of assessment.

A. The fee in lieu of assessment shall be based on the frontage of property on Valley View Road (179th Avenue SE). Where a property seeking a sewer connection does not abut Valley View Road, then the basis of the fee in lieu of assessment shall be projected front footage, which shall mean lot frontage on any city street or country road, or if a lot is served by an access road only, then the width of the lot shall be deemed the frontage or projected frontage for purposes of application and determination of the fee in lieu of assessment.

B. The fee in lieu of assessment shall be in the sum as established by the city council by periodic resolution, and shall be per front or projected front footage of each parcel of property provided with sewerage service.

C. The property owner shall designate frontage on the forms provided by the city in circumstances where the total property under ownership of any individual has not been developed, but is only partially used, then the property owner may make a declaration of less than the full frontage or width of the property; provided, that no designation of less than one hundred feet shall be made for any single-family residential use, commercial or industrial use unless the property width or frontage is actually less than one hundred feet; and further provided, that the minimum designation for multiresidential development shall be fifty feet per residential unit for purposes of the fee in lieu of assessment, irrespective of the lot frontage or width; and further provided, that all designations are subject to the approval of the city council. (Ord. 914, 1989; Ord. 722, 1981)

13.08.220 Area subject to fee – No connection without payment.

The area subject to and covered by the fee in lieu of assessment shall be limited to the service area to which sewer service is available through side sewer connections to the Valley View Road interceptor sewer line. Side sewers connecting to said line shall be no greater than three hundred feet in length excluding that portion of the side sewer in the public right-of-way. A map of this area is on file with the city clerk. (Ord. 750, 1983; Ord. 722, 1981)

13.08.230 Conditions of connection.

A. No connection to lines will be allowed until the payment in lieu of assessment is made or arrangements for payment suitable and approved by the city council are made. Suitable lines or mains for connection, as determined and approved by the city engineer, shall be provided prior to connection.

B. The city reserves the right to refuse individual property owners connection to sewer lines unless a utility connection agreement, on form provided by the city available at City Hall, are properly signed and completed by the property owners. The city further reserves the right to refuse individual property owners connection to the city mains at such time as council finds that the treatment plant, sewer main, or any portion of the city's sewer system is at maximum efficient capacity so as to make it inadvisable in the opinion of the council to provide for and allow further connections to the city's system.

C. The city reserves the right to review sewer connection including side sewers under MMC 13.08.220 on an individual basis. Consideration to serving the area designated the 1990 service area, and as set forth on a map designating said area and filed with the city clerk, shall be given. Factors to be considered in accepting or rejecting any proposal for sewer main extensions shall include, but are not limited to, the capacity of the Valley View Road interceptor sewer line and pump station, sewer treatment plant capacity, allocations of sewer system capacity already made or provided for the existing demands and allocations on sewer service in the city.

D. Fee in lieu of assessment charges shall not apply for connections located in the 1990 service area as follows:

1. Where premises are connected to sewer mains outside the service area set forth in MMC 13.08.220, being basically the area within three hundred feet of the Valley View Road interceptor sewer line, after January 1, 1983;

2. Connections to sewer line extensions from the Valley View Road interceptor sewer line, when said lines have been dedicated or donated to the city prior to such

connections;

3. Lines constructed pursuant to a local improvement district or utility local improvement district, unless the fee in lieu of assessment is included as an expense of such district;

4. Where a fee in lieu of assessment has been paid for connections outside the service area defined in MMC 13.08.220, then the city treasurer shall be empowered to reimburse said payor(s); it being understood that the provisions of this section are in clarification of prior code provisions and in some instances such fees have been paid pending this clarification. (Ord. 1260, 2002; Ord. 750, 1983; Ord. 722, 1981)

13.08.240 Sanitary sewer service area.

The service area for the city of Monroe sanitary sewer system shall be the Monroe urban growth area. (Ord. 005/2013 § 2; Ord. 1130, 1998)

13.08.250 Application/reapplication for connection fees.

It is unlawful for any person to make any opening in any sewer or drain or connect any private sewer or drain thereto without complying with all the provisions of this chapter, and obtaining therefor a permit from the city engineer to make such connection or opening. A sum established by the city council by periodic resolution shall be charged and collected by the city clerk for any connection permit issued. A reinspection charge as established by the city council by periodic resolution shall be made for any service laterals failing the initial test or any other reinspection required by the city personnel. (Ord. 1260, 2002; Ord. 914, 1989; Ord. 750, 1983; Ord. 722, 1981)

13.08.260 Contents of permit application.

In order to obtain the permit provided for in MMC 13.08.250, the property owner or his designated agent shall file an application therefor stating the name of the owner or occupant of the premises to be connected, the number of buildings thereon, and the purposes for which they are to be occupied, together with plans and specifications showing the course and depth of the drain from the connection with the public sewer to its terminus within the building and premises, which plans and specifications shall be made in duplicate and presented at the time of application. The city engineer shall examine said plans and may change or modify the same and designate the manner and route from which said connecting sewer shall be connected with the building and places where such connection with the public sewer shall be made, and specify the material and size of such connecting sewer, and shall endorse his approval on such plans and specifications originally prepared, or as modified and changed, and retain one copy thereof in the office of the city clerk or such other place as the city council may designate. Upon presentation of the plans so approved by the city engineer, the city clerk shall issue the permit, which permit shall contain or have attached to it the other copy of such approved plans and specifications; and it shall be unlawful for any person to extend any private sewer or drain beyond the limits of the building or property for which a permit has been given. (Ord. 1260, 2002; Ord. 750, 1983; Ord. 722, 1981)

13.08.270 Sewer connection charges.

In addition to the permit fee required by the preceding sections, the following connection charges shall be made at the time of application for a permit to connect to the system.

A. Sewer connection installation fees shall be as established by the city council by periodic resolution.

B. Treatment facility reserve capacity charges shall be made at time of application for a new connection to the Monroe sanitary sewer system or at time of application for a building permit or change of use permit when the water usage is expected to increase. No refunds will be given if a change in use or occupancy causes the expected water usage to decrease. Treatment facility reserve capacity charges shall be as established by the city council by periodic resolution.

The amount set by such resolution shall be the amount paid per equivalent residential unit (ERU). Single-family residences shall be charged for one ERU. Multifamily structures shall be charged for one ERU per residential unit. Exception: one-bedroom or studio residential units located in the downtown commercial zone, which structures are mixed commercial and residential use, shall be charged .333 per ERU per unit. ERUs for nonresidential new customers shall be based on the size of water meter needed to supply the customer’s calculated peak demand:

Meter size	ERUs
5/8 x 3/4 inch	1
1 inch	2.5
1-1/2 inches	5
2 inches	8
3 inches	16
4 inches	25
6 inches	50
8 inches	80

or expected sewage flows, whichever is greater. When using expected sewage flows, one ERU is defined as having an average annual monthly discharge of one thousand cubic feet. This charge will be determined by the city engineer and any decision may be appealed to the city council for a final determination.

In no case shall the ERU amount be less than one. (Ord. 025/2004; Ord. 1238, 2001; Ord. 1210, 2000)

13.08.275 Exemption for homeless transitional shelters.

A. The sewer treatment facility reserve capacity charges imposed by MMC 13.08.270 shall not apply to transitional housing for homeless persons operated by federal, state, county or municipal agencies or public benefit nonprofit corporations. In order to qualify for this exemption, the transitional housing must focus upon providing counseling, training and/or opportunities to the homeless to enable them to find employment and support themselves. All persons who use the transitional home shall either be homeless individuals, support staff or others involved in the operations of the shelter. For purposes of this section, homeless persons shall be deemed to be individuals who do not have the resources for a fixed place to sleep at night. Such persons must qualify as “very low-income” individuals as defined in the city of Monroe comprehensive plan.

B. As a condition of granting this exemption, the property owner shall record a covenant prepared by the city that provides that if the use is subsequently changed in a manner that no longer qualifies it for the exemption in subsection (A) of this section, MMC 13.08.270 shall be applied at the time the exempted use was changed as if the exempted use had never occurred. Under these circumstances, sewer treatment facility reserve capacity charges for a change in use shall be based upon the change in use from the use immediately preceding the exempted use to the use to which the exempted use was converted. Similarly, if the exempted use was the first sewer use of the property, the capital improvement fee assessed at the time the exempted use is changed shall be assessed as if the changed use were the first sewer use of the property.

C. This exemption shall only apply to the first thirty equivalent residential units (ERUs) that qualify. Any exempted uses that are subsequently discontinued shall not qualify as one of the thirty ERUs. (Ord. 007/2008 § 2; Ord. 032/2005 § 1)

13.08.280 Sewer lateral (side sewer) charges.

The owner of any property abutting a street, alley, or easement wherein there is a sewer line that has been designated to be constructed and said sewer line falls within the area limited by the projection of the side property lines may order a sewer lateral constructed from the main line to the property line upon payment of the sewer lateral charges. In the event that the sewer lateral charge is paid one week prior to main line construction, the charge will be ninety percent of the total fee set forth in MMC 13.08.270. All sewer lateral charges paid after that time will be as per MMC 13.08.270. The sewer lateral charge will be collected in return for providing a side sewer to the property line in the location designated by the public works director. In the event that the one sewer lateral is constructed to serve more than one property ownership, the sewer lateral charge will not be reduced. (Ord. 1132, 1998)

13.08.290 Connections – Method.

All connections to public sewers or drains shall be made in a workmanlike manner and in accordance with instructions from the city engineer and/or in accordance with other ordinances of the city which may be applicable thereto, and as amended from time to time. (Ord. 1260, 2002; Ord. 750, 1983; Ord. 722, 1981)

13.08.295 Construction of extensions.

A. A main extension is required whenever property within the sanitary sewer service area desires to connect to the city of Monroe sanitary sewer system and that property does not fully abut a sewer main, or when existing abutting or downstream sewer mains do not have adequate capacity. When the property is the last developable lot that can be served, the public works director is authorized to waive this requirement administratively. If an existing lot is more than two hundred feet from an existing gravity sewer main, a septic tank may be used in lieu of a sewer main extension if the design is approved by the Snohomish Health District.

1. The person desiring a main extension shall petition the public works director requesting permission to extend the city's sewer system.

2. The public works director shall review the request, and, if the requested extension is determined to be a desirable extension of the sewer system, shall provide the petitioner with the design requirements for the extension. If the requested main extension is determined to be an undesirable extension of the sewer system, the petition shall be denied.

3. Upon receipt of the design requirements from the public works department, the petitioner shall, at the petitioner's sole expense, cause the plans and specifications for the extension to be prepared. All design and construction drawings and specifications shall be in accordance with engineering standards adopted by the public works department. The completed design and specifications, having a valid professional

engineer’s seal and endorsement, shall be submitted to the public works department for review and approval.

4. The project for main construction will be carried out in accordance with the provisions of a contract entered into between the city and the petitioner. In the discretion of the public works director, appropriate security may be required covering construction performance and guaranteeing the construction after completion for a period of one year.

5. After approval of the design and construction details, the public works department shall provide the petitioner with an estimate of the construction inspection fee. A permit for construction will be issued after the inspection fees have been deposited with the finance director.

6. The petitioner shall extend sanitary sewer at no expense to the city of Monroe, including construction and sizing of sanitary sewer mains as specified in the current city of Monroe sanitary sewer system plan.

7. The petitioner shall contract with a contractor to install the main extension as approved by the public works department. The contractor shall be licensed to perform the construction.

8. The public works department shall inspect the installation of the sewer main to ensure compliance with the specifications. The charges for such inspection, including administrative and overhead charges, shall be withdrawn from the construction inspection fee deposited with the finance director. At such time as the public works director determines the remaining funds are not adequate to provide necessary inspection for the project, the petitioner shall be notified and an estimate of additional inspection fee required will be provided. The additional fees shall be deposited with the finance director prior to depletion of the funds on deposit. The city reserves the right to reject any installation not inspected and approved by the public works department. Any moneys unexpended from the inspection fee upon completion of the project shall be returned to the petitioner.

9. Individual services shall be installed by the developer to serve each proposed building site. These services shall be installed to city standards. All connection fees and charges shall be paid prior to connection.

10. Upon completion of a main extension, the petitioner shall provide the department of public works a reproducible mylar drawing that accurately indicates the main extension and appurtenances as actually installed, in plan and profile (“record construction

drawing").

11. No main extension will be accepted until satisfactory record construction drawings are provided to and approved by the director of public works or his designee.

B. The minimum standards for construction of extensions to the city sanitary sewer system shall be prepared by the city engineer and updated periodically as required. A copy of these standards shall be available for purchase by anyone requesting a copy.

C. Length of Side Sewers.

1. All side sewers shorter than one hundred feet shall be four inches or larger.

2. All side sewers one hundred feet and longer but shorter than three hundred feet shall be six inches or larger.

3. All side sewers longer than three hundred feet shall be constructed as mainline additions to the sanitary sewer systems, eight-inch pipe size, deeded to the city for operation and maintenance on a public easement right-of-way.

4. All eight-inch sewer mains shall terminate with an approved cleanout if the length is less than two hundred feet. If the length is greater than two hundred feet, it shall terminate in a manhole. (Ord. 005/2013 § 3; Ord. 1260, 2002; Ord. 783, 1985; Ord. 750, 1983)

13.08.300 Inspection of work.

No trench shall be filled or any connecting sewer constructed under the provisions of this chapter until the same shall have been inspected and approved by or under the direction of the city engineer at the point where the same connects with the pipe or other plumbing of the building or premises being connected, or until the same shall be made in all respects to conform to this chapter or such other ordinances as are now or hereafter may become applicable from time to time. (Ord. 1260, 2002; Ord. 750, 1983; Ord. 722, 1981)

13.08.310 Inspection and approval by city engineer.

All work done in pursuance of any connection permit granted as heretofore prescribed shall be under the inspection and subject to the approval and acceptance of the city engineer. The grade, materials, and manner of construction of any sewer or drain built under permit shall be subject to the approval or rejection of the city. Upon acceptance of work, the city engineer shall issue a notice of approval and acceptance of sewer connection, with one copy to the property owner or designated agent as authorization to backfill and use the connection, one copy to the city clerk to initiate billing, and one copy for the file. (Ord. 1260, 2002; Ord. 750, 1983; Ord.

722, 1981)

13.08.320 Excavations.

All excavations made by any permittee adjacent to or abutting any street, alley, avenue or other public place shall be guarded both night and day by a display of proper signals and lights. At the time of application for permit, the applicant shall satisfy the city of his or its ability to indemnify the city, and shall be liable personally for all accidents and damages caused by the failure of the permittee to comply with this section. Liability coverage in the amount of one hundred thousand dollars shall be deemed to be sufficient indemnification to the city. The city engineer may require a further performance bond in an amount the city engineer deems appropriate to ensure completion of any project requiring excavation and so as to ensure backfilling and resurfacing in the event the property owner or contractor fails to comply with this section. The city engineer may also place reasonable time limitations on excavation work, pursuant to this section. (Ord. 1260, 2002; Ord. 722, 1981)

13.08.330 Delay in work.

All work adjacent to or abutting any street or public place must be pursued to completion with due diligence, and if, within the judgment of the city engineer, public works director, any excavation is left upon beyond a reasonable time, he shall cause the same to be refilled forthwith without notice, and costs incurred in such work, or for correcting work improperly done by the permittee, shall be charged to him. (Ord. 1260, 2002; Ord. 750, 1983; Ord. 722, 1981)

13.08.340 Right of access to inspect – Order to comply.

The public works director, city engineer and authorized representative shall have the right to enter upon any lands, buildings, or premises required by this chapter to be connected to the sanitary sewer or to disconnect the source or sources of storm water, groundwater or surface water from the sanitary sewer at all reasonable times to ascertain whether the provisions of this chapter have been or are being complied with, and if they shall find that such lands, building or premises connections or disconnections do not conform to the provisions of this chapter, to notify the owner or occupant or his agent of the fact, and it shall thereupon be the duty of such owner, occupant or agent to cause the requirements of this chapter to be so altered, repaired, or reconstructed as to make them conform to these provisions within fifteen days from the time of receiving such notice. (Ord. 1260, 2002; Ord. 750, 1983; Ord. 722, 1981)

13.08.350 Installation costs.

All costs and expense incident to the installation and connection of the building sewer shall be borne by the owner. The owner shall indemnify the city from any loss or damage that may directly or indirectly be occasioned by the installation of the building sewer. (Ord. 722, 1981)

13.08.360 Elevation for connections.

Whenever possible, the building sewer shall be brought to the building at an elevation below the basement floor. In all buildings in which any building drain is too low to permit gravity flow to the public sewer, sanitary sewage carried by such building drain shall be lifted by means approved by the city engineer and discharged to the building sewer. (Ord. 1260, 2002; Ord. 722, 1981)

13.08.370 General rate schedule.

A. All rates and charges for sanitary sewer collection and disposal services shall be as established by the city council by periodic resolutions unless otherwise specifically proved, and shall be collected by the collector of sewer revenues.

Each year during May or June the city shall review the water consumption for all residential customers. The customer's sewer charges during the four summer months of July, August, September and October shall be based on their winter usage during the months of November through June.

And further provided, that such established shall pay an initial user charge of thirty cents per pound BOD, as defined in this chapter, and an additional twenty cents per pound suspended solids as defined in this chapter as measured by the city pursuant to this chapter.

B. The initial charges for flow, BOD and suspended solids shall be increased annually. The city's costs of treating flow, BOD and suspended solids are to be determined annually by the public works director and certified to the council and city treasurer for purposes of billing for sewer user charges. The public works director shall file an annual report to the city council for purposes of establishing appropriated additional charges herein and such report shall be approved by the city council as part of the annual sewer department budget. (Ord. 1260, 2002; Ord. 993, 1992; Ord. 914, 1989; Ord. 809, 1986; Ord. 756, 1983; Ord. 722, 1981)

13.08.380 Commercial and industrial.

Higher waste strength than two hundred milligrams per liter of BOD or TSS (BOD – biochemical oxygen demand, a parameter of organic strength of wastewater; TSS – total suspended solids (nonfilterable residue)), the user shall pay all user charges. (Ord. 722, 1981)

13.08.390 Determination of strength and flow rate.

The delivery flow rate, upon which user charges will be made, shall be based upon one hundred percent of water consumption, or flow rates measured and substantiated by the user.

Strength of sewage discharged from each user shall be established based upon twenty-four-hour composite samples made by the city and tested by the city's wastewater treatment facility laboratory. Composite samples shall be taken at such intervals as to assure that the strength estimates reflect the true strength of the user's waste over the year. Each user shall provide a location where its total waste stream may be sampled. If the user feels that the city's sampling program reflects too high a waste strength, it may arrange to have samples taken by a state-certified and state-approved testing laboratory at the user's cost. (Ord. 722, 1981)

13.08.400 Right of entry.

The public works director, city engineer and authorized representatives shall have the right to enter upon any user's lands, buildings or premises using city sewerage for purposes of obtaining samples and making tests. City equipment left at any such site for sampling and testing purposes shall not be removed or in any way tampered with. (Ord. 1260, 2002; Ord. 722, 1981)

13.08.410 Projecting total annual costs.

The estimated annual cost used to compute user charges shall be computed from the following:

A. Operation and maintenance costs; includes, but are not limited to, all costs associated with day-to-day operation of the collection systems, pump stations, force mains, treatment plant and outfall (i.e., electricity to operate pumps, etc., chlorine for disinfection, lubricants for equipment, etc.);

B. Debt services, bond and other debts payback;

C. Taxes;

D. Administration; includes, but is not limited to, all clerical and billing time, city staff time on sewers, side sewers, etc., and city attorney time on wastewater-related items;

E. Wages and benefits to employees working on operation and maintenance of wastewater facilities including a percentage of the public works director's and city engineer's time;

F. Insurance;

G. Professional services; includes consulting engineering services required for year;

H. Replacement and improvement costs; includes present accumulative sewer equipment fund (fifteen thousand dollars a year) and sewer cost fund (about fifty thousand dollars in fund as of January 1981, not figured in annual cost) and replacement fund to raise capital for future upgrade and expansion of collection system, pump stations and treatment plant (added to receipts from portion of hookup charges set aside for capital improvements). (Ord. 1260, 2002; Ord. 750, 1983; Ord. 722, 1981)

13.08.420 Use of city manholes/septage.

With special council permission and under written agreement, a user may use the city dumpsite or a city manhole for dumping septage for a fee and under conditions set forth in such agreement. The council may impose a fee and establish conditions appropriate to compensate for the utilization of the city's sewerage system. The council may preclude such dumping if at any time the council feels that such will impair the city's sewerage system in any way. (Ord. 750, 1983; Ord. 722, 1981)

13.08.430 Senior citizen and disabled discount.

For senior citizens with very low income or disabled persons hereinafter defined, the single-family residential housekeeping unit charge shall be as established by the city council by periodic resolution. The rate established for seniors is restricted to single-family residences or other residences with a single water meter per unit primarily occupied by a senior citizen or senior citizens being fifty-five years of age or older having an annual household income of fifty percent or less of the area median income for Snohomish County, as published by the Washington State Office of Financial Management. In the event that such income determination is no longer published, the city may use such other reasonable methods of determining average median income as it may choose. Discount rate is restricted to minimum residential meter size. To qualify as a disabled person, the disability is defined as the inability to do any substantial gainful activity due to any medically determinable physical or mental impairment which can be expected to result in death, or which has lasted or can be expected to last for a continuous period of not less than twelve months. To qualify for the disabled discount, said rate is restricted to single-family residences primarily occupied by a disabled person. The discount rates provided for herein are available only upon application, which is required to be updated annually by the customer. (Ord. 024/2009 § 4 (Exh. B); Ord. 012/2009 § 3; Ord. 003/2003; Ord. 914, 1989; Ord. 780, 1984; Ord. 722, 1981)

13.08.432 Low-income senior citizen discount – Nonprofit multifamily.

For low-income senior citizens as hereinafter defined, the nonprofit multifamily residential utility rate shall be as established by periodic resolution of the city council. The rate established under this section is restricted to multifamily residences that are: (A) exclusively occupied by low-income senior citizens, and (B) owned or operated by entities with nonprofit public benefit status as defined by RCW 24.03.490. For purposes of this section, "low-income senior citizens" are defined as persons being fifty-five years of age or older and having an annual household income of fifty percent or less of the area median income for Snohomish County, as published by the Washington State Office of Financial Management. In the event that such income determination is no longer published, the city may use such other reasonable methods of determining average median income as it may choose.

The discount rates provided for herein are available only upon application, which is required to be updated annually by the customer. Such annual update shall provide current documentation of the customer's nonprofit public benefit status and certify that all residents of the multifamily facility are low-income senior citizens as defined herein. (Ord. 017/2013 § 2)

13.08.440 User rate – Outside city limits.

Monthly rates and charges for sanitary sewage collection and disposal system service outside the city limits shall be two hundred percent of the appropriate in-city charge, except outside city public facilities one hundred and fifty percent of the appropriate in-city charge. This rate differential is based upon the city's additional expenses for administration, maintenance, and service for nonresident users as well as to assist in covering departmental expenses and city expenses not covered by user fees such as resident users pay as revenues to the city. (Ord. 1176, 1999)

13.08.450 Rate – Class of user not specified.

Monthly rates and charges for sanitary sewage collection and disposal system service for any class of user not otherwise provided for under this chapter, for major users of the system or for users of the system where special circumstances as determined by the city council exist shall be as arranged by special contract with the city, as approved by the city council. (Ord. 722, 1981)

13.08.460 Future rate increases.

The city council shall set the rates for sewer usage by periodic resolution according to the laws applicable to the setting of sewer rates. (Ord. 039/2004 § 2; Ord. 027/2003)

13.08.470 Billing.

A. All sewage rates and charges shall be billed monthly on the first day of the billing month, shall be due and payable not later than the last day of the month, and shall become delinquent after that date.

B. All rates and charges provided in this chapter shall be billed to the owner, contract vendee, or authorized agent of the owner of the particular premises to which the service herein defined is provided.

C. All permits or notification of and application for rate classification change which may be required to be obtained shall be obtained by and issued to such owner, contract vendee or authorized agent; provided, that tenants shall not be deemed agents of the owner or contract vendee by virtue of their tenancy alone.

D. Where payment of user charges under subsection (A) of this section is delinquent, a late charge as established by the city council by periodic resolution shall be levied for each delinquent sewer service or family unit sewer service as the case may be.

E. For all other charges, to include, but not be limited to, user charges under major or special user agreements, connection charges, inspection fees, fees in lieu of assessment, installation fees, treatment facility reserve capacity charges, system charges, delinquent or unpaid user charges where service has been terminated and the account remains due, and late-comer payments due to the city, such delinquent accounts shall bear the interest at the rate of one percent per month from the date of delinquency, or due date as the case may be.

F. If in payment of any fee or charge under this chapter, a check has been given for payment for which insufficient funds are held in account to cover such check, said check being an NSF check, then a charge as established by the city council by periodic resolution shall be due and payable to the city.

G. All payments on a combined utility billing shall be applied first to fees or penalties, second to utility taxes, third to storm drainage, fourth to solid waste, fifth to recycling, sixth to sewer, and seventh to water. (Ord. 011/2009 § 1; Ord. 027/2003; Ord. 003/2003; Ord. 1284, 2002; Ord. 1245, 2001; Ord. 1219, 2000; Ord. 993, 1992; Ord. 914, 1989; Ord. 750, 1983; Ord. 722, 1981)

13.08.475 Vacation/vacancy credit.

Single-family dwelling accounts shall be eligible for vacation/vacancy credits for any absence of thirty days or more with a maximum of ninety days in any concurrent twelve-month period. Low-income senior citizen accounts satisfying the criteria set forth in MMC 13.08.430, and city of Monroe irrigation accounts, shall be eligible for vacancy credits for any absence or nonuse of thirty days or more with a maximum of one hundred eighty days in any concurrent twelve-month period. Utility accounts must be current, no vacancy credits shall be granted for an account that is delinquent. Credits shall be computed on a percentage of days used. The city will provide a vacancy credit application in the event the city operates the utility and the contractor will provide a vacancy credit application in the event a contractor operates the utility.

Vacancy credit applications must be filed forty-eight hours in advance. Persons filing vacancy credit applications found to be false shall, in addition to any other penalties, be ineligible to receive future vacancy credits. Failure to apply for continuation of services within seven days of the renewed occupancy of the premises shall result in charges being imposed for sanitary sewer services without regard for any period of vacancy. (Ord. 019/2011 § 3; Ord. 008/2005; Ord. 027/2003; Ord. 1119, 1997)

13.08.480 Unpaid charges – Lien.

All rates and charges provided for in this chapter, together with any penalties and interest thereon at the rate of eight percent per annum from the date of delinquency and all costs and fees of collecting or foreclosing upon the premises served to collect the same, shall be a lien upon the property and premises with which the connection is made or sewage disposal service furnished, superior to all other liens or encumbrances except those for general taxes and special assessments. Enforcement of such lien or liens shall be made in the manner provided by law. (Ord. 012/2008 § 2; Ord. 750, 1983; Ord. 722, 1981)

13.08.485 Sewerage lien – Extension of coverage.

Pursuant to RCW 35.67.215, the sewerage lien set forth in MMC 13.08.480 shall be effective for one year’s delinquent charges without the necessity of any writing or recording of the lien with the county auditor. Pursuant to RCW 35.67.210, a sewage lien for more than one year’s delinquent charges shall be valid if properly recorded in the office of the county auditor. (Ord. 012/2008 § 3)

13.08.490 Unpaid charges – Water shutoff.

In the event that any such bill for sewage disposal service rates and charges or connections and any other charges or fees due under this chapter are not paid within thirty days from the date the same become delinquent, the city may shut off the water furnished the premises to which such services was rendered or connection made without further notice. The water shall not be turned on again until such bill(s), together with all late charges, interest due thereon, plus all fee established by the city council by periodic resolution for shutoff and turn-on of the water, have been paid. (Ord. 914, 1989; Ord. 750, 1983; Ord. 722, 1981)

13.08.500 Penalty for violations.

Any person who shall violate or fail to comply with any provisions of this chapter shall be deemed guilty of a misdemeanor, and upon conviction thereof shall be punished by a fine in any sum not exceeding five hundred dollars or by imprisonment for a term not exceeding thirty days, or by both fine and imprisonment. (Ord. 722, 1981)

13.08.510 Other relief.

The city may seek injunctive or such other relief or recourse as may be appropriate. Also, any person violating any of the provisions of this chapter shall become liable to the city for any expense, loss, or damage occasioned the city by reason of such violation. (Ord. 722, 1981)

Chapter 13.10
SEWAGE PRETREATMENT

Sections:

13.10.010 Purpose and policy.

A. This chapter sets forth uniform requirements for users of the publicly owned treatment works (POTW) operated by the city of Monroe. It enables the city of Monroe to comply with state and federal laws that apply to POTWs with significant industrial users, but without a discharge permit program. All actions required or authorities granted under this chapter are in accordance with the Clean Water Act (33 USC 1251 et seq.), the Federal Pretreatment Regulations (40 CFR Part 403), and Chapter 90.48 RCW, Water Pollution Control. The objectives of this chapter are:

1. To prevent the introduction of pollutants into the POTW that will interfere with the operation of the POTW;

2. To prevent the introduction of pollutants into the POTW which will pass through the POTW, inadequately treated, into receiving waters or otherwise be incompatible with the POTW;

3. To ensure that the quality of POTW sludge is maintained at a level which allows its use and disposal in compliance with applicable statutes and regulations;

4. To protect POTW personnel who may be affected by wastewater and sludge in the course of their employment and to protect the general public;

5. To improve the opportunity to recycle and reclaim wastewater and sludge (biosolids) from the POTW;

6. To promote strategies which reduce the amounts of pollution generated by users, thereby reducing the associated hazards to the POTW and receiving waters; and

7. To provide for equitable distribution of wastewater costs among dischargers and to establish a system of fees for the recovery of the cost of the pretreatment program.

B. This chapter shall apply to all users of the POTW. This chapter defines certain prohibited discharges; sets forth local limits for use by state agencies in the issuance of wastewater discharge permits; authorizes monitoring, compliance, and enforcement activities; establishes administrative review procedures; requires user reporting; and provides for the recovery of liquidated damages and collection of penalties. (Ord. 011/2004)

13.10.020 Administration.

Except as otherwise provided herein, the director shall administer, implement, and enforce the provisions of this chapter. Any powers granted to or duties imposed upon the director may be delegated in writing by the director to other city of Monroe personnel. (Ord. 011/2004)

13.10.030 Definitions.

Unless a provision explicitly states otherwise, the following terms and phrases, as used in this chapter, shall have the meanings hereinafter designated:

“Act” or “the Act” means the Federal Water Pollution Control Act, also known as the Clean Water Act (33 USC 1251 et seq.), as amended.

“AKART” means an acronym for “all known, available, and reasonable treatment methods (prevention, control, and treatment) to prevent and control pollution of the waters of the state of Washington.” (Chapter 90.48 RCW governs said term and AKART shall be interpreted and applied pursuant to said chapter.) AKART shall represent the most current methodology that can be reasonably required for preventing, controlling, or abating the pollutants associated with a discharge. AKART shall by applied by all users of the POTW. AKART includes best management practices and may be required by the director for any discharge to the POTW.

Applicable Pretreatment Standards. For any specified pollutant, the more stringent of city of Monroe prohibitive standards, city of Monroe specific pretreatment standards (local limits), state of Washington pretreatment standards, or applicable National Categorical Pretreatment Standards.

Authorized Representative of the User.

1. If the user is a corporation:

   a. The president, secretary, treasurer, or a vice president of the corporation in charge of a principal business function, or any other person who performs similar policy or decision-making functions for the corporation; or

   b. The manager of one or more manufacturing, production, or operation facilities employing more than two hundred fifty persons or having gross annual sales or expenditures exceeding twenty-five million (in second-quarter 1980 dollars), if authority to sign documents has been assigned or delegated to the manager in accordance with corporate procedures;

2. If the user is a partnership or sole proprietorship, a general partner or proprietor, respectively;

3. If the user is a federal, state, or local governmental facility, a director or highest official appointed or designated to oversee the operation and performance of the activities of the government facility, or his/her designee;

4. The individuals described in subsections (1) through (3) of this definition may designate another authorized representative if the authorization is in writing, the authorization specifies the individual or position responsible for the overall operation of the facility from which the discharge originates or having overall responsibility for environmental matters for the company, and the written authorization is submitted to the city.

“Best management practices (BMPs)” means schedules of activities, prohibitions of practices, maintenance procedures, and other management practices to prevent or reduce the pollution of waters of the United States. BMPs also include treatment requirements, operating procedures, and practices to control plant site runoff, spillage or leaks, sludge or waste disposal, or drainage from raw material storage.

“Biochemical oxygen demand (BOD)” means the quantity of oxygen utilized in the biochemical oxidation of organic matter under standard laboratory procedures during five days at twenty degrees centigrade, usually expressed as a concentration [milligrams per liter (mg/l)].

“Bypass” means the intentional diversion of waste streams from any portion of a user’s treatment facility.

“Categorical pretreatment standard” or “categorical standard” means any regulation containing pollutant discharge limits promulgated by the EPA in accordance with Sections 307(b) and (c) of the Act (33 USC 1317) which apply to a specific category of users and which appear in 40 CFR Chapter I, Subchapter N, Parts 405-471.

“Categorical user” means a user covered by one or more categorical standards as defined herein.

“City” means the city of Monroe, Washington.

“Color” means the optical density at the visual wave length of maximum absorption, relative to distilled water. One hundred percent transmittance is equivalent to zero optical density.

“Composite sample” means the sample resulting from the combination of individual wastewater samples taken at selected intervals based on an increment of either flow or time.

“Cooling water” means water used for cooling purposes generated from any use, such as air conditioning, heat exchangers, cooling or refrigeration. For purposes of this chapter, such waters are further divided into two subcategories:

1. Uncontaminated. Water to which the only pollutant added is heat, which has no direct contact with any raw material, waste, intermediate, or final product, and which does not contain a level of contaminants detectably higher than that of the intake water.

2. Contaminated. Water likely to contain levels of pollutants detectably higher than intake water. This includes water contaminated through any means, including chemicals added for water treatment, corrosion inhibition, or biocides, or by direct contact with any process materials, products, and/or wastewater.

“Department, the (Ecology)” means the Washington State Department of Ecology or authorized representatives thereof.

“Director” means the city of Monroe director of public works, designated by the city to supervise the operation of the POTW, and who is charged with certain duties and responsibilities by this chapter, and specifically including his/her duly authorized representative or inspector.

“Dishwasher” means an automated device which uses chemicals and water to clean or sanitize kitchenware and/or other apparatus used for food preparation and/or food service.

“Domestic user” means any person who contributes, causes, or allows the discharge of wastewater into the city of Monroe POTW that is similar in volume and/or chemical makeup to domestic wastewater. For comparison, the director may assume discharges of domestic wastewater from dwelling units to be one hundred gallons containing two-tenths pound of BOD, and two-tenths of a pound of TSS per capita per day, or as identified in the design of the POTW.

“Domestic wastewater” means wastewater from residential kitchens, bathrooms, and laundries, and waterborne human wastes from sanitary facilities in all other buildings, together with such groundwater infiltration or surface waters as may be present.

“Environmental Protection Agency (EPA)” means the U.S. Environmental Protection Agency or, where appropriate, the regional water management division director, or other duly authorized official of said agency.

“Existing source” means any categorical user which discharges wastewater to the POTW, the construction or operation of which commenced prior to the publication of proposed categorical pretreatment standards which will be applicable to such source if the standard is thereafter promulgated in accordance with Section 307 of the Act.

“Existing user” means any industrial user not subject to categorical pretreatment standards which discharges wastewater to the POTW prior to the effective date of the ordinance codified in this chapter.

“Fats, oils and grease (FOG)” means those components of wastewater amenable to measurement by the methods described in Standard Methods for the Examination of Water and Wastewater, 19th Edition, 1995. The term “fats, oils and grease” shall include polar and nonpolar fats, oils and grease and other components extracted from wastewater by these methods.

“Food service establishment (FSE)” means a place where food or drink is regularly prepared for consumption on the premises or elsewhere at least twelve times annually, including without limitation restaurants, bakeries, delis, cafeterias, concession stands, and kitchens associated with community centers, churches, grocery stores, hospitals, hotels, motels, nursing homes, prisons and schools, but excluding residential kitchens.

“Grab sample” means a sample which is taken from a waste stream on a one-time basis without regard to the flow in the waste stream and without consideration of time.

“Gravity grease interceptor (GGI)” means an interceptor with a capacity of at least five hundred gallons to serve one or more fixtures and which shall be sized, plumbed and remotely located pursuant to the Uniform Plumbing Code currently in use and MMC 13.10.140(B).

“Hydromechanical grease interceptor (HGI)” means a device designed to retain grease from one or more fixtures which shall be sized and plumbed pursuant to the Uniform Plumbing Code currently in use and MMC 13.10.140(B).

“Indirect discharge” or “discharge” means the introduction of pollutants into the POTW from any nondomestic source regulated under Section 307(b), (c), or (d) of the Act. The discharge into the POTW is normally by means of pipes, conduits, pumping stations, force mains, constructed drainage ditches, surface water intercepting ditches, and all constructed devices and appliances appurtenant thereto.

“Industrial wastewater” means water- or liquid-carried waste from any industry, manufacturing operation, trade, or business which includes any combination of process wastewater, cooling water, contaminated storm water, contaminated leachates, or other waters such that the combined effluent differs in some way from purely domestic wastewater, or is subject to regulation under Federal Categorical Pretreatment Standards, the State Waste Discharge Permit Program, or this chapter.

“Interceptor” means interceptor as defined by Section 211.0 of the Uniform Plumbing Code currently in use.

“Interference” means the effect of a discharge or discharges on the POTW from one or more users which results in either (1) inhibition or disruption of the POTW, its treatment processes or operations, or its sludge processes, use or disposal; (2) violation of any permit regulating the city of Monroe wastewater discharge or sewage sludge; or (3) prevention of sewage sludge use or disposal in compliance with any applicable statutory or regulatory provision or permit issued thereunder. [Applicable sludge regulations shall include Section 405 of the Clean Water Act (33 USC 1345 et seq.); the Solid Waste Disposal Act (SWDA), including Title II, commonly referred to as the Resource Conservation and Recovery Act (RCRA) (42 USC 6901 et seq.); state regulations contained in any state sludge management plan prepared pursuant to Subtitle D of the SWDA; the Clean Air Act (42 USC 7401 et seq.); the Toxic Substances Control Act (TSCA) (15 USC 2601 et seq.); the Marine Protection, Research, and Sanctuaries Act (33 USC et seq.); and 40 CFR Part 503.]

“Maximum allowable discharge limit” means the maximum concentration of a pollutant allowed to be discharged at any time, determined from the analysis of any discrete or composited sample collected, independent of the industrial flow rate and the duration of the sampling event.

“Medical wastes” means isolation wastes, infectious agents, human blood and blood products or byproducts, pathological wastes, sharps, body parts, fomites, etiologic agents, contaminated bedding, surgical wastes, potentially contaminated laboratory wastes, and dialysis wastes.

“Minor industrial user (MIU)” means an industrial user of the POTW identified by the city that discharges a waste stream which, when taken with the waste stream from other minor industrial users, may have a significant impact on the POTW. MIUs without process discharge waste streams that have potential for accidental spills to the sewer may be subject to ASPP/SCP requirements.

“New source” means:

1. Any facility constructed after proposed categorical standards applicable to operations conducted at the facility were published, provided the facility is or may be a source of discharge to the POTW; and:

   a. The building, structure, facility, or installation is constructed at a site at which no other source is located; or

   b. The new construction totally replaces the process or production equipment that causes the discharge of pollutants at an existing source; or

   c. The production or wastewater-generating processes of the building, structure, facility, or installation are substantially independent of an existing source at the same site.

2. Construction of a new source as defined under this subsection has commenced if the owner or operator has either (a) begun, or caused to begin, any placement, assembly, or installation of facilities or equipment; (b) begun, or caused to begin, significant site preparation work including removal of existing facilities necessary for the emplacement of new source facilities or equipment; or (c) entered into a binding contractual obligation for the purchase of facilities or equipment for use in operation of a new source within a reasonable time.

“New user” means any noncategorical user that plans to discharge a new source of wastewater to the city of Monroe collection system after the effective date of the ordinance codified in this chapter. This discharge may be from either a new or an existing facility. Any person that buys an existing facility discharging nondomestic wastewater will be considered an "existing user" if no significant changes in facility operation are made and wastewater characteristics are not expected to change.

"Pass through" means a condition occurring when discharges from users (singly or in combination) exit the POTW in quantities or concentrations which either (1) cause a violation of any requirement of a city of Monroe NPDES; or (2) cause an increase in the magnitude or duration of a violation.

"Permittee" means any person or user issued a wastewater discharge permit by a state or federal agency with jurisdiction.

"Person" means any individual, partnership, firm, company, corporation, association, joint stock company, trust, estate, any federal, state, or local governmental agency or entity, or any other entity whatsoever; or their legal representatives, agents, or assigns.

"pH" means a measure of the acidity or alkalinity of a substance, expressed in standard units. (Technically defined as the logarithm of the reciprocal of the mass of hydrogen ions in grams per liter of solution.)

"Pollutant" means any substance, either liquid, gaseous, solid, or radioactive, discharged to the POTW which, if discharged directly, would alter the chemical, physical, thermal, biological, or radiological properties of waters of the state of Washington including pH, temperature, taste, color, turbidity, oxygen demand, toxicity, or odor. This includes any discharge likely to create a nuisance or render such waters harmful, detrimental or injurious to any beneficial uses, terrestrial or aquatic life, or to public health, safety or welfare.

"Pollution prevention" means source reduction; protection of natural resources by conservation; or increased efficiency in the use of raw materials, energy, water or other resources.

"Pretreatment" means the reduction of the amount of pollutants, the elimination of pollutants, or the alteration of the nature of pollutant properties in wastewater prior to (or in lieu of) introducing such pollutants into the POTW. This reduction or alteration can be obtained by physical, chemical, or biological processes; by process changes; or by other means (except by diluting the concentration of the pollutants unless allowed by an applicable pretreatment standard).

"Pretreatment requirements" means any substantive or procedural local, state, or federal requirement related to pretreatment developed under Chapter 90.48 RCW and/or Sections

307 and 402 of the Clean Water Act.

“Pretreatment standards” or “standards” means any pollutant discharge limitations including categorical standards, state standards, and limits in MMC 13.10.080 applicable to the discharge of nondomestic wastes to the POTW. The term shall also include the prohibited discharge standards of this chapter, WAC 173-216-060, and 40 CFR Part 403.5.

“Prohibited discharge standards” or “prohibited discharges” means absolute prohibitions against the discharge of certain substances; these prohibitions appear in MMC 13.10.050.

“Publicly owned treatment works (POTW)” means a treatment works, as defined by Section 212 of the Act (33 USC 1292) which is owned by the city of Monroe. This definition includes any devices or systems used in the collection, storage, treatment, recycling, and reclamation of sewage or industrial wastewater and any conveyances which convey wastes to a wastewater treatment plant. The term shall also mean the city of Monroe.

“Septage” means the liquid and solid material pumped from a septic tank, cesspool, or similar domestic sewage treatment system. This includes liquids and solids from domestic holding tanks, chemical toilets, campers, and trailers, when these systems are cleaned or maintained.

“Severe property damage” means substantial physical damage to property, damage to the treatment facilities which causes 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. Severe property damage does not mean economic loss caused by delays in production.

“Sewage” or “wastewater” means water-carried human wastes or a combination of water-carried wastes from residences, business buildings, institutions and industrial establishments, together with such ground, surface, storm, or other waters as may be present.

“Sewer” means any pipe, conduit, ditch, or other device used to collect and transport sewage.

“Shall” means a mandatory requirement.

“Significant industrial user” means:

1. A user subject to categorical pretreatment standards;

2. A user that:

   a. Discharges an average of twenty-five thousand gpd or more of process wastewater to the POTW (excluding sanitary, noncontact cooling, and boiler blowdown wastewater); or

b. Contributes a process waste stream which makes up five percent or more of the average dry weather hydraulic or organic capacity of the POTW treatment plant; or

c. Is designated as such by the department with input from the city of Monroe on the basis that it, alone or in conjunction with other sources, has a reasonable potential for adversely affecting the POTW's operation or for violating any pretreatment standard or requirement;

3. Upon a finding that a user meeting the criteria in subsection (2) of this definition has no reasonable potential for adversely affecting the POTW's operation or for violating any applicable pretreatment standard or requirement, the department may at any time, on its own initiative or in response to a petition received from a user or the city of Monroe and in accordance with procedures in 40 CFR 403.8(f)(6), determine that such user should not be considered a significant industrial user.

"Significant noncompliance (SNC)" shall refer to a violation or pattern of violation of one of the following natures:

1. Chronic violations of wastewater discharge limits, defined here as those in which sixty-six percent or more of all wastewater measurements taken during a six-month period exceed the daily maximum limit or average limit for the same pollutant parameter by any amount;

2. Technical review criteria (TRC) violations, defined here as those in which thirty-three percent or more of all wastewater measurements taken for each pollutant parameter during a six-month period equal or exceed the product of the daily maximum limit or the average limit multiplied by the applicable TRC (one and four-tenths for BOD, TSS, fats, oils and grease, and one and two-tenths for all other pollutants except pH);

3. Any other discharge violation that the city of Monroe believes has caused, alone or in combination with other discharges, interference or pass through (including endangering the health of city of Monroe personnel or the general public);

4. Any discharge of pollutants that has caused imminent endangerment to human health, welfare or to the environment, or has resulted in the city of Monroe's exercise of its emergency authority to halt or prevent such a discharge;

5. Failure to meet, within ninety days after the scheduled date, a compliance schedule

milestone contained in a wastewater discharge permit or enforcement order for starting construction, completing construction, or attaining final compliance;

6. Failure to provide, within thirty days after the due date, any required reports, including baseline monitoring reports, periodic self-monitoring reports, and reports on compliance with compliance schedules;

7. Failure to accurately report noncompliance; or

8. Any other violation(s) which the director determines will adversely affect the operation or implementation of the local pretreatment program; provided, however, that nothing herein shall be interpreted to permit or require the director to take action regarding violations or alleged violations of the terms of a state permit or state statute or regulation.

"Sludge" means any solid, semisolid or liquid residue generated by the weight processes of a domestic treatment works or the wastewater treatment plant. "Sludge" includes, but is not limited to, domestic septage, scum or solids removed in primary, secondary or advanced wastewater treatment processes and any material derived from sewage sludge. "Sludge" does not include ash generated during the firing of sludge in a sludge incinerator or grit in screenings generated during preliminary treatment of domestic sewage in a treatment works. For the purposes of this chapter, scum which is not combined with the solids removed in primary, secondary or advanced wastewater treatment process is not considered to be sludge.

"Slug load" means any pollutant released in a discharge at a flow rate or concentration which could violate this chapter, or any discharge of a nonroutine, episodic nature such as an accidental spill or a noncustomary batch discharge.

"Standard industrial classification (SIC) code" means a classification pursuant to the Standard Industrial Classification Manual issued by the United States Office of Management and Budget.

"State" means the state of Washington.

"Storm water" means any flow occurring during or following any form of natural precipitation and resulting from such precipitation, including snowmelt.

"Total suspended solids" means the total suspended matter that floats on the surface of, or is suspended in, water, wastewater, or other liquids, and which is removable by laboratory filtering.

“Toxic pollutant” means one or a combination of the pollutants listed as toxic in regulations promulgated by the EPA under Section 307 (33 USC 1317) of the Act.

“Treatment plant effluent” means the discharge from the city of Monroe POTW.

“Upset” means an exceptional incident in which there is unintentional and temporary noncompliance with applicable pretreatment standards because of factors beyond the reasonable control of the user. 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.

“User” or “industrial user” means any nondomestic source of wastewater discharged to the POTW. This excludes “domestic users” as defined herein.

Wastewater. See “Sewage.”

“Wastewater discharge permit (industrial wastewater discharge permit, discharge permit)” means an authorization or equivalent control document issued by the department to users discharging wastewater to the POTW. The permit may contain appropriate pretreatment standards and requirements as set forth in this chapter.

“Wastewater treatment plant” or “treatment plant” means that portion of the POTW designed to provide treatment of sewage as defined herein. (Ord. 004/2014 § 1; Ord. 011/2004)

13.10.040 Abbreviations.

The following abbreviations shall have the designated meanings:

A. ASPP/SCP. Accidental spill prevention plan/slug control plan requirement;

B. AKART. All known, available, and reasonable means of prevention, control, and treatment (see MMC 13.10.030, Definitions);

C. BOD. Biochemical oxygen demand;

D. CFR. Code of Federal Regulations;

E. COD. Chemical oxygen demand;

F. EPA. U.S. Environmental Protection Agency;

G. gpd. Gallons per day;

H. l. Liter;

I. LEL. Lower explosive limit;

J. mg. Milligrams;

K. mg/l. Milligrams per liter;

L. NPDES. The National Pollutant Discharge Elimination System as defined under Section 402 of the Clean Water Act;

M. O&M. Operation and maintenance;

N. POTW. Publicly owned treatment works;

O. RCRA. Resource Conservation and Recovery Act (42 USC 6901, et seq.);

P. SIC. Standard industrial classifications;

Q. SIU. Significant industrial user;

R. SWDA. Solid Waste Disposal Act (42 USC 6901, et seq.);

S. TSS. Total suspended solids;

T. USC. United States Code.

Note: With regards to abbreviations above, the use of the singular shall be construed to include the plural and the plural shall include the singular as indicated by the context of its use. (Ord. 011/2004)

13.10.050 Prohibited discharge standards.

A. General Prohibitions. No user shall introduce or cause to be introduced into the POTW any pollutant or wastewater which causes pass through or interference. These general prohibitions apply to all users of the POTW whether or not they are subject to categorical pretreatment standards or any other national, state, or local pretreatment standards or requirements (40 CFR 403.5(a) and WAC 173-216-060(2)(b)(i)).

B. Specific Prohibitions. No user shall introduce or cause to be introduced into the POTW the following pollutants in any form (solid, liquid, or gaseous):

1. Any pollutant which either alone or by interaction may create a fire or explosive hazard in the POTW, including, but not limited to, waste streams with a closed-cup

flashpoint of less than one hundred forty degrees Fahrenheit (sixty degrees centigrade) using the test methods specified in 40 CFR 261.21 and 403.5(b)(1), or are capable of creating a public nuisance (WAC 173-216-060(2)(b)(ii)).

2. Any pollutant which will cause corrosive structural damage to the POTW, but in no case discharges with a pH less than 5.5 or more than 9.5, or having any other corrosive property capable of causing damage or hazard to structures, equipment, or personnel of the POTW, unless the system is specifically designed to accommodate such discharge and the discharge is authorized by an applicable wastewater discharge permit (40 CFR 403.5(b)(2) and WAC 173-216-060(2)(b)(iv)).

3. Any solid or viscous substances including fats, oils, and greases in amounts which may cause obstruction to the flow to or in a POTW or other interference with the operation of the POTW (40 CFR 403.5(b)(3) and WAC 173-216-060(2)(b)(iii)). Any fat, oil or grease substance in excess of one hundred ppm shall be presumed to cause obstruction.

4. Any discharge of pollutants, including oxygen-demanding pollutants (BOD, etc.), released at a flow rate and/or pollutant concentration which, either singly or by interaction with other pollutants, is sufficient to cause interference with the POTW (40 CFR 403.5(b)(4) and WAC 173-216-060(2)(b)(vi)).

5. Any waste stream having a temperature which will inhibit biological activity in the treatment plant resulting in interference or cause worker health or safety problems in the collection system. In no case shall wastewater be discharged at a temperature which causes the temperature of the influent to the treatment plant to exceed one hundred four degrees Fahrenheit (forty degrees centigrade) unless the system is specifically designed to accommodate such a discharge, and the discharge is authorized by an applicable wastewater discharge permit (40 CFR 403.5(b)(5) and WAC 173-216-060(2)(b)(v)).

6. Any petroleum oil, nonbiodegradable cutting oil, or products of mineral oil origin, in amounts that will cause interference or pass through (40 CFR 403.5(b)(6) and WAC 173-216-060(2)(b)(i)).

7. Any pollutants which result in the presence of toxic gases, vapors, or fumes within any portion of the POTW in a quantity that may cause acute worker health and safety problems (40 CFR 403.5(b)(7)) and WAC 173-216-060(b)(ii)).

8. Any trucked or hauled wastes unless authorized by the director and at discharge points designated by the city of Monroe and in compliance with all applicable city of

Monroe requirements and during specified hours (40 CFR 403.5(b)(8)).

9. Any noxious or malodorous liquids, gases, solids, or other wastewater which, either singly or by interaction with other wastes, are sufficient to create a public nuisance or a hazard to life, or to prevent entry into the sewers for maintenance or repair (WAC 173-216-060(2)(b)(ii)).

10. Any of the following discharges unless approved by the department under extraordinary circumstances such as the lack of direct discharge alternatives due to combined sewer service or need to augment sewage flows due to septic conditions (WAC 173-216-060(2)(b)(vii)).

a. Noncontact cooling water in significant volumes;

b. Storm water and other direct inflow sources; or

c. Wastewaters significantly affecting system hydraulic loading which do not require treatment or would not be afforded a significant degree of treatment by the POTW.

11. Any dangerous or hazardous wastes as defined in Chapter 173-303 WAC, as amended, except as allowed in compliance with that regulation (WAC 173-216-060(1) and 40 CFR Part 261).

12. Any substance which will cause the POTW to violate its NPDES, state waste discharge or other disposal system permits or causing, alone or in conjunction with other sources, the treatment plant's effluent to fail a toxicity test.

13. Any substance which may cause the POTW's effluent or treatment residues, sludges, or scums to be unsuitable for reclamation and reuse or would interfere with the reclamation process or cause the POTW to be in noncompliance with sludge use or disposal criteria, guidelines or regulations developed pursuant to the federal, state, or local statutes or regulations applicable to the sludge management method being used.

14. Any discharge which imparts color which cannot be removed by the POTW's treatment process such as dye wastes and vegetable tanning solutions, which consequently impart color to the treatment plant's effluent, thereby violating the city of Monroe NPDES permit. Color (in combination with turbidity) shall not cause the treatment plant effluent to reduce the depth of the compensation point for photosynthetic activity in the receiving waters by more than ten percent from the seasonably established norm for aquatic life.

15. Any discharge which causes the transmittance of the POTW final effluent to fall below sixty percent at two hundred fifty-four nanometers.

16. Any discharge containing radioactive wastes or isotopes except as specifically approved by the director in compliance with applicable state or federal regulations including WAC 246-221-190, Disposal by release into sanitary sewage systems and meeting the concentration limits of WAC 246-221-290 Appendix A, Table I, Column 2 and WAC 246-221-300 Appendix B.

17. Any sludges, screenings, or other residues from the pretreatment of industrial wastes or from industrial processes.

18. Any medical wastes, except as specifically authorized by the director.

19. Any detergents, surface-active agents, or other substances in amounts which may cause excessive foaming or other interference in the POTW.

20. Any incompatible substance including, but not limited to, grease, animal guts or tissues, paunch manure, bones, hair, hides or fleshings, entrails, whole blood, whole milk, feathers, ashes, cinders, sand, spent lime, stone or marble dusts, metal, glass, straw, shavings, grass clippings, rags, spent grains, spent hops, waste paper, wood, plastics, gas, tar asphalt residues, residues from refining or processing of fuel or lubricating oil, mud, or glass grinding or polishing wastes.

21. Persistent pesticides and/or pesticides prohibited above the level set by the Federal Insecticide Fungicide Rodenticide Act (FIFRA).

22. Any wastewater which can cause harm either to the sewers, sewage treatment process, or equipment; have an adverse effect on the receiving stream; or can otherwise endanger life, limb, public property, or constitute a nuisance, unless allowed under a legal and binding agreement by the director (except that no waiver may be given to any categorical pretreatment standard).

C. Pollutants, substances, or wastewater prohibited by this section shall not be processed or stored in such a manner that they could be discharged to the POTW. (Ord. 011/2004)

13.10.060 Federal categorical pretreatment standards.

National categorical pretreatment standards as adopted and hereafter amended by the EPA pursuant to the Act shall be met by all users in the regulated industrial categories.

These standards, found in 40 CFR Chapter I, Subchapter N, Parts 405-471, are hereby incorporated by reference. (Ord. 011/2004)

13.10.070 State requirements.

A. State requirements and limitations on discharges to the POTW, as incorporated into Washington State law by Chapter 90.48 RCW, shall be met by all users which are subject to such standards in any instance in which they are more stringent than federal requirements and limitations, or those in this or other applicable ordinances. This includes the requirement to meet AKART as defined herein whenever applicable and more stringent than the limits of MMC 13.10.080, and to comply with the requirements of MMC 13.10.180.

B. Any user determined by the city of Monroe to qualify as a significant industrial user shall file an application for a state waste discharge permit with the department in accordance with the requirements of WAC 173-216-070. Proof of acceptance of the application and payment of permit fees shall be kept at the user's facilities and produced upon request by the city of Monroe. Failure to submit the application or rejection of the application by the department may be considered sufficient grounds to terminate or refuse to provide sewer service pursuant to written notice and order to correct. (Ord. 011/2004)

13.10.080 Local limits.

A. The following pollutant limits are established to protect against pass through and interference. No person shall discharge wastewater containing in excess of the following daily maximum allowable discharge limits:

Metal	mg/l
Arsenic	0.384
Cadmium	0.285
Copper	0.780
Lead	0.799
Mercury	0.003
Nickel	2.120
Selenium	0.165
Zinc	4.020
Molydenum	0.160

B. The above limits apply to the end of any process or combination of processes identified to have a potential discharge of this pollutant. All concentrations for metallic substances are for total metal unless indicated otherwise. The city may impose mass limitations in addition to or in place of the concentration-based limitations above. Where a user is subject to a categorical pretreatment standard and a local limit for a given pollutant, the more stringent limit or applicable pretreatment standard shall apply. (Ord. 011/2004)

13.10.090 City of Monroe's right of revision.

The city of Monroe reserves the right to establish more stringent standards or requirements on discharges to the POTW. (Ord. 011/2004)

13.10.100 Special agreement.

A. The city may enter into agreements with users to accept pollutants compatible with the treatment system at concentrations greater than those typical of domestic wastewater. Within such agreements, the city of Monroe may establish terms of the user's discharge to the POTW including maximum flow rates and concentrations. The city of Monroe may also establish fees to recover costs associated with treating such wastes and monitoring schedules in such agreements. Such fees shall provide for an equitable system of cost recovery adequate to fully recover all identifiable costs. In no case will a special agreement waive compliance with a state or federal pretreatment standard or requirement including categorical standards.

B. Users discharging or intending to discharge pollutants other than BOD and TSS, and claiming compatibility, must prove to the satisfaction of the director that such pollutants are compatible with the POTW. The director may required any claim of compatibility to be endorsed by the department.

C. Within the limits of the city's resources, expertise and legal authority, the city may assist, by arrangement or formal agreement, any agencies that regulate hazardous wastes and materials and air emissions from users in order to maximize state, county, and city resources.

D. The city may facilitate compliance by requesting pollution prevention technical assistance for users, especially those in violation of pretreatment standards. The director intends to request such assistance in coordination and cooperation with the appropriate local, county, and state authority(ies). (Ord. 011/2004)

13.10.110 Dilution.

No user shall ever increase the use of water, nor combine separate waste streams, or in any way attempt to dilute a discharge, as a partial or complete substitute for adequate treatment to achieve compliance with an applicable pretreatment standard or requirement unless expressly authorized by an applicable pretreatment standard or requirement. The director may request the department impose mass limitations on users which he/she believes may be using dilution to meet applicable pretreatment standards or requirements, or in other cases when the imposition of mass limitations is appropriate. (Ord. 011/2004)

13.10.120 Pretreatment facilities.

A. Users shall procure and properly install, operate, and maintain the pretreatment facilities which, combined with appropriate best management practices, are necessary to achieve AKART as defined herein. Such pretreatment facilities shall be designed to achieve compliance with all applicable pretreatment standards and requirements within the time limitations specified by the EPA or the state, whichever is more stringent. Detailed plans showing the pretreatment facilities and operating procedures shall be submitted to the department for review and approval in accordance with the procedures of Chapter 173-240 WAC, and shall be disclosed to the city of Monroe before construction of the facility. The review of such plans and operating procedures will in no way relieve the user from the responsibility of modifying its facility as necessary to produce a discharge acceptable to the city of Monroe and/or the department and meet discharge limitations under the provisions of this chapter. Such facilities shall be provided, operated, and maintained at the user’s expense.

B. Users shall comply with approved engineering reports, plans and specifications, and operations and maintenance manuals, and shall modify such documents to reflect any proposed modifications of industrial wastewater (pretreatment) facilities. Users shall submit proposals to modify pretreatment facilities to the department before implementation in accordance with Chapter 173-240 WAC. Users shall submit a copy of such revised plans and the department’s acceptance to the director before implementing changes to approved pretreatment facilities. The director may audit the compliance of any user, and require changes in operating procedures deemed necessary by the director to ensure continued compliance with applicable pretreatment standards and requirements. (Ord. 011/2004)

13.10.130 Deadline for compliance with applicable pretreatment requirements.

A. Existing sources (as defined herein) to which one or more categorical pretreatment standard is applicable shall comply with all applicable standards within three years of the date the standard is effective unless the pretreatment standard includes a more stringent compliance schedule. The department shall establish a final compliance deadline date for any existing user (as defined herein) or any categorical user when the local limits for said user are more restrictive than EPA’s categorical pretreatment standards.

B. New sources and new users as defined herein shall comply with applicable pretreatment standards within the shortest feasible time. In no case shall such time exceed ninety days from beginning a discharge. Prior to commencing discharge, such users shall have all pollution control equipment required to meet applicable pretreatment standards installed and in proper operation. (Ord. 011/2004)

13.10.140 Additional pretreatment measures.

A. Whenever deemed necessary, the director may require users and specifically users with a history of significant noncompliance to comply with such conditions as may be necessary to protect the POTW and determine the user's compliance with the requirements of this chapter. Such measures may include restricting a discharge during peak flow periods; designating that certain wastewater be discharged only into specific sewers; requiring relocation and/or consolidation of discharge points; and/or separating sewage waste streams from industrial waste streams.

B. Any FSE which washes food preparation and/or food service equipment, appliances, utensils and/or containers on site shall install and utilize a city-approved interceptor. All plumbing fixtures, garbage disposals, dishwashers, floor drains and cooking equipment with drain connections shall be plumbed to an appropriate interceptor approved by the public works director. Food service establishments with dishwashers and/or garbage grinders shall be required to install a gravity grease interceptor (GGI). Food service establishments without dishwashers and garbage grinders shall be required to install a hydromechanical grease interceptor (HGI). Interceptors shall be sized and installed in accordance with the city's currently adopted plumbing code.

C. Grease, oil, and sand interceptors or traps shall be required when they are necessary for the proper handling of wastewater containing grease and oil in excess of the limits in MMC 13.10.050(B)(3) or excessive amounts of sand or other settleable solids. Such interceptors shall not be required for domestic users. All interceptors shall be of type and capacity approved by the director and shall be located to be easily accessible for cleaning and inspection. Each user shall maintain, inspect, and clean required interceptors or traps on a schedule that ensures they capture the intended pollutants and prevents their reintroduction into the storm or sanitary sewer systems. Users shall bear all expenses related to installation, maintenance, and repair of interceptors and the proper disposal of removed materials.

D. Users with the potential to discharge flammable substances may be required to install and maintain an approved combustible gas detection meter.

E. The director may require a user discharging more than ten thousand gallons per day or ten percent of the average daily flow in the POTW, whichever is less, to install and maintain, on its property and at its expense, a suitable storage and flow-control facility to ensure equalization of flow over a twenty-four-hour period. The facility shall have a capacity for at least fifty percent of the daily wastewater discharge volume and shall be equipped with alarms and a rate of discharge controller. The director shall direct the control of discharges. The city may require the user to obtain a wastewater discharge permit solely for flow equalization or to develop a slug discharge control plan (below). (Ord. 004/2014 § 2; Ord. 011/2004)

13.10.150 Accidental spill/slug discharge control plans.

A. The director may require any user to install, properly operate, and maintain, at its own expense, facilities to prevent slug loads or accidental discharges of pollutants to the POTW. The director may require users to produce and/or implement spill plans developed in compliance with applicable OSHA, health, fire, and department regulations applicable to discharges to POTWs. When such plans are required by the director they shall contain at least the following elements:

1. A description of all wastewater discharge practices, including nonroutine batch discharges;

2. A description of any and all stored chemicals which have a reasonable potential to reach the sewer in the event of a spill;

3. Procedures for immediately notifying the director of any accidental or slug load discharges, with procedures for follow-up written notification within five days; and

4. Procedures to prevent adverse impact from any accidental or slug load discharge, including, but not limited to, the following: inspection and maintenance of chemical storage areas; handling and transfer of materials; loading and unloading operations; control of runoff, which has a reasonable potential to reach the sewer, worker training; construction of containment structures or equipment; and measures for emergency response.

B. Users shall verbally notify the director immediately upon the occurrence of a slug load or accidental discharge of substances regulated by this chapter and take immediate actions to correct the situation. Such notification shall include the following information: (1) the location of discharge, (2) the date and time thereof, (3) the type of waste, (4) the waste concentration and volume, and (5) the corrective actions taken and planned. The user shall follow up with a written notification to the director containing the same information within seven days following the discharge.

C. Any user who discharges an accidental discharge or slug load shall be liable for (1) recovery of any resultant expenses, losses, and damages to the POTW; (2) recovery of any fines or settlements levied upon the city by any government agency or court of competent jurisdiction attributable to the discharge; and (3) applicable fines and penalties assessed upon the user by the city of Monroe for noncompliance with this chapter. (Ord. 011/2004)

13.10.160 Septage and liquid hauled wastes.

A. Septage (as defined in MMC 13.10.030) and liquid hauled wastes shall be introduced into the POTW only at the designated receiving structure within the treatment plant area at such times as are established by the director. No load may be discharged without prior consent of the director.

B. Septage shall not violate any discharge prohibition or standard of this chapter or any other requirements established or adopted by the city.

C. Septage and liquid waste haulers must provide the director a waste-tracking form for every load when discharged. This form shall include, at a minimum, the name and address of the waste hauler, city septage permit number, truck identification, addresses of the sources of waste, and volume and characteristics of waste.

D. Haulers of liquid wastes other than septage shall provide full disclosure to the director of the source(s) of the wastewater, and such additional information as required by the director to characterize the wastewater. The director may issue an authorization on his/her own authority, or require haulers of nondomestic wastewater to obtain a waste discharge permit prior to authorizing the discharge. No authorization to discharge such wastewater shall be granted until the director has determined to his satisfaction that the wastewater complies with all applicable discharge standards, prohibitions, and requirements of this chapter.

E. The director shall exercise absolute discretion in whether to accept any load of septage or liquid hauled wastes. In determining whether to accept a load, the director may collect samples of each hauled load and/or require the hauler to provide a wastewater analysis of any load prior to discharge.

F. Fees for discharge of septage or liquid hauled wastes will be established as part of the user fee system as authorized in this chapter. (Ord. 004/2014 § 3; Ord. 011/2004)

13.10.170 Requirements to complete industrial user surveys.

The director shall periodically notify new, existing, and potential users of the requirement to complete an industrial user survey form. Upon notification, users shall fully and accurately complete the survey form, and return the completed form to the director within thirty days of receipt. Each user shall maintain a copy of the latest completed survey form at their place of business. Failure to fully or accurately complete a survey form or to maintain the latest survey form on the premises where a wastewater discharge is occurring shall be a violation of this chapter. (Ord. 011/2004)

13.10.180 Wastewater discharge permitting – Requirements for discharge.

A. No significant industrial user (SIU) shall discharge wastewater into the POTW without first obtaining a statement from the director that the POTW has the hydraulic and/or loading capacity to accept the discharge. Each SIU must also comply with the state requirements listed in MMC 13.10.070, and in particular, apply for and receive a wastewater discharge permit from the department which authorizes the discharge. The director may require proof of application as a condition of new or continued discharge. Obtaining a wastewater discharge permit does not relieve an SIU of his/her obligation to comply with all federal and state pretreatment standards or requirements or with any other requirements of federal, state, and local regulation including the requirement for applying AKART.

B. The director may require other users, including liquid waste haulers, to apply for, and obtain, applicable wastewater discharge permits as necessary to carry out the purposes of this chapter.

C. The director may also establish, and require users by letter, permit, or rule, to implement those best management practices determined by the director to be representative of AKART, or following violation to discontinue use of any substance which has caused such violation and for which an effective substitute is available which will either (1) lessen the potential for violating this chapter or any water quality standard, or (2) may represent a significant decrease either singly, or in combination with other similar users, in the toxicity of pollutant loadings to the POTW.

D. The city encourages all users seeking authorization to discharge to the POTW to complete a pollution prevention review before submitting their request to discharge to the director. The city may require users who must submit a pollution prevention plan under the state’s Hazardous Waste Reduction Act to provide this plan to the director as a condition of initial or continued discharge.

E. Whenever a moratorium has been imposed upon the POTW preventing the addition of new users, the director may require any or all users of the POTW to develop plans to reduce their discharges through water reuse, recycling, reclamation or other applicable management practices and to implement such plans or other measures deemed appropriate by the director to preserve the availability of public sewage treatment services. (Ord. 011/2004)

13.10.190 Permit requirements for dangerous waste constituents.

A. Users discharging a waste stream containing dangerous wastes as defined in Chapter 173-303 WAC (listed, characteristic, or criteria wastes) are required to comply with the following permit provisions:

1. Obtain a written authorization to discharge the waste from the director, and either obtain specific authorization to discharge the waste in a state waste discharge permit issued by the department or accurately describe the waste stream in a permit obtained pursuant to RCW 90.48.165. The description shall include at least:

a. The name of the dangerous waste as set forth in Chapter 173-303 WAC and the dangerous waste number;

b. The mass of each constituent expected to be discharged;

c. The type of discharge (continuous, batch, or other).

2. Compliance shall be obtained on the following schedule:

a. Before discharge for new users;

b. Within thirty days after becoming aware of a discharge of dangerous wastes to the POTW for existing users; and

c. Within ninety days after final rules identifying additional dangerous wastes or new characteristics or criteria of dangerous waste are published for users discharging a newly listed dangerous waste. (Ord. 011/2004)

13.10.200 Disclosure of records.

Each user shall have available at the location of discharge all records and reports required by this chapter, any applicable state and federal regulation, or any permit or order issued thereunder.

Each user shall make such records available for review by the director during business hours, when activities are being conducted at the facility, and at all reasonable times. Failure to comply with this provision is a violation of this chapter. (Ord. 011/2004)

13.10.210 Reports from unpermitted users.

All users not obligated to obtain a wastewater discharge permit from the department shall provide appropriate reports to the city of Monroe as the director may require. The director shall determine the schedule and format of such reports, and the pollutant properties, flow rates, and other pertinent information to be reported. (Ord. 011/2004)

13.10.220 Reporting requirements for dangerous waste constituents.

Any user discharging one hundred kg or more of dangerous waste in any calendar month to the POTW where the pollutants are not reported through self-monitoring under an applicable state waste discharge permit shall report to the director and the department the following information to the extent that it is known or readily available to the user:

A. The name of the dangerous waste as set forth in Chapter 173-303 WAC, and the dangerous waste number;

B. The specific hazardous constituents;

C. The estimated mass and concentration of such constituents in waste streams discharged during the calendar month;

D. The type of discharge (continuous, batch, or other); and

E. The estimated mass of dangerous waste constituents in waste streams expected to be discharged in the next twelve months. (Ord. 011/2004)

13.10.230 Record keeping.

A. Users subject to this chapter shall retain, and make readily available for inspection and copying, all records of information maintained to comply with this chapter, a state waste discharge permit, or approved operations and maintenance procedures (inspections, lubrication, repair, etc.) relating to activities regulated by this chapter. Users subject to monitoring requirements shall keep records of all monitoring activities whether required or voluntary.

B. Monitoring records shall include the date, exact place, method, and time of sampling; the name of the person(s) taking the samples; the dates analyses were performed; who performed the analyses; the analytical techniques or methods used; and the results of such analyses.

C. These records shall remain available for a period of at least three years. This period shall be automatically extended for the duration of any litigation concerning the user or POTW or where the director has specifically notified the user that a longer retention period is required. (Ord. 011/2004)

13.10.240 Sampling requirements for users.

A. Applicable Requirements. Users which discharge to the POTW shall abide by all applicable wastewater monitoring requirements of this chapter, any applicable order, and any state or federal regulation or permit, including a state waste discharge or NPDES permit. The director may require self-monitoring as a requirement of discharge to the POTW or may conduct city of Monroe monitoring of any discharge to the POTW.

B. Categorical User Sampling Requirements. Categorical users with combined discharges shall measure flows and pollutant concentrations necessary to allow use of the combined waste stream formula of 40 CFR 403.6(e). Where feasible, such users shall sample immediately downstream from any pretreatment facilities, unless the department determines end-of-pipe monitoring to be more stringent or applicable.

C. Noncategorical Users. All other users, where required to sample, shall measure the flows and pollutant concentrations necessary to evaluate compliance with pretreatment standards and requirements.

D. Data Required. Users which analyze wastewater samples shall record and report, with the sampling results, the information required by MMC 13.10.230(B). All required reports shall also certify that the samples are representative of normal work cycles and wastewater discharges from the user. Whenever a user analyzes wastewater samples for any regulated pollutant more frequently than required, using methodologies in 40 CFR Part 136, the results of such analyses shall be submitted with the next required wastewater discharge report. Reports containing incomplete information shall not demonstrate compliance with this chapter or a wastewater discharge permit. (Ord. 011/2004)

13.10.250 Analytical requirements.

Users shall ensure that all wastewater analyses required to be reported with the exception of flow, temperature, settleable solids, conductivity, and pH shall be performed by a laboratory registered or accredited under the provisions of Chapter 173-50 WAC. Sampling and analysis techniques used in collection, preservation, and analysis shall be in accordance with 40 CFR Part 136, unless otherwise specified in an applicable categorical pretreatment standard. Where 40 CFR Part 136 does not contain applicable sampling or analytical techniques for the pollutant in question, sampling and analyses shall be performed in accordance with procedures approved by the EPA or the department. (Ord. 011/2004)

13.10.260 City of Monroe monitoring of wastewater.

The city shall follow the procedures required of users described in MMC 13.10.240 and

13.10.250 whenever conducting wastewater sampling of any industrial user when such sampling is conducted to ensure compliance with this chapter and applicable pretreatment standards and requirements. (Ord. 011/2004)

13.10.270 Right of entry for inspection and sampling.

A. The director shall have the right to enter the facilities of any user to ascertain whether the purpose of this chapter, and any wastewater discharge permit or order issued under this chapter or by the department, is being met and whether the user is complying with all requirements thereof.

B. The director shall have the right to set up on any user's property such devices as are necessary to conduct sampling, compliance monitoring, and/or metering of a user's operations. It shall be the policy of the director to inform the department of such activities where users hold a state waste discharge permit in order to make the results of such sampling available to the department.

C. Users shall allow the director ready access to all parts of the premises for the purposes of inspection, sampling, records examination and copying, and the performance of any additional duties.

D. Where a user has security measures in force which require proper identification and clearance before entry into its premises, the user shall make necessary arrangements with its security guards so that, upon presentation of suitable identification, the director, his or her agents or assigns, and representatives of state and federal authority will be allowed to enter without delay for the purposes of performing their respective duties.

E. Entry to a Washington State Department of Correction Facility (DOC) shall comply with security procedures incorporated in an interlocal agreement between the DOC and the city.

F. Any temporary or permanent obstruction to safe, ready, and easy access to the facility to be inspected and/or sampled shall be promptly removed by the user at the written or verbal request of the director and shall not be replaced. The costs of clearing such access shall be borne by the user.

G. Unreasonable delays or failure to allow the director access to any area to perform functions authorized under this chapter shall be grounds for termination of wastewater treatment services and enforcement as authorized by this chapter. (Ord. 011/2004)

13.10.280 Monitoring facilities.

A. Any user notified by the department or the city of Monroe that monitoring facilities are required shall provide and operate at its own expense a monitoring facility to allow proper inspection, sampling, and flow measurements of each sewer discharge to the POTW. Monitoring facilities shall be situated on the user's premises, unless this would be impractical or cause undue hardship on the user. In such cases, the city of Monroe may allow the user to construct the facility in the public street or sidewalk area, providing it will not be obstructed by landscaping or parked vehicles.

B. When the director or the department determines it is appropriate, they may require a user to construct and maintain monitoring facilities at other locations (for example, at the end of a manufacturing line or wastewater treatment system).

C. There shall be ample room in or near such monitoring facilities to allow accurate sampling and preparation of samples for analysis. The user shall maintain the facility, sampling, and measuring equipment at all times in a safe and proper operating condition at his/her own expense.

D. All wastewater monitoring facilities shall be constructed and maintained in accordance with all applicable construction standards and specifications. All devices used to measure wastewater flow and quality shall be regularly calibrated, but no less frequently than annually, to ensure their accuracy. Calibration records shall be available for inspection of the director. (Ord. 011/2004)

13.10.290 Search warrants.

A. If the director or authorized inspector acting as his/her agent has been refused access to a building, structure or property, or any part thereof, then the director shall seek issuance of a search and/or seizure warrant from the Snohomish County superior court when:

1. There is probable cause to believe that there may be a violation of this chapter;

2. There is a need to inspect, as part of a routine inspection program of the city designed to verify compliance with this chapter, an order issued hereunder or any wastewater discharge permit; or

3. To protect the overall public health, safety and welfare of the community.

Such warrant shall be served at reasonable hours by the director in the company of a uniformed police officer of the city.

B. In the event the director has reason to believe a situation represents an imminent threat to public health and safety, and where entry has been denied or the area is inaccessible, the director may enter in the company of a uniformed police officer, before a requested warrant has been produced, in order to determine if the suspected situation exists, and if so, to take such actions necessary to protect the public; provided, however, that entry to the DOC facility shall be in accord with an interlocal agreement between the parties. (Ord. 011/2004)

13.10.300 Vandalism.

No person shall willfully or negligently break, damage, destroy, uncover, deface, tamper with, or prevent access to any structure, appurtenance or equipment, or other part of the POTW. Any person found in violation of this requirement shall be subject to the sanctions set out in this chapter. (Ord. 011/2004)

13.10.310 Confidential information.

A. Records kept by the city of Monroe with respect to the nature and frequency of discharges from any user shall be available to the public without restriction, unless the user specifically requests, and is able to demonstrate to the satisfaction of the city of Monroe, that the release of such information would divulge information, processes or methods of production entitled to confidentiality under the law.

B. Users shall clearly mark “confidential” on all areas of correspondence they wish to be held confidential from the public and feel is afforded such protection. The city of Monroe shall determine if such information is legally afforded this protection under the law upon receipt of a request for such information. Only information marked “confidential” and determined by the city to legally qualify as such shall be withheld from the public.

C. No correspondence claimed as confidential shall be withheld from any state or federal agency responsible for oversight of the city’s NPDES permit or authority to implement the NPDES, or state or federal pretreatment programs. Wastewater constituents and characteristics, and other effluent data as defined by 40 CFR 2.302 will not be recognized as confidential information and will be available to the public without restriction, unless otherwise exempted from disclosure under RCW 42.17.360, et seq. (Ord. 011/2004)

13.10.320 State responsibility for administrative actions.

The Department is charged with permitting and regulating SIUs discharging to the city POTW. Except for emergency actions, it shall be the policy of the director to forward potential violations in regard to control of such users to the Department until such time as a local pretreatment program for the city may be authorized by the state. Failure to forward a potential violation, however, shall not invalidate any emergency action of the city authorized by this chapter. (Ord. 011/2004)

13.10.330 Notification of violation.

A. Whenever the director finds that any user has violated or is continuing to violate any provision of this chapter, or an order issued hereunder, the director may serve upon such user written notice of the violation.

B. Within ten days of receipt of such notice of violation, the user shall submit to the director an explanation of the violation and a plan to satisfactorily correct and prevent the reoccurrence of such violation(s). The plan shall include specific actions the user will take and the completion dates of each. Submission of this plan in no way relieves the user of liability for any violations occurring before or after receipt of the notice of violation.

C. Nothing in this section shall limit the authority of the city to take any action, including emergency actions or any other enforcement action, without first issuing a notice of violation. (Ord. 011/2004)

13.10.340 Consent orders.

A. The director is hereby empowered to enter into consent orders, assurances of voluntary compliance, or other similar documents establishing an agreement with any user responsible for noncompliance. Such consent orders shall include specific action to be taken by the user to correct the noncompliance within a time schedule also specified by the consent order.

B. Compliance schedules, when included in consent orders, may not extend the compliance date beyond any applicable state or federal deadlines. Consent orders shall have the same force and effect as compliance orders issued pursuant to this chapter, and shall be judicially enforceable.

C. Failure to comply with any terms or requirements of a consent order by the user shall be an additional and independent basis for termination of wastewater services, including collection and treatment, or for any other enforcement action authorized under this chapter and deemed appropriate by the director. (Ord. 011/2004)

13.10.350 Compliance orders.

A. Whenever the director finds that a user has violated, or continues to violate, any provision of this chapter, or order issued hereunder, the director may issue a compliance order to the user responsible for the violation. The order shall specify that wastewater services, including collection and treatment, shall be discontinued and/or applicable penalties imposed unless, within a specified time period, corrective action has been taken in conformance with governing statutes and regulations which is reasonably calculated to remedy the violation.

B. Compliance orders may also contain such other requirements as might be reasonably necessary and appropriate to address the violation or noncompliance, including, but not limited to, the adoption of additional management practices designed to minimize the amount of pollutants discharged to the POTW. A compliance order may not extend the deadline for compliance beyond any applicable state or federal deadlines, nor does a compliance order release the user from liability from any past, present, or continuing violation(s). Issuance of a compliance order shall not be a prerequisite to taking any other action against the user.

C. Failure to comply with any terms or requirements of a compliance order by a user shall be an additional and independent basis for termination of wastewater services, including collection and treatment, or any other enforcement action authorized under this chapter and deemed appropriate by the director. With respect to DOC facilities, service may be reinstated upon cessation of the industrial service or use which reasonably appears to have caused a violation or history of SNC. (Ord. 011/2004)

13.10.360 Administrative show cause hearing.

A. A user shall be afforded the opportunity to an administrative hearing to contest the city’s determination to suspend services, impose penalties, recover costs, or establish compliance schedules. A user shall also have the right to a hearing prior to termination of a user’s wastewater collection and treatment services.

B. Notice shall be served on the user specifying the time and place for the administrative hearing, the proposed enforcement action, the reasons for such action, and a request that the user show cause why the proposed enforcement action should not be taken. The notice of the hearing shall be served on an authorized representative of the user (return receipt requested) at least fifteen days prior to the scheduled hearing date. Standards for such hearing shall be adopted by order of the director.

C. An administrative hearing shall not be a bar against, or prerequisite for, taking any other action against the user. (Ord. 011/2004)

13.10.370 Cease and desist orders.

A. The director may issue a cease and desist order upon finding a user has or is violating this chapter. The decision to issue a cease and desist order shall consider the likelihood that a user’s violations in conjunction with other discharges could cause a threat to the POTW, POTW workers, or the public, or cause pass through, interference, or a violation of the POTW’s NPDES permit. The order issued by the director will direct the user to cease and desist all such violations and to:

1. Immediately cease such actions or discharges as described;

2. Comply with all applicable pretreatment standards and requirements;

3. Take such appropriate remedial or preventive action as may be needed to properly address a continuing or threatened violation, including halting operations and/or terminating the discharge.

B. Issuance of a cease and desist order shall not be a bar against, or a prerequisite for, taking any other action against the user. (Ord. 011/2004)

13.10.380 Emergency suspension of wastewater services.

A. The director may immediately suspend wastewater services, including collection and treatment, after reasonable attempts to provide actual notice to the user, if it appears to the city that such suspension is necessary to stop an actual or threatened discharge which reasonably appears to present or cause an imminent or substantial endangerment to either the environment, normal operation of the POTW, or the health or welfare of any person or the general public.

B. Any user notified of a suspension of its wastewater discharge shall immediately cease all such discharges. In the event of a user's failure to immediately comply voluntarily with the suspension order, the director shall take such steps as deemed necessary, including immediate severance of the sewer connection, to prevent or minimize damage to the POTW, its receiving stream, or the danger to the public. The director may allow the user to recommence its discharge when the user has demonstrated that the period of endangerment has passed, unless termination proceedings pursuant to this chapter are initiated against the user.

C. It shall be unlawful for any person to prevent or attempt to prevent the director and/or city from terminating wastewater collection and treatment services in an emergency situation by barring entry, by physically interfering with city employees or contractors, or by any other means. See MMC 13.10.270(E) for regulation of entry to a DOC facility.

D. A user that is responsible, in whole or in part, for any discharge presenting imminent endangerment shall submit a detailed written statement describing the causes of the harmful contribution and the measures taken to prevent any future occurrence to the director prior to the date of any administrative hearing authorized by this chapter.

E. Nothing in this section shall be interpreted as requiring an administrative hearing prior to any emergency suspension under this section. (Ord. 011/2004)

13.10.390 Termination of treatment services (nonemergency).

A. Subject to the procedures adopted pursuant to MMC 13.10.360, the director shall have authority to terminate wastewater services, including collection and treatment, through the issuance of a termination order to any user upon determining that such user has:

1. Refused access allowed by this chapter, thereby preventing the implementation of any purpose of this chapter;

2. Violated any provision of this chapter including the discharge prohibitions and standards of this chapter; or

3. Violated any lawful order of the city issued with respect to this chapter.

B. For users holding permits to discharge to the city POTW, violation of the following conditions is also grounds for terminating discharge services:

1. Failure to accurately report wastewater constituents or characteristics;

2. Failure to report significant changes in operations or wastewater constituents or characteristics; or

3. Violation of any term or condition of the user’s waste discharge permit.

C. Issuance of a termination order by the city shall not be a bar to, or a prerequisite for, taking any other action against the user. (Ord. 011/2004)

13.10.400 Injunctive relief.

When the director finds that a user has violated (or continues to violate) any provision of this chapter, or order issued hereunder, he/she may petition the Snohomish County superior court through the city attorney for the issuance of a temporary or permanent injunction, as appropriate, to restrain or compel specific compliance with an applicable permit, order, or other requirement imposed by or issued under this chapter on activities of the user. The city may also seek such other action as is appropriate for legal and/or equitable relief, including a requirement for the user to conduct environmental remediation. A petition for injunctive relief shall not be a bar against, or a prerequisite for, taking any other action against a user. (Ord. 011/2004)

13.10.410 Civil penalties.

A. A user which has violated or continues to violate any provision of this chapter or an order issued hereunder shall be liable to the city for a maximum civil penalty of ten thousand dollars per violation per day. Each day upon which a violation occurs or continues shall constitute a separate violation. In the case of noncompliance with monthly or other long-term average discharge limits, penalties shall accrue for each day during the period of such noncompliance.

B. In addition to the penalty amounts assessable under subsection (A) of this section, the director may recover reasonable attorneys' fees, court costs, and other expenses associated with compliance and enforcement activities authorized under this chapter. This shall include recovery of costs for sampling and monitoring, and the cost of any actual damages incurred by the city of Monroe including penalties for noncompliance with the city of Monroe NPDES permit to the extent attributable to the user.

C. The city shall petition the Snohomish County superior court to impose, assess, and recover such sums. In recommending the amount of civil liability, the director shall consider all relevant circumstances, including, but not limited to, the extent of harm caused by the violation, the magnitude and duration, any economic benefit gained through the user's violation, corrective actions by the user, the compliance history of the user, and any other factor as justice requires, and shall present this analysis as evidence in support of the recommended penalty.

D. Filing a suit for civil penalties shall not be a bar against, or a prerequisite for, taking any other action against a user. (Ord. 011/2004)

13.10.420 Criminal prosecution.

A. A user which has willfully or negligently violated any provision of this chapter or order issued hereunder shall, upon conviction, be guilty of a misdemeanor, punishable by a fine of not more than ten thousand dollars per violation, per day, plus costs of prosecution or imprisonment in the county jail not to exceed one year, or by both fine and imprisonment, at the discretion of the Snohomish County superior court.

B. The above provision applies to any user which knowingly makes any false statements, representations, or certifications in any application, record, report, plan, or other documentation filed, or required to be maintained, pursuant to this chapter, wastewater discharge permit, or order issued hereunder, or who falsifies, tampers with, or knowingly renders inaccurate any monitoring device or method required under this chapter.

C. Where willful or negligent introduction of a substance into the POTW causes personal injury or property damage, this action shall be in addition to any other civil or criminal action for personal injury or property damage available under the law. (Ord. 011/2004)

13.10.430 Remedies nonexclusive.

The enforcement provisions of this chapter are not exclusive remedies. The city reserves the right to take any, all, or any combination of these actions concurrently or sequentially against a noncompliant user or to take other actions as warranted by the circumstances. (Ord. 011/2004)

13.10.440 Water supply severance.

Whenever a user has violated or continues to violate any provision of this chapter, a wastewater discharge permit or order issued hereunder, water service to the user may be severed pursuant to procedures adopted under MMC 13.10.360. Service will only recommence, at the user's expense, after it has satisfactorily demonstrated its ability to comply. (Ord. 011/2004)

13.10.450 Public nuisances.

A violation of any provision of this chapter, a wastewater discharge permit, or order issued hereunder, or any other pretreatment standard or requirement is hereby declared a public nuisance and shall be corrected or abated as directed by the director. Any person(s) creating a public nuisance shall be subject to the provisions of Chapter 6.04 MMC governing such nuisances, including reimbursing the city for any costs incurred in removing, abating, or remedying said nuisance. (Ord. 011/2004)

13.10.460 Performance bonds and liability insurance.

The director may decline to reinstate wastewater collection and treatment service to any user whose wastewater services were suspended or terminated under the provisions of this chapter, unless such user, at the sole discretion of the director, either (A) first files with the city a satisfactory bond, payable to the city, in a sum not to exceed a value determined by the director to be necessary to achieve consistent compliance; or (B) first submits proof that the user has obtained financial assurances sufficient to restore or repair POTW damage caused by its discharge. This section shall not apply to the state of Washington or any agency exempted by statute from the posting of a bond. (Ord. 011/2004)

13.10.470 Innovative settlements and supplemental environmental projects.

A. In any enforcement action allowed under this chapter, the director may recommend, and the city may agree to set aside all or portions of the recommended penalty amount in favor of requiring completion of a project of environmental benefit to the POTW of equal or greater value than the proposed penalty. Such projects must be proposed or agreed to in writing by the user.

B. In recommending this option, the director shall consider all relevant circumstances, including, but not limited to, the following criteria: (1) the net environmental benefit, (2) the ability of the project to help achieve or ensure compliance, (3) the willingness of the party to change the circumstances that led to the noncompliance, and (4) the responsible party's technical and financial ability to successfully complete the project.

C. In enforcement actions taken by the department, the city may make written recommendations either for, or against, an innovative settlement agreement with a noncompliant user based on the above criteria. (Ord. 011/2004)

13.10.480 General prohibited discharge standards.

A. The city may allow an affirmative defense to an enforcement action brought against a user for noncompliance with the general and specific prohibitions in MMC 13.10.050(A) and (B)(3) through (B)(7). An affirmative defense requires the user to prove to the satisfaction of the director that:

1. The user did not know or have reason to know that its discharge, alone or in conjunction with discharges from other sources, would cause pass through or interference;

2. The discharge did not change substantially in nature or constituents from the industrial user's prior discharge when the city was regularly in compliance with its NPDES permit; and

3. In the case of interference, the user was in compliance with applicable sludge use or disposal requirements.

B. This defense does not relieve the user from responsibility for enforcement to recover costs as provided under this chapter. (Ord. 011/2004)

13.10.490 Upset.

A. Users shall control production or all discharges to the extent necessary to maintain compliance with applicable pretreatment standards and requirements upon reduction, loss, or failure of its wastewater 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.

B. A user who wishes to establish the affirmative defense of upset to an enforcement action brought for noncompliance with applicable pretreatment standards shall demonstrate, through properly signed, contemporaneous operating logs, or other relevant evidence that:

1. An upset occurred; the user can identify the cause(s) of the upset; and it was not due to improperly designed or inadequate treatment facilities, lack of preventative maintenance, or careless or improper operation;

2. The facility was at the time being operated in a prudent and workmanlike manner and in compliance with applicable operation and maintenance procedures; and

3. The user has submitted the following information to the POTW and the director within twenty-four hours of becoming aware of the upset. If this information is provided orally, the user must submit a written report within five days containing this same information:

a. A description of the indirect discharge and cause of noncompliance;

b. The period of noncompliance, including exact dates and times or, if not corrected, the anticipated time the noncompliance is expected to continue; and

c. Steps being taken and/or planned to reduce, eliminate, and prevent recurrence of the noncompliance.

C. Users will only have the opportunity for a judicial determination on a claim of upset in an enforcement action brought for noncompliance with applicable pretreatment standards. In any such enforcement proceeding, the user seeking to establish the occurrence of an upset shall have the burden of proof. (Ord. 011/2004)

13.10.500 Bypass.

A. A user may allow a bypass to occur if it does not cause applicable pretreatment standards or requirements to be violated and if it is for essential maintenance to ensure efficient wastewater treatment operations. These bypasses are subject to the provision of subsections (B) and (C) of this section.

B. Requirements for bypasses subject to pretreatment standards or requirements:

1. If a user knows in advance of the need for a bypass, it shall submit prior notice to the POTW, at least ten days before the date of the bypass, if possible.

2. A user shall give verbal notification to the director of an unanticipated bypass that exceeds applicable pretreatment standards within twenty-four hours of becoming aware of the bypass, and submit a written report to the director within five days of becoming aware of the bypass.

3. The written report shall contain a description of the bypass and its cause; the duration of the bypass, including exact dates and times; the anticipated time when any ongoing bypass is expected to be halted; and the steps taken or planned to reduce, eliminate, and prevent reoccurrence of the bypass. The director may waive the written report if the verbal notification has been received within twenty-four hours.

C. Exceptions. Bypass is prohibited, and the POTW may take an enforcement action against a user for a bypass, unless:

1. The bypass was unavoidable to prevent loss of life, personal injury, or severe property damage (as defined herein);

2. There were no feasible alternatives to the bypass, such as the use of auxiliary treatment facilities, retention of untreated or inadequately treated wastewaters, or maintenance during normal periods of equipment downtime. This condition is not satisfied if adequate backup equipment should have been installed in the exercise of reasonable engineering judgment to prevent a bypass which occurred during normal periods of equipment downtime or preventive maintenance; and

3. The user submitted notices as required in subsection (B) of this section.

D. The director may approve an anticipated bypass, after considering its adverse effects, if he/she determines that it will meet the three conditions listed in subsection (C) of this section. (Ord. 011/2004)

13.10.510 Regulatory conflicts.

All other provisions of this code inconsistent or conflicting with any part of this chapter are hereby superseded to the extent of the inconsistency or conflict. (Ord. 011/2004)

Water System Appendices

Appendix W-A

Water Service Area Legal Description

CITY OF MONROE
WATER SERVICE AREA
BOUNDARY LEGAL DESCRIPTION

Beginning at the southwest corner NW 1/4 section 26 township 28 range 6 EWM; thence, north 1020 feet more-or-less to the northerly right-of-way proposed SR 2; thence, southeasterly along said right-of-way 7940 feet more-or-less to the intersection of said right-of-way with the easterly boundary Fair View Estates Division #1 pages 74-75 volume 25 of plats records of Snohomish County; thence, northeasterly along said boundary and along easterly boundary Fair View Estates Division #2 page 65 volume 29 records of Snohomish County to the intersection said boundary with the south line section 25 township 28 range 6 EWM; thence, east along south line to the southeast corner SW 1/4 said section; thence, north along east line SW 1/4 said section to northline line SE 1/4 SW 1/4 said section; thence, west along said north line to west line NE 1/4 SW 1/4 said section; thence, north along said west line to north line said subsection; thence, east along said north line to west line east 1/2 NE 1/4 said section; thence, north along said west line to south line section 24 township 28 range 6 EWM; thence, east to west line east 1/2 east 1/2 SE 1/4 said section; thence, north along said west line to south line NE 1/4 said section; thence, west to west line said NE 1/4; thence, north along said west line to south line NW 1/4 NE 1/4; thence, east along said south line to west line east 1/2 NW 1/4 NE 1/4; thence, north to City of Everett 52" supply main; thence, easterly along said supply main to the east line of section 21 township 28 range 7 EWM; thence, south along east line section 21 township 28 range 7 EWM, section 28 township 28 range 7 EWM to the north line section 33 township 28 range 7 EWM; thence, west along said north line to west line E 1/2 NE 1/4 said section; thence, south along said west line to north line SE 1/4 said section; thence, west along said north line 290 feet more-or-less to the west line east 6 acres of the portion of NW 1/4 SE 1/4 said section lying north of county road; thence, south along said west line 550 feet more-or-less to a point on west line said 6 acres 425 feet north of intersection said west line with north right-of-way Florence Acres Road; thence, west 450 feet;thence, southwesterly to a point on the west line SE 1/4 SW 1/4 said section 300 feet north of north right-of-way Florence Acres Road; thence, south along said west line to north right-of-way Florence Acres Road; thence south westerly along said right-of-way to northwest corner section 4 township 27 range 7 EWM; thence, south along west line section 4 township 27 range 7 EWM to the north line S 1/2 N 1/2 said section 4; thence, east along said north line to west line E 1/2 NE 1/4 said section; thence, north along said west line 330; thence, east 330 north of and parallel to the north line S 1/2 N 1/2 said section 4 to the east line said section; thence, south along said east line to the right bank Skykomish River; thence southwesterly along right bank Skykomish and Snohomish Rivers to the intersection said right bank with north line section 16 township 27 range 6 EWM; thence easterly along north line section 16 township 27 range 6 EWM, section 15 township 27 range 6 EWM to intersection north right-of-way SR 522; thence easterly along said right-of-way to west line section 11 township 27 range 6 EWM; thence, north along west line section 11 township 27 range 6 EWM, section 2 township 27 range 6 EWM, section 35 township 38 range 6 EWM, section 26 township 28 range 6 EWM to point of beginning.
Situate Snohomish County Washington

Additional service area legal description 2013

At the intersection of the right bank of the Snohomish River and the left bank of the Pilchuck River, northeasterly along said left bank to the intersection of said left bank and the South boundary line of the Burlington Northern Sante-Fe Seattle to Milwaukee Railroad Right of Way, then southeasterly to the intersection of the east line of Section 34, T. 28 N., R.6 E., and the South side of the Burlington Northern Sante-Fe Seattle to Milwaukee Railroad Right of Way, then south to the SE corner of Section 34, T. 28 N., R.6 E, then West to SW corner of the SE ¼ of the SE ¼ of Section 34, T. 28 N., R.6 E, then South to the center of the NE ¼ of Section 3 T. 27 N., R. 6 E., then East to the southeast corner of the northeast quarter Section 3, T27N, R6E, then South to the intersection of the east line of Section 10, T. 27 N., R. 6 E., and the northwestern line of the Washington State Department of Transportation State Route 522 Right of Way, then southwest to the southwest to the south line of Section 10, T. 27 N, R. 6 E, then West to the right bank of the Snohomish River, then northwesterly following the right bank of the Snohomish River back to the true point of beginning.

Appendix W-B

Department of Corrections
Water Service Agreement

cc: 2-7-01

4

INTERAGENCY AGREEMENT

BETWEEN

STATE OF WASHINGTON
DARTMENT OF CORRECTIONS

AND

CITY OF MONROE, WASHINGTON

THIS AGREEMENT, pursuant to Title 39, Chapter 34 of the Revised Code of Washington (RCW), THE INTERLOCAL COOPERATION ACT is made and entered into by and between the Department of Corrections, hereinafter referred to as "DOC", and the City of Monroe, hereinafter referred to as "City".

Whereas, there exists an Agreement between the DOC and City for the purpose of providing water service to DOC, dated February 26, 1996 (1996 Water Service Agreement), and;

Whereas, the City annexed the Monroe Consolidated Command complex (MCC) in 1996 and the MCC is within the City's water service area.

Whereas, DOC desires to transfer ownership of the 750,000 gallon steel water reservoir (the reservoir) and water supply booster station (MCC booster station) together with all appurtenances, to the City to be utilized in the City's water system serving the MCC facility.

Whereas, the parties hereto hereby acknowledge and agree to the following:

1. DOC owns real property and operates correctional facilities on the site in Snohomish County, Washington known as the MCC.

2. DOC transfers its ownership of the reservoir, MCC booster station, and associated appurtenances located on the above-described property to the City. DOC will provide the City an (easement/license) to access and maintain the reservoir and MCC booster station.

3. The MCC water facilities presently meet the City's requirements for emergency and fire flow storage. The City shall use the MCC and Tester Road booster stations to provide present and future emergency flow and domestic water to the MCC along with the 750,000 gallon water reservoir. If MCC's fire flow requirement in the future exceeds 750,000 gallons due to new construction, MCC shall be required to participate in the costs of providing additional fire flow storage.

4. DOC will allow the City to construct and maintain a 12" water line between the Monroe School District property and the reservoir as shown on the site plan. DOC will grant the City an easement (license) for the 12" water main. The City's use of the water reservoir, booster station, appurtenances, and 12" water line is subject to the maximum security nature of the institution and prison activities, including:

   a. All improvements will be organized and construction plans approved prior to initiating construction, in a manner compatible with the maintenance of institution security as determined by the MCC Superintendent or his delegated representative.

   b. All access to MCC is subject to prior approval as provided.

   c. Right to access is subject to DOC right to decline entry in the event of an emergency.

5. DOC net water usage will be metered at the primary outlets as indicated on the site plan. DOC shall be charged the water rate indicated in the 1996 Water Service Agreement.

6. The City will not take any action that may compromise the provision of water without prior notification to MCC. The City shall notify the MCC 72 hours prior to any scheduled reservoir maintenance. The City shall provide the MCC with adequate water service throughout the reservoir maintenance period. In the event of an emergency MCC reserves the right to 100% use of water in the reservoir. MCC shall receive priority fire service in the zone in which it is served.

7. If the City desires to terminate the use of the reservoir or booster station, it shall give DOC a minimum of three months notice to determine if DOC desires the facilities to be transferred to DOC at no cost. If DOC does not desire the facilities, the City shall demolish the facilities. When the City no longer uses the reservoir or MCC booster station for MCC domestic or emergency fire flow purposes, the property (easement/license) will be terminated and the sites returned to DOC.

8. In consideration for the transfer, the city agrees to assume all maintenance responsibilities for the reservoir, the MCC booster station, and appurtenant facilities and will provide additional water to MCC in emergency situations such as fire protection.

9. This agreement may not be amended or modified except in writing signed by all parties. Only the Secretary or the Secretary's designee shall have the express, implied, or apparent authority to alter, amend, modify, or waive any clause or condition of the agreement on behalf of DOC. This agreement shall be subject to the written approval of the Secretary of the Department of Corrections or the Secretary's designee and shall not be binding until so approved.

CITY OF MONROE

Mayor 2-9-01 Date

City Clerk 2-09-01 Date

APPROVED AS TO FORM:

City Attorney 2-7-01 Date

STATE OF WASHINGTON
DEPARTMENT OF CORRECTIONS

Contracts Administrator 1/18/01 Date

APPROVED AS TO FORM:

AAG for DOC 2/21/2001 Date

WSR with 400 bed and wells

250 0 500 1000

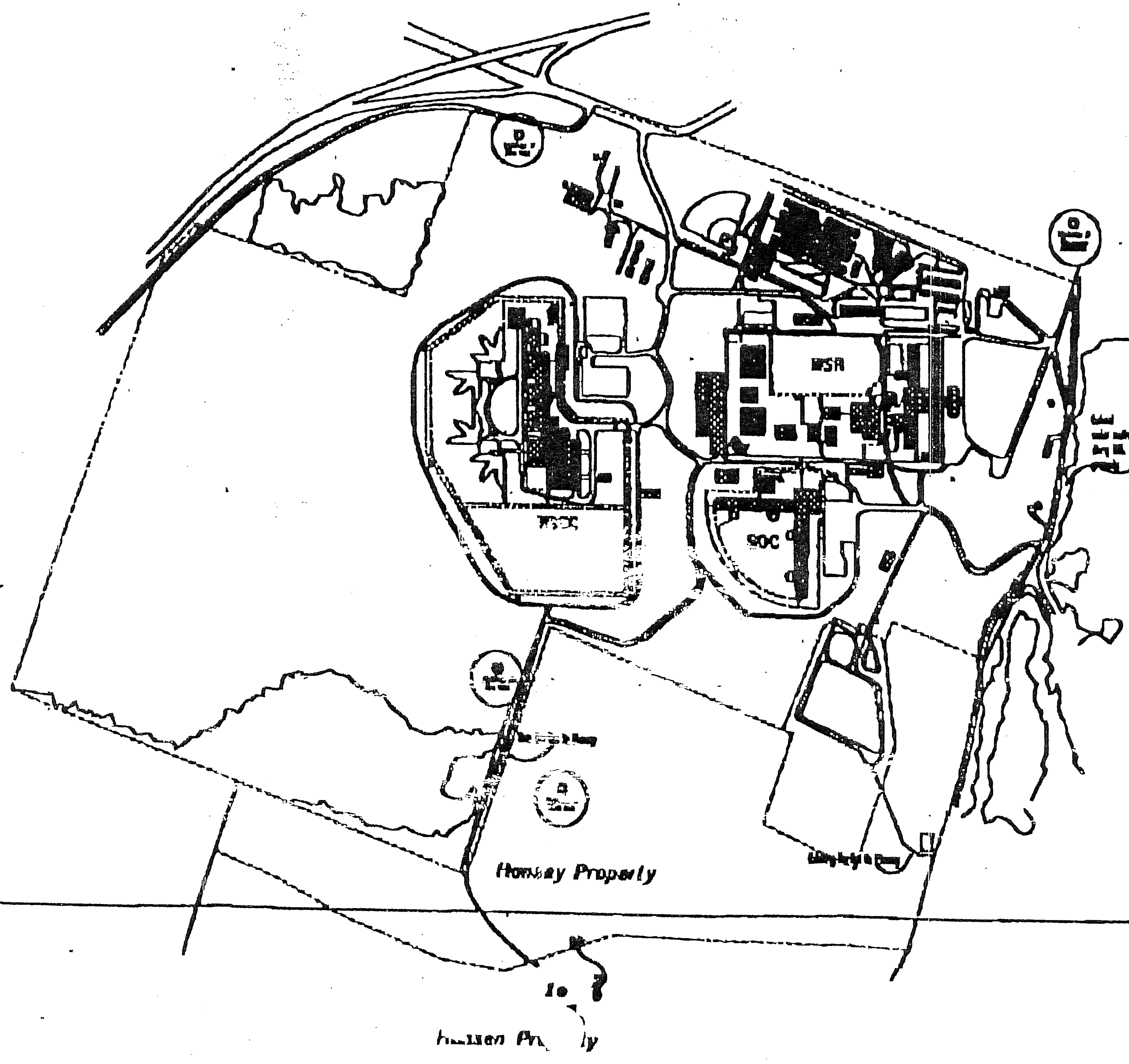
1. WSR Washington State Reformatory
2. SOC Special Offenders Center
3. TRCC Twin Rivers Corrections Center

Option 1. Close wells, transfer or relinquish water rights, quit claim deed an easement back to owners---WSR drills new well for i[illegible]tion.

Option 2. WSR operates wells for irrigation and provides 3,000 gpd to Hanson property by constructing service line from WSR. Both Hanson and Hansey properties supplied with City water by WSR. Easements continue as present.

Option 3. Provide city water connection to Hanson and Hansey extended along 177th SE. WSR operates wells for irrigation. Negotiate new easements for irrigation.

Option 4. Negotiate new easement for WSR to operate wells for irrigation and Hanson water obligation terminated by [illegible] owing one well for domestic or [illegible]ing new well, City water continued to Hansey from WSR.



WASHINGTON STATE DEPARTMENT OF CORRECTIONS FACILITIES MANAGEMENT

WASHINGTON STATE REFORMATORY

Appendix W-C

Not Used

Appendix W-D

Cross Connection Control Program

Table of Contents

10. Tanker Truck and Trailer Requirements

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13. Private Wells or Auxiliary Water Supplies

14. Plan Reviews and Surveys

    a. Plan Reviews for New Construction
    b. Field Surveys for Existing Facilities

City of Monroe
Cross Connection Control Program

Introduction

Congress passed the "Safe Drinking Water Act" with the intent of protecting the public health and welfare of all public water supply users in the United States. The Environmental Protection Agency (EPA) interpreted this mandate to mean that certain contaminants should not be found in water "delivered to the free flowing outlet of the ultimate user." Thus, these contaminants became the responsibility of the water purveyor (The City of Monroe). The EPA specifically exempted contaminants added to the water under circumstances controlled by the user (except for plumbing corrosion by-products). This was not, however, intended to absolve the purveyor of a responsibility to conduct an aggressive cross connection control program.

In cross connection control, The City of Monroe's responsibility is to protect the water distribution system from contamination. The greatest public health risk lies in the introduction of contamination. The greatest public health risk lies in the introduction of a contaminant into the public water supply system because the water distribution system can provide the conduit for the spread of the contaminant to a large population. Cross connections within the customer's plumbing system and within the purveyor's distribution system pose a potential source for the contamination of the public water supply.

Once water leaves the control of the water purveyor (i.e., leaves the distribution system), the water purveyor must consider the plumbing systems of all customers to be a potential health hazard. The hazard, and thus the health risk, may vary from minor to severe. The purveyor's cross connection control program should be based on the supposition that all customers should be isolated at the property line (meter) with an approved air gap, unless the purveyor is satisfied with the level of protection provided by the customer. This supposition should be expressed in the form of a service policy or service contract with the customer. Notwithstanding this basic supposition, the water purveyor should recognize the practical deeds of the customer, and the responsibility of other regulatory agencies to protect the customer's plumbing system from becoming contaminated.

The water purveyor's degree of satisfaction in the customer's reduction of their cross connection risk, is a factor in the determination by the purveyor that the purveyor's requirement for premises isolation may be reduced from an approved air gap, to a reduced pressure backflow assembly, double check valve assembly, or no premise isolation.

To protect occupants of the customer's premises, it is necessary to isolate areas of the premises and/or each outlet rather than to install backflow protection at the meter. Generally, the prevention of contamination of a water distribution system or potable water system in a building is of concern to the following:

The water purveyor (City of Monroe)
The plumbing inspector (City of Monroe)
The local health inspector (Snohomish County Department of Health)
The Department of Labor & Industries (workers safety regulations)

A cross connection program may be administered by any or all of the above. To avoid confusion, it is desirable for the water purveyor to have a joint or cooperative program with the other agencies having jurisdiction. Unfortunately, although each has the same overall goal of preventing contamination, each has a different enforcement criteria, authority and responsibility that may prevent a subordination of its authority to another agency.

The need to eliminate cross connections as a source of potential contamination has been long recognized in plumbing design and plumbing code enforcement. However, plumbing codes handled cross connection only in very general terms. Few details are provided to specify methods of identifying and preventing cross connections. This is because it is impractical to cover in a plumbing code all of the information needed to control cross connections.

The plumbing code addresses the plumbing design and installation in new buildings. Generally, once a building occupancy permit is given, plumbing code jurisdiction effectively ceases until a permit is requested to modify the plumbing system. Changes to a plumbing system are often made without a permit. New equipment may be added. Piping, fixtures and appliances may wear out, malfunction, or be relocated. New cross connections may then be created. Backflow prevention assemblies and devises installed under the plumbing code to protect the public could be removed, bypassed or fail to operate due to the lack of maintenance. For these reasons, it is recommended that a water purveyor not place full reliance on the enforcement of the plumbing code to protect the water distribution system from contamination through cross connections.

The history of cross connection control has provided regulatory authorities with sufficient information to establish a list of those premises where high health hazard cross connections exist, or where the potential hazard is so great that these premises must be isolated from the water purveyor's system. Some states and provinces have established mandatory protection for these premises. However, it is important that each premises be surveyed individually to assess the degree of hazard and what corresponding backflow prevention assembly is required. Never assume that all premises of the same kind will require the same type of backflow protection.

Experience has shown that the water purveyor is in a unique position to implement and administer a cross connection control program. The water purveyor has authority to supply water to a customer and to establish standards and remedies for a breach of those standards. The City of Monroe Cross Connection Program is needed to effectively deal with all aspects of the public health risk posed by cross connections.

A. Purpose

Washington Administrative Code (WAC) 246-290-490 mandates the purveyor to develop and implement a Cross-Connection Control Program (CCCP). Protecting the public water system from contamination via cross connections is the purpose for regulations and requirements within Monroe's CCCP.

B. Policy

The City of Monroe (COM) will refer to the most current edition of the three following references: Pacific Northwest Section AWWA Cross-Connection Control Manual Accepted Procedure and Practice, USC's Manual of Cross-Connection Control, and the Uniform Plumbing Code and Standards published by the International Association of Plumbing and Mechanical Officials. Assemblies are approved for installation only through USC's "List of Approved Assemblies," which can be found on their website at http://www.usc.edu/dept/fccchr/list.html.

The COM will ensure cross-connections between the distribution system and a customer's premises are eliminated or controlled by the installation of a USC approved backflow preventer that is equal to the degree of hazard. Premise isolation will be required on any connection if the purveyor detects a level of risk to the public water system. Premise isolation is required on all warehouse and/or industrial type facilities throughout the COM, whether or not an actual cross connection exists. Premise isolation will be met by the proper installation and maintenance of an approved Air Gap (AG) or a Reduced Pressure Backflow Assembly (RPBA). Various equipment, units, or devices with water connections may be permitted to have in-premise backflow protection (within the customer's property lines) if the hazard can be contained by an approved backflow assembly at the point of hazard. The Cross-Connection Control Specialist will work in collaboration with the Authority Having Jurisdiction (AHJ) on all in-premise cross-connections needing backflow protection.

COM water customers are responsible for the expense to protect the public water system from backflow contamination by installing, maintaining, and testing backflow assemblies in accordance with the COM Cross-Connection Control Program. Failure to cooperate in the installation, maintenance, inspection or testing of backflow prevention assemblies required by COM will result in a discontinuance of water service to the premise.

C. Responsibilities

At least one person certified as a Cross-Connection Specialist (CCS) will develop and implement the COM's Cross-Connection Control Program. The CCS will be responsible for the following:

- Administer the Cross-Connection Control Program (CCCP).
- Investigate water quality concerns where backflow is suspected.
- To eliminate or control cross-connections between the distribution system and the consumer's premise.
- Evaluate service connections for backflow hazards in the following priority:
    1. Severe and high health hazard facilities.
    2. Utility service applications for new water meters. Service requests for new meters to be installed in rural properties will be cross referenced with the Department of Ecology's well logs. The City of Monroe considers properties with access to well water a high hazard and will require backflow protection at the meter.
    3. New commercial/industrial facilities or tenant improvements on commercial/industrial facilities will be reviewed/inspected for cross-connection control.
    4. Existing facilities will be systematically surveyed through mail-out surveys and/or walk-through appointments.
    5. Residential irrigation systems backflow requirements.
    6. Keep current records of all backflow assembly testing, AGs installed in lieu of approved backflow assembly(s), test kit calibration, and tester certification.

- Completing the State Department of Health's annual Cross-Connection Control Annual Summary Report (ASR) by the reporting deadline.
- Ensure quality control for backflow testing
- Public Education

1. Backflow Prevention Assemblies

Cross-connections are channels for contaminants to spread throughout the public water distribution system. It is the City's main goal to eliminate cross-connections whenever possible; however, when cross-connections cannot be eliminated they will be controlled by the installation of an approved backflow preventer equal to the degree of hazard. The following table is "Table 8" from the WAC 246-290-490, and is used to determine the appropriate backflow protection required for the degree of hazard.

Appropriate Methods of Backflow Protection for Premises Isolation

Degree of Hazard	Application Conditions	Appropriate Approved Backflow Preventer
High health cross-connection hazard	Backsiphonage or backpressure backflow	AG, RPBA, or RPDA
Low health cross-connection hazard	Backsiphonage or backpressure backflow	AG, RPBA, RPDA, DCVA, or DCDA

When selecting and installing backflow prevention assemblies it must be done in accordance with the following requirements:

WAC 246-290-490, USC's most current Manual of Cross-Connection Control, the Uniform Plumbing Code (UPC), and the most current edition of Cross-Connection Control Manual: Accepted Procedure and Practice by the Pacific NW Section American Water Works Association (to be used as a guideline), and newly installed assemblies must be found on USC's "List of Approved Backflow Prevention Assemblies."

The COM will require, approve, inspect, and test all new backflow prevention assemblies that protect the public water system. This involves a permit process where the premise will be evaluated from the meter to every water connection within the premise. Backflow requirements may be required even if there is a possibility of cross-connections. Once an assembly is installed, and has been inspected and tested, it is the property owner's responsibility to have the assembly tested at least annually. The COM CCS may require assemblies to be tested more often in cases where:

1. A backflow assembly fails a test
2. The assembly has a history of failing
3. A backflow contamination incident occurs
4. High/Severe health hazards facilities
5. An assembly is disassembled, disconnected, moved, or relocated

6. The CCS requires the assembly to be retested

A. Selection of Backflow Preventers

In accordance with WAC 246-290-490(4)

The Washington State Department of Health requires backflow prevention assemblies protecting the public water system to be on USC's current "List of Approved Backflow Prevention Assemblies."

The COM may rely on testable backflow prevention assemblies that are not currently on USC's List of Approved Assemblies, if the assemblies:

a. Were included on the USC list of approved backflow prevention assemblies at the time of installation.
b. Have been properly maintained;
c. Are commensurate with the COM assessed degree of hazard;
d. Have been inspected and tested at least annually and have successfully passed the annual tests.

The COM shall ensure that an unlisted backflow assembly is replaced by an approved assembly equal with the degree of hazard, when the unlisted assembly:

a. Does not meet the conditions of this section.
b. Is moved.
c. Cannot be repaired using spare parts from the original manufacturer.

B. Installation of Backflow Prevention Assemblies

In accordance with WAC 246-290-490(5)

The COM shall ensure that approved backflow preventers are installed in the orientation for which they are approved (if applicable).

The COM shall ensure that approved backflow preventers are installed in a manner that:

Facilitates their proper operation, maintenance, inspection, in-line testing (as applicable), and repair using standard installation procedures acceptable to the department such as those in the USC Manual or PNWS-AWWA Manual; ensures that the assembly will not become submerged due to weather-related conditions such as flooding ; and ensures compliance with all applicable safety regulations.

The COM shall ensure that approved backflow assemblies for premises isolation are installed at a location adjacent to the meter or property line or an alternate location acceptable to the COM CCS. RPBAs for premise isolation that are installed outside must be covered with a City approved hot box.

When premises isolation assemblies are installed at an alternate location acceptable to the COM, the COM shall ensure that there are no connections between the point of delivery from the public water system and the approved backflow assembly, unless the installation of such a connection meets the COM cross-connection control requirements and is specifically approved by the COM.

The COM shall ensure that approved backflow preventers are installed in accordance with the following time frames:

For new connections made on or after the effective date of these regulations, the following conditions shall be met before service is provided; they shall be controlled by eliminating the cross-connection or by installation of approved backflow preventers equal with the degree of hazard. A satisfactory inspection and test by a COM backflow assembly tester (BAT) must be completed in accordance with the description of backflow preventer inspection and testing. Each following year the owner shall have their assembly tested by certified BAT of their own selection.

For existing connections where the COM identifies a high health cross-connection hazard, they shall be controlled by installation of an approved backflow preventer equal with the degree of hazard. The assembly shall be installed within thirty days of the COM notifying the consumer of the high health hazard cross-connection hazard; or in accordance with an alternate schedule acceptable to the COM.

For existing connections where the COM identifies a low health cross-connection hazard, the hazard shall be controlled by the installation of an approved backflow preventer equal with the degree of hazard within ninety days of the COM notifying the consumer of the low health hazard cross-connection hazard; or in accordance with an alternate schedule acceptable to the COM.

The COM shall ensure that by-pass piping installed around any approved backflow preventer is equipped with an approved backflow preventer that affords at least the same level of protection as the approved backflow preventer that is being bypassed and complies with all applicable requirements of this section.

Backflow preventers shall be installed to the COM specifications. When assemblies are installed in-premises, they shall be installed in compliance with the Authority Having Jurisdiction (AHJ).

C. Inspection and/or Testing of Backflow Preventers

The COM requires a CCS to inspect new installations of Double Check Valve Assemblies (DCVA), Double Check Detector Assemblies (DCDA), Reduced Pressure Backflow Assemblies (RPBA), Reduced Pressure Detector Assemblies (RPDA), Pressure Vacuum Breaker Assemblies (PVBA), Spill-Resistant Pressure Vacuum Breaker Assemblies (SVBA), and Air Gaps in lieu of a backflow assembly(s) that protect the public water system to ensure that proper protection is equal to the degree of hazard. These assemblies are required to be tested:

a. At the time of installation by a COM certified backflow assembly tester (BAT).
b. Annually after installation, or more frequently, if required by the COM for facilities that pose a high health cross-connection hazard or for assemblies that repeatedly fail.
c. After a backflow incident.
d. After an assembly is repaired, reinstalled, or relocated.

1. The BAT or a CCS inspects:
   a. Air gaps in stalled in lieu of approved backflow prevention assemblies for compliance with the approved air gap definition.
   b. Backflow prevention assembly proper installation.
2. The COM shall ensure that inspections and/or tests of approved air gaps and approved backflow assemblies are conducted:
   a. At the time of installation.
   b. Annually after installation or more frequently, required by the COM for facilities that pose a high health cross-connection hazard, or for assemblies that repeatedly fail;
   c. After a backflow incident, after an assembly is repaired, reinstalled, or relocated or an air gap is replumbed.
3. After the COM performs a backflow assembly's initial inspection/test it becomes the owner's responsibility to have the assembly tested annually by a certified BAT of their selection. The COM will notify customers annually on their due date informing them that their backflow assembly is due to be tested. Notification to water customer is as follows:
   a. "Letter 1" will be sent just prior to or the month the assembly is due for annual testing. The customer will have 30 days to have the assembly tested from the date the date of the letter.
   b. "Letter 2, Second Notice" will be sent if the customer does not respond to letter 1. The customer has fourteen days to respond from the date of the letter.
   c. "Letter 3, Final Notice" will be sent to the customer if the customer does not respond to letter 2. The customer has five days to respond from the date of the letter.
   d. A door-hanger will be delivered directly to the customer's premise if the customer does not respond to letter 3. The customer will have twenty-four hours to respond to the door hanger.
   e. A discontinuance of water service to the customer's premise will occur if the customer fails to the have their backflow assembly tested. There will be $50.00 fine to have water

assembly has been tested or the customer notifies the COM water department with the date and time of an appointment to have their backflow assembly tested. The customer must also provide contact information of the customer's tester. If the customer wishes to have water service restored after business hours an additional $100 fee will be added to the customer's account.

The COM shall ensure that approved backflow prevention assemblies are tested using procedures acceptable to the Washington State Department of Health (DOH), such as those specified in the most recent published edition of the USC Manual. When circumstances, such as, but not limited to, configuration or location of the assembly, preclude the use of USC test procedures, the COM may allow, on a case-by-case basis, the use of alternate test (non-USC) procedures acceptable to the DOH.

The COM shall ensure that results of backflow prevention assembly inspections and tests are documented and reported in a manner acceptable to the COM.

The COM shall ensure that an approved backflow prevention assembly or AVB, whenever found to be improperly installed, defective, not equal to the degree of hazard, or failing a test (if applicable) is properly reinstalled, repaired, overhauled, or replaced.

The COM shall ensure that an approved air gap, whenever found to be altered or improperly installed, is properly replumbed or, if equal with the degree of hazard, is replaced by an approved RPBA.

2. Service Connections

Water service connections to the COM public water system must meet the state of Washington cross-connection control requirements found in WAC 246-290-490. The COM shall ensure that all customers connected to the public water system shall install a USC approved backflow assembly equal with the degree of hazard. This will be accomplished by relying on the appropriate type of backflow protection used for premises isolation or in-premises protection. Premises isolation shall be accomplished by the installation of a COM CCS approved air gap or RPBA located directly beyond the meter or at a location acceptable to the CCS, and will be purchased and installed at the expense of the customer. In-premise protection may be permitted if the criterion for premise isolation is met, and the CCS and AHJ agree that the level of backflow protection is equal to the degree of hazard. If the CCS finds that there is no risk of a hazard to the public water system that could affect public health an exemption may be granted from backflow assembly installation for the premise.

Protecting the public water system will require customers to install, maintain, and have annual tests performed on their backflow assemblies. Water service may be terminated if the following deadlines for cross-connection control are not met:

- New service connections that require backflow protection will be required to have backflow assemblies installed, pass inspection and testing before water service is granted.

- For a cross-connection that poses an **immediate** high hazard, the COM will terminate water service immediately. Water service will not be restored until the cross-connection has been eliminated or protected with a backflow assembly to the CCS satisfaction.

- High health cross-connection hazards must be controlled within 30 days of the COM notifying the customer of the high health cross-connection hazard, or an alternate approved schedule according to the CCS.

- Low health cross-connection hazards must be controlled within 90 days of the COM notifying the customer of the low health cross-connection hazard, or an alternate approved schedule according to the CCS.

Authority Having Jurisdiction deputizes CCS for in-premise inspections

The COM CCS has been deputized by the COM Building Official and also as the Authority Having Jurisdiction under WAC 51-56-0600 and 2012 UPC 102.1 in matters concerning cross-connection control in regard to the Uniform Plumbing Code. The CCS shall have authority to conduct inspections within the property lines of all applicable premises in the course of cross-connection control enforcement.

The following responsibilities dealing with cross-connections will be conducted by the COM Water Department's CCS:

1) Plan review
2) Survey process; new and existing
3) Customer interaction; educating, compliance, and notification issues
4) Records management
5) Investigating of backflow incidents
6) Backflow testing

Coordination between the Water Purveyor and the AHJ in matters pertaining to cross-connection control is required by both WAC 246-290-490 and the Uniform Plumbing Code. By administering authority to inspect and approve cross-connections in all construction within the City, the City is legally in compliance with state code.

A. New Connections

There are specific steps that must take place before water service will be granted for a new water service connection. A representative from the COM will review pre-application documents, new construction plans, water service applications, business license applications, and any other documents which may indicate requirements for cross-connection control. The COM building department and/or water department will assist customers in seeing that Washington state regulations and COM ordinances regarding cross-connection control are being met. The CCS will oversee new construction cross-connection control issues are met or addressed satisfactorily before water service is provided.

Procedures for New Service Connections:

a. Customer completes application for utility service and, if needed, a backflow permit application.
b. COM engineering approves location of meter. COM CCS approves location and design of backflow details.
c. Customer purchases COM water meter.
d. The COM sets water meter, and locks off the meter.

e. Customer purchases and installs approved backflow assembly(s) that commensurate the degree of hazard to the COM specifications.
f. Customer must have plumbing connected to meter, and ready for water to be turned on.
g. Customer calls the COM Water Department for installation inspection and backflow assembly test(s).
h. Meter will be left unlocked and ready for service once an installation inspection and a passing test report have been performed to COM satisfaction.
i. The COM keeps records of each facility's/premise's test reports, and will notify customers when backflow tests are needed.
j. Each backflow assembly is required to be tested at least annually by a State certified backflow assembly tester (BAT).
k. COM water customers are required to follow the COM cross-connection program that includes backflow assembly testing at least annually, and must notify the building department regarding any new water connection within the customer's premise.

B. Existing Connections

The COM CCS will evaluate and/or survey each premise during tenant improvements (TI) or through periodic surveys to determine cross-connection requirements. Cross-connections will be evaluated by the CCS, and will assess the degree of hazard to see that proper backflow protection is being utilized. The COM CCS will coordinate with the Authority Having Jurisdiction (AHJ) regarding in-premise protection.

If a backflow assembly is required by the COM on an existing service and it is determined the meter sizing or piping size is no longer adequate for that building the customer will be required to work with the COM AHJ to make the appropriate upgrades.

C. All Service Connections

Premise Isolation:

The COM will have a CCS assess the degree of hazard posed by the customer's water system upon the City's distribution system. The CCS will determine the appropriate method of backflow protection by the following table:

Appropriate Methods of Backflow Protection for Premises Isolation

Degree of Hazard	Application Conditions	Appropriate Approved Backflow Preventer
High health cross-connection hazard	Backsiphonage or backpressure backflow	AG, RPBA, or RPDA
Low health cross-connection hazard	Backsiphonage or backpressure backflow	AG, RPBA, RPDA, DCVA, or DCDA

The COM shall ensure that an approved AG, RPBA, or RPDA is installed for premises isolation for service connection to premises posing a high health cross-connection hazard. This includes, but is not limited to the premises listed below:

Agricultural (farms and dairies)
Beverage bottling plants
Car washes
Chemical plants
Commercial laundries and dry cleaners
Premises where both reclaimed water and potable water are provided
Film process facilities
Food processing plants
Hospitals, medical centers, nursing homes, veterinary, medical and dental clinics, and blood plasma centers.
Premises with separate irrigation systems using COM water supply and with chemical addition such as parks, playgrounds, golf courses, cemeteries, estates etc.
Laboratories
Metal plating industries
Mortuaries
Petroleum processing or storage plants
Piers and docks
Survey access denied or restricted
Wastewater lift stations and pumping stations
Wastewater treatment plants, radioactive material processing plants or nuclear reactors may use RPBAs only when used in combination with an in-plant approved air gap, otherwise an air gap behind the meter shall be used.
Premises with an unapproved or approved auxiliary water supply interconnected with the potable water supply.

The COM may require backflow assembly protection equal with the degree of hazard determined by the COM to be installed for premises isolation for connections serving premises that have characteristics such as, but not limited to the following:

- Warehouse, multi-unit, and/or industrial type buildings are required to contain premises isolation due the repeated unknown changes of use and plumbing reconfigurations unknown to the COM CCS and AHJ;

- Any premises that has access to an auxiliary water supply such as well that has not been decommissioned.;

- Complex plumbing arrangements or plumbing potentially subject to frequent changes that make it impractical to assess whether cross-connection hazard exits;

- A repeated history of cross-connections being established or reestablished; or

- Cross-connection hazards that are unavoidable or not correctable, such as, but not limited to tall buildings;

- Facilities not found on the above list and above special cases will be evaluated for appropriate premises or in-premises protection based upon potential or actual cross-connection(s) found. The CCS will coordinate with the Authority Having Jurisdiction (AHJ) regarding in-premises protection.

In-Premises Isolation:

The COM will have a CCS assess the level of protection equal with the degree of hazard for in-premise protection used in protecting the public water system. The COM CCS will work in conjunction with the COM Building Department to ensure that proper in-premises protection is installed and/or being used properly in protecting the public water supply.

If the hazard does not need premises isolation as described above and in WAC 246-290-490, then backflow protection provided at the point of hazard in accordance with WAC 51-46-0603 of the UPC for hazards such as, but not limited to: soda machines, irrigation systems, swimming pools or spas, ponds, and boilers may be used.

D. Fire Connections

Backflow Protection for Fire Systems:

Backflow is not required for flow-through or combination fire protection systems constructed of potable water piping and materials.

For service connections with fire protection systems other than flow-through or combination systems, the COM shall ensure that backflow protection consistent with WAC 51-46-0603 of the UPC is installed. The UPC requires minimum protection as follows: A RPBA or RPDA shall be used for protection systems with chemical addition or using unapproved auxiliary water supply. A DCVA or DCDA shall be used for all other fire protection systems.

Dry Fire Systems:

All dry fire systems are required to have backflow protection. A RPBA or RPDA shall be used for protection systems with chemical addition or using unapproved auxiliary water supply. A DCVA or DCDA shall be used for all other fire protection systems.

New Fire Connections:

For new connections made on or after the effective date of these regulations, the COM shall ensure that backflow protection is installed before water service is provided.

Existing Fire Connections:

With chemical addition or using unapproved auxiliary supplies, the COM shall ensure that backflow protection is installed within 30 days of the COM notifying the customer of the high health cross-connection hazard or in accordance with an alternate schedule acceptable to the COM.

Without chemical addition, without on-site storage, and using only COM water (i.e. no unapproved auxiliary supplies on or available to the premises), the COM shall ensure that backflow protection is installed within 90 days of the COM notifying the customer of the cross-connection hazard or in accordance with a schedule acceptable to the COM or at an earlier date if required by the agency administering the Uniform Building Code as adopted under chapter 19.27 RCW.

3. Assessing Backflow Protection

It is vital that the public health protection provided is commensurate with the assessed risk (i.e. degree of hazard). There are several factors the CCS must take into consideration before requiring backflow assembly protection.

Degree of Hazard:

The CCS will determine the degree of hazard for each cross-connection, and come to conclusion with what type of backflow protection is needed. The risk to the potable drinking water system can be classified in the following categories:

1. Severe Health Hazard (potentially lethal health risk)
2. High Health Hazard (contamination)
3. Low Health Risk (pollutant)

If knowledge of the degree of hazard posed by a substance is not known, the CCS must always assume that it is a high health hazard.

Hydraulic Condition:

The CCS will determine what type of backflow could occur at the fixture or equipment:

1. Backpressure
2. Backsiphonage

Probability of Occurrence:

The likelihood of a physical connection being made between the potable water system and any tank, vat or pipe containing non-potable fluid, must take into consideration that:

- The probability increases that an existing cross-connection will go undetected, as the complexity of a piping system increases,

- Piping changes will create new cross-connections, or change the operating conditions (e.g., from backsiphonage to backpressure), and

- A backflow preventer could be by-passed, removed from service, etc.

The likelihood of the substance in the connection tank, vat or pipe becoming a health hazard must take into consideration that:

- The substance could be changed or increased in strength,

- The substance may deteriorate, and thus become a health hazard,
- The substance, when combined with the chemicals in the potable water supply, or when exposed to certain piping material, may react and form a compound that poses a health hazard,
- The substance, if it contains a bacteriological contaminant, could become a health hazard long after it enters the potable water supply.

Reliability of Backflow Preventers:

The reliability of a backflow preventer to perform the task of stopping backflow is significantly increased by the ability to test it in the field to determine if it continues to properly function. Backflow preventers which are designed to be in-line tested and repaired, and to meet the head loss and flow requirements of the recognized approval agency are referred to as "assemblies."

To place a high degree of reliance upon the installation of a backflow prevention assembly, the assembly must be actually tested upon installation, annually thereafter at a minimum, and after moving or repair. Testing is precursory to maintenance. Test procedures should verify that the assembly meets the design standards; rather than detect that a component of the assembly has failed allows backflow to occur. This ensures that maintenance will likely be performed before the assembly fails to prevent backflow.

Risk Analysis:

Risk analysis applies methods of analysis to matters of risk. Its aim is to increase understanding of the substantive qualities, seriousness, likelihood, and conditions of a hazard or risk and of the options for managing it. The prerequisite to making a determination of the type of backflow preventer needed to isolate a specific cross-connection (e.g. a plumbing fixture), or a group of cross-connections contained within a facility or complex of facilities (e.g. a strip mall) are:

1. Determine the degree of hazard and probability or occurrence of the cross-connection, and
2. Determine the acceptable risk, and
3. Determine the reliability required of the backflow preventer.

Selection of Backflow Preventers:

A well-designed and properly maintained air gap provides the highest degree of protection from backflow. Accordingly, an "approved" air gap is often used to provide protection against substances that constitute the highest (severe) health hazard. The air gap is effective against both backsiphonage and backpressure backflow conditions. Annual inspection of an air gap is essential if it is relied upon to provide protection from a substance that constitutes a high health hazard.

For high health hazards, the reduced pressure backflow assembly (RPBA) or reduced pressure detector assembly (RPDA) should be used. The RPBA (or RPDA) is effective against backflow caused by backsiphonage and backpressure conditions. The RPBA has an air gap for the relief valve drain, which must be maintained as an "approved air gap" for the assembly to properly drain.

As the assessment of the degree of health hazard is reduced, a double check valve assembly (DCVA), double check detector assembly (DCDA), pressure vacuum breaker assembly (PVBA), spill-resistant vacuum breaker assembly (SVBA), or an atmospheric vacuum breaker (AVB) may be used. The DCVA (or DCDA) is effective against backsiphonage and backpressure conditions. The PVBA, SVBA, and AVB are effective against backflow from backsiphonage conditions only.

4. Backflow Incident Response Procedure

When a water quality problem occurs where backflow is the suspected cause the COM will ensure that:

1. A CCS will investigate the water quality problem.
2. The COM shall notify the Authority Having Jurisdiction (AHJ) and the Department of Health (DOH) as soon as possible, but no later than the end of the next business day when a backflow incident is known by the COM to have contaminated the public water system or occurred within the premises of a customer served by the COM.
3. The COM will document details of backflow incidents on a DOH approved form (such as the most recent form from the DOH website).
4. Isolate contamination and flush.
5. Refer to the COM Emergency Response Plan for more information.
6. Include all backflow incident report(s) in the annual cross-connection program summary report (ASR).

5. Cross-Connection Education

The COM shall implement an education program for the City's customers. The education program will consist of but not limited to the following:

1. The COM shall have information available on cross-connection control for educating consumers about water system operation. The public education program may include periodic bill inserts, public service announcements, pamphlet distribution, notification of new consumers and consumer confidence reports.

2. Sharing knowledge and training with engineers, architects, plumbing contractors, suppliers and inspectors, irrigation contractors and suppliers, fire protection contractors, wastewater personnel, and the customer.

3. Public speaking at schools, homeowner's association meetings, City council meetings, and other public events.

4. Educating COM staff can be significantly beneficial. Utilize locators, meter readers, utility workers, Building Official and Engineering staff can all be of assistance in identifying cross-connections.

5. In addition to public education, the CCS shall periodically attend classes, groups, and seminars that keep the CCS educated and up-to-date on current changes in the profession.

6. Records and Reports

The COM shall develop and maintain cross-connection records that include:

A. Service Connection Master List

A master list of service connections and/or consumer's premises where the COM relies upon approved backflow preventers to protect the public water system from contamination by premises isolation and/or in-premises protection, with the assessed hazard level of each, shall be kept on file, accessible, and available. Records pertaining to the master list shall be kept as long as the premises pose a cross-connection hazard to the City's distribution system.

1. The COM Water Quality Office shall keep hard-copy files for each individual customer that has COM required backflow assembly(s). Files shall include all backflow assembly test reports, may include plan reviews, photos, and/or other documents pertaining to the facility.

2. All backflow assembly test reports shall be entered into the City's XC2 computer software program. XC2 is used for keeping current customer contact information, backflow assembly testing history, customer communication documentation, BAT information, tracks past due backflow assemblies, and creates letters.

    a. The City's everyday CCS shall attend XC2 groups and meetings to utilize the maximum capabilities of the program. The CCS will work with City's IT department to keep the program current with the most current updates.

B. Inventory Information

Records regarding inventory information shall be kept for five years or for the life of the approved backflow preventer, whichever is shorter. Inventory information will be kept on:

1. Approved air gaps installed in lieu of approved assemblies:

    a. Exact air gap location
    b. Assessed degree of hazard
    c. Installation date
    d. History of inspections

e. Inspection results
f. Person conducting inspection

2. Approved backflow assemblies including:
    a. Exact assembly location
    b. Type of assembly
    c. Manufacturer
    d. Model
    e. Size
    f. Serial number
    g. Assessed degree of hazard
    h. Installation date
    i. History of inspections, tests, and repairs
    j. Test results
    k. Person performing test

3. Approved AVBs used for irrigation systems including:

    a. Location
    b. Manufacturer
    c. Model
    d. Size
    e. Installation date
    f. History of inspection(s)
    g. Person performing inspection

C. Annual Summary Report

The COM will complete an annual summary report and all records will be kept on file for at least five years. Records will include:

1. Types of connections

    a. Residential
    b. Commercial

2. High health hazard facilities that the water system serves:

    a. Number of facilities served

   b. The number currently protected by an AG or RPBA installed for premise isolation
   c. The number exempted from premise isolation. The COM shall document reasons for not applying premise isolation for facilities that are considered high hazard facilities on "Table 9" found in the WAC 246-290-490.
3. AG and AVBs used for irrigation systems are:

   a. Installed in the system (total)
   b. New installations for reporting year
   c. inspected
   d. Inspected failing inspection, including, incorrect installations
   e. Re-plumbed or reinstalled correctly
   f. Replaced by an approved backflow assembly
   g. Replaced by new AVB
   h. Re-inspected

4. All assemblies (RPBA, RPDA, DCVA, DCDA, PVBA, SVBA):
   a. Installed in system
   b. New installations during year
   c. Installed correctly
   d. Failing initial test
   e. Repaired
   f. Replaced
   g. Replaced with different assembly type
   h. Re-tested

5. The COM will record test report information that includes:
   a. Customer's name
   b. Address
   c. Location of the device
   d. Phone number
   e. Device manufacturer
   f. Model
   g. Size
   h. Serial number
   i. Test kit calibration date
   j. BAT certification number and signature
   k. Date of test
   l. Line pressure
   m. Pressure that the check valve(s) held at
   n. RPBA's opening relief valve pressure and check of the minimum air gap
   o. Results of the test, did the assembly pass or fail

7. Reclaimed and Rainwater Harvesting

Purveyors who distribute and/or have facilities that receive reclaimed water within their water service area shall meet any additional cross-connection control requirements imposed by the department in a permit issued under chapter 90.46 RCW.

The Department of Ecology has issued an interpretive policy statement clarifying that Washington residents can collect and store rooftop or guzzler collected rainwater for on-site use without having to go through the permit (water right) process of RCW 90.03. The COM CCS will require the right to assess the property, and ensure proper backflow protection is in place in regard to the safety of the public water system (DOE: Water Resource Program. Publication Number: 09-11-026, 2013).

Any facility that uses reclaimed water or harvested rainwater and which is also supplied by the COM water supply shall have an AG or RPBA protecting the COM water distribution system from that premises.

All reclaimed water and rain harvesting systems shall also comply with the current edition of the State adopted Uniform Plumbing Code.

Any facility that is using harvested rain water for human consumption must comply with Washington State Department of Health regulations regarding Drinking Water Standards.

8. Backflow Assembly Testing Quality Control Assurance

In accordance with WAC 246-290-490 (3)

The COM is required to develop and implement a backflow assembly testing quality control assurance program. The following are essential elements of the program:

1. All backflow assemblies used to protect the COM public water system must be tested annually by a State of Washington certified backflow assembly tester (BAT).

2. Backflow assembly test reports shall be filled out complete, accurate, and legible, and include the following information:
   a. Customer's name
   b. Address
   c. Phone number
   d. Location of device
   e. Assembly manufacturer
   f. Model
   g. Size
   h. Serial number
   i. Test kit calibration date
   j. BAT certification number
   k. Date of test
   l. Line pressure
   m. Pressure the check valves held at
   n. RPBA's opening pressure or the relief valve
   o. Minimum air gap
   p. Pass or fail test results
   q. Notes can be recorded for any comment or concern the test believe would be helpful to the COM CCS.

3. Test kits used by any tester who is testing backflow assemblies protecting COM's water system must report current test kit calibration documentation on file with the COM.

4. The COM creates an annual list of certified BATs for customer convenience. To be on the list testers must submit the following information by February 28 of each year.
   a. Current contact information

b. Business name
c. A copy of current BAT certification card, test kit calibration documentation, business license, and proof of insurance.

5. Testers who submit proper documentation to be listed on the COM's current "List of Testers" shall:

   a. Fax a copy of the test report to COM water department as soon as possible after test has been completed.

6. The COM will only accept tests that have been performed using most recent State approved (USC) test procedures. When circumstances preclude the use of State approved tests procedures the COM may allow, on a case-by-case basis, the use of alternate test procedures acceptable to the DOH.

7. Testers will be removed from the current "List of Testers" if:

   a. a tester repeatedly fails to submit completed test reports. Reports should always be turned into the COM within two weeks of the test. In the case where an assembly is due for shut-off the tester must contact the COM once the test is complete or have a test report faxed within twenty-four hours.

   b. falsified information is recorded on a test report.

   c. the tester does not perform the test with certified equipment or uses procedures not accepted by DOH.

9. Notification Procedures for Backflow Assembly Testing

COM water customers with backflow assemblies that protect the public water system will be required to have their assemblies tested in accordance with the COM Cross-Connection Control Program, and at the owner's expense. The COM's backflow software program, XC2, tracks every customer's backflow testing date. COM administrative staff will generate notification letters addressed to customers who are due for annual testing. The first notice is sent out at the beginning of each month.

If the customer does not submit a completed test report form by the assembly's annual due date a reminder letter will be sent to the customer. The customer has approximately 25 days to respond to the first letter. There is a "Test Form Due Date" at the top of the letter showing the date that the completed test report must be submitted to the COM Water Quality Office.

If there is no response from the first letter, a second letter will be sent notifying the customer the COM may discontinue water service if a test report is not turned into the COM Water Quality Office by the "Test Form Due Date" at the top of the letter. The customer will have approximately two weeks from the date the letter is sent to have their assembly tested.

If there is no response from the second letter, a third letter will be sent notifying the customer the COM may discontinue water service if a test report is not turned into the COM Water Quality Office by the "Test Form Due Date" at the top of the letter. The customer will have approximately five days from the date the letter is sent to have their assembly tested.

If there is no response from the third letter, a door hanger will be hung at the customer's property notifying the customer the water will be shut-off at noon the next day if a completed test report is not turned into the COM Water Quality Office before the 12:00pm deadline.

If the customer's water service is terminated there will be a $75.00 fee added to the customer's account. Water will not be returned to service until the backflow assembly has been tested or the customer notifies the COM Water Quality Office with the date and time of an appointment to have their backflow assembly tested. The customer must also provide the contact information for the backflow assembly tester they have scheduled. If the customer wishes to have water service restored after business hours an additional $100 fee will be added to the customer's account, and they will need to contact the COM Public Works after hours line.

10. Tanker Truck and Trailer Requirements

Tanker trucks and trailers should be assessed the same as unapproved auxiliary supply; a high health hazard. Chemical or bacteriological contaminants could be present in any truck or trailer, even those intended to contain only potable water.

1. Tanker trucks and trailers will be assessed the same risk as an unapproved auxiliary water supply, a high health hazard.

2. Air Gap or RPBA is required protection for all tanker trucks and trailers (unless approved by COM).

3. The COM Water Fill Station is equipped with a permanent RPBA. Tanker trucks and trailer are required to use the Water Fill Station unless the COM CCS permits filling at another location.

11. Hydrant Use Requirements

Authorization must be obtained to use a COM hydrant-meter. Permits may be obtained at the COM City Hall. A hydrant meter may be leased from the COM, however, the contractor or a representative of the contractor, must discuss uses with the COM CCS to ensure allowance of use is permitted. Unless otherwise arranged between the CCS and the contractor, the CCS will deliver and install the hydrant-meter to a pre arranged hydrant. The hydrant-meter will remain locked on the hydrant until water use is complete or the contractor request the hydrant-meter to be moved to another location.

1. Any potable portable pressure spray or cleaning unit that is connected to a hydrant shall be fitted with a DCVA if it does not contain an approved air gap. If chemicals are used, a RPBA must be used in place of the DCVA and testing must be in accordance with the COM Cross-Connection Program.

2. Flushing storm drains and sanitary sewers from a hydrant is prohibited, unless approved by the CCS. A tanker truck is required for flushing storm drains and sanitary sewers.

3. Filling tanker trucks and trailers from a hydrant is assessed the same as an unapproved auxiliary water supply; a high health hazard. An RPBA is required for filling tanker trucks from a hydrant if no Air Gap is present.

4. When using a hydrant to flush new water mains a DCVA must be used, and is the minimum level of required protection.

5. All hydrant-meters are required to have backflow assembly protection with a minimum of a DCVA.

12. Connecting to an Existing Water Main

In dealing with cross-connections, when a contactor wishes to connect to an existing water main for new service there are detailed steps that must take place before water will be granted from the existing main to the newly installed water main.

1. The contractor shall connect a double check valve assembly (DCVA) at the beginning of the water line at the designated point of connection as shown on approved drawings.

2. The temporary DCVA shall be tested by a certified BAT at the contactor's expense.

3. The DCVA must be tested after being connected to the existing water main. The tester shall leave the #2 shut-off valve closed during testing and only open the #2 shut-off valve after assembly has passed testing, and been given the "Ok" by a COM Inspector.

4. The BAT must be selected from the COM's most current list of Backflow Assembly Testers. The list can be obtained by calling the COM Water Quality Office or the list can also be found on the City's website. If the contactor uses a BAT that is not on the City's current list of testers, the following documentation must be submitted to the COM Water Quality Office:

    a. A copy of the tester's current BAT certification card
    b. Proof of insurance
    c. A copy of the BAT's business license
    d. Documentation showing current calibration for the test kit being used to perform the backflow test

5. A copy of the test report must be submitted immediately to the COM Water Department. The test report can be given to an on-site City Inspector, dropped off at City Hall, or faxed directly to the Water Department at 360-863-4601.

6. Water will be granted through the COM water mains and into the new lines once the DCVA has passed testing, and to the City Inspector's satisfaction.

7. The temporary DCVA is required during pressure, flushing, and purity tests.

13. Private Wells or Auxiliary Water Supplies

Private wells and/or auxiliary water supplies are strictly prohibited from being interconnected to the COM's public water system. The COM considers all auxiliary water supplies (including private wells) a high-health hazard, and therefore must be effectively isolated from the COM's water supply.

The COM cross-connection control requirements for customers with a private well and/or any auxiliary water supply are as follows:

1. No backflow assembly protection is required if the well source has been decommissioned according Department of Ecology standards. Documentation must be provided to the City of Monroe Water Quality Office for verification.

2. If an active well and/or an auxiliary water supply is present on a customer's property an RPBA will be required to be installed at the service connection and serve as premise isolation. The COM takes no chances of inadvertent interconnection of the water supplies.

    a. The RPBA must be inspected by a COM CCS and tested by a COM BAT before receiving water service.
    b. New services will be locked off until the COM verifies compliance. Visual inspection of the piping is required for premises retaining active well systems.

14. Plan Reviews and Surveys

A. Plan Reviews for New Construction

The following outlines the procedure for evaluating new construction:

- All applications for new services, enlarging of existing facilities, and tenant improvements (TI) shall be routed to the CCS for cross-connection review. All plans will be reviewed by the CCS, and cross-connections will be evaluated for the need of proper backflow protection.

- When reviewing plans for cross-connection control the CCS will use all applicable publications as a reference such as; the most current editions of the AWWA PNWS's Cross-Connection Control Manual , the USC Manual for Cross-Connection Control, and the Uniform Plumbing Code.

- Each cross-connection will be evaluated, along with the approved method and assemblies, or devices used to protect the water system.

- The backflow assembly(s) required by the COM to protect the water distribution system should be listed on the final plans.
    - If assemblies within the customer's premise are accepted by the purveyor in lieu of premise isolation, or as a condition to a lesser degree of premise isolation, those assemblies should be identified on the plans.
    - It should be documented that the approval of the plans does not relieve the customer of the responsibility to comply with the requirements of other agencies having jurisdiction, to install additional backflow assemblies or other modifications determined necessary in the final survey of the facilities prior to providing water service, or at a future date should changes in the customer's water use increase the degree of risk to the COM's distribution system.

- The CCS will include COM standard backflow installation details upon plan approval to the customer.

- When construction is completed the CCS will inspect the facility for any installation procedures that do not meet COM and/or State regulations. The customer will be notified of any changes for compliance that may arise from the inspection.

- Once the CCS is satisfied with the inspection water will be turned on for backflow assembly testing.

- A COM certified BAT will test each approved backflow assembly within the premise/facility. If an assembly does not pass testing the customer will be notified that the assembly will need to be corrected by their plumber, and then retested by a certified backflow assembly tester. Once the assembly(s) passes testing water will be left on at the meter.

    - BATs must provide the COM CCS with proof of current certification and test kit calibration.

B. Field Surveys for Existing Facilities

The customer's water system shall be open for "Field Surveys" at a time arranged between the COM and the customer to determine whether cross-connections exist, other structural or sanitary hazards exist, or violations of these regulations exist.

All existing facilities will be surveyed on a priority basis, based on the typical risk assessment of various categories of facilities. Surveys will start with facilities with the highest risk (high health hazard) to the public water distribution system. These facilities are classified as "Table 9" severe and high health hazard facilities in the WAC 246-290-490(4).

The following outlines the procedure for conducting existing facility surveys:

- To initiate a survey the CCS shall set up an appointment to meet the owner or owner's representative of the facility to be surveyed. The CCS will explain the customer's responsibility to protect the public water system, the COM's conditions for service, and other applicable City and State regulations. It shall be requested that the customer or a maintenance person familiar with the plumbing system accompany the CCS during the survey.

- During the survey, as cross-connections are located, the CCS will explain the COM's concern about potential health risk. The CSS will take photographs and notes to document all potential hazard locations throughout the customer's water system.

- The CCS shall explain to the customer that the purpose of the survey is to ensure the protection of the water distribution system from contamination, and that the survey is not for the purpose of identifying and isolating all cross-connections within the customer's premise.

- If alterations to the customer's water system must be made the CCS will complete a survey report as soon as possible to give to the customer. The report shall include, but is not limited to, the following:

    - A list of all cross-connections found in their location, and any optional methods of control.
    - Any applicable drawings, sketches, blueprints, photos, etc.
    - A summary of the findings, and the recommendations of requirements for corrective action, and a time (normally 30 days) in which the corrective action must be completed.

- On the corrective action completion date, the CCS shall contract the customer and ask if the corrective actions have been completed. If the corrective actions have been completed, the CCS shall make a re-inspection of the facility. If the corrective actions have not been completed water service will be discontinued to the facility/premise.

- When all required actions have been completed, the file copy of the completed actions shall be placed in the cross-connection control file for the facility, together with any completed backflow assembly test report forms.

- Re-inspection of each premise found to have cross-connections may be resurveyed annually, or more often, if the CCS determines additional surveys are needed.

Chapter 13.06
CROSS-CONNECTION CONTROL

Sections:

13.06.010 Interpretation and intent.

The regulations set out in this chapter detail the manner in which the public potable water supply shall be protected from contamination or pollution. Washington State Department of Health requires Group A water systems to meet the requirements as laid out in WAC 246-290-490 by developing and implementing a cross-connection control program. The cross-connection control program presents detailed requirements that must be met by city of Monroe water customers. (Ord. 002/2012 § 1; Ord. 784, 1985)

13.06.015 References adopted into Monroe's cross-connection control program.

A. The Group 'A' Public Water Systems, Chapter 246-290 WAC, as it is applicable to the city of Monroe water system, is hereby adopted by reference.

B. The city of Monroe's Cross-Connection Control Program Manual, most current edition, as required by WAC 246-290-490(3)(b), is adopted by reference.

C. The Cross-Connection Control Manual, Accepted Procedure and Practice, most current edition, published by the Pacific Northwest Section of the American Water Works Association, is adopted by reference.

D. The Manual of Cross-Connection Control, most current edition, published by the University of Southern California Foundation for Cross-Connection Control and Hydraulic Research, is adopted by reference.

E. The Uniform Plumbing Code and Standards published by the International Association of Plumbing and Mechanical Officials, most current edition, is adopted by reference. (Ord. 002/2012 § 1)

13.06.020 Conformance to rules and regulations.

Any customer receiving water from the city, or who will in the future receive water from the city, shall comply with the rules and regulations contained in this chapter. (Ord. 002/2012 § 1; Ord. 784, 1985)

13.06.030 Organization – Conformance.

Any water district, municipal organization or other organization, which is connected to the city water supply and/or which is furnished to people within said district or organization, shall cause all the people or members within said district or organization, as well as the district or organization itself, to comply with the rules and regulations contained in this chapter. (Ord. 002/2012 § 1; Ord. 784, 1985)

13.06.040 Definitions.

As used in this chapter, unless the context states otherwise, the following definitions shall apply:

A. "Approved air gap" means a physical separation between the free-flowing end of a potable water supply pipeline and the overflow rim of an open or nonpressurized receiving vessel. To be an air gap approved by the department, the separation must meet the dimensions defined in WAC 246-290-490.

B. "Auxiliary supply" means any water source other than the public water supply that may be available in the building or on the premises.

C. "Backflow" means the undesirable reversal of flow of water or other substances through a cross-connection into the public water system or consumer's potable water system.

D. "Approved backflow preventer" means an approved air gap, an approved backflow prevention assembly or an approved atmospheric vacuum breaker. The terms "approved backflow preventer," "approved air gap" and "approved backflow prevention assembly" refer only to those approved backflow preventers relied upon by the city's cross-connection control specialist for the protection of the public water system.

E. “Backpressure” means a pressure (caused by a pump, elevated tank or piping, boiler or other means) on the consumer’s side of the service connection that is greater than the pressure provided by the public water system and which may cause backflow.

F. “Backsiphonage” means backflow due to a reduction in system pressure in the city’s distribution system and/or consumer’s water system.

G. “The city of Monroe” is the authority having jurisdiction, in regards to this chapter, to administer and enforce the provisions upheld in the city’s cross-connection control program.

H. “Cross-connection” means any actual or potential physical connection between a public water system or the consumer’s water system and any source of nonpotable liquid, solid or gas that could contaminate the potable water system.

I. “Cross-connection control program” means the administrative and technical procedures the city of Monroe implements to protect the public water system from contamination via cross-connections as required in WAC 246-290-490 as defined in WAC 246-290-010. Cross-connection control program requirements are found in the city’s Cross-Connection Control Manual.

J. “Cross-connection control specialist” means a person holding a valid cross-connection control specialist certificate issued under WAC 246-290-292.

K. “Fire system” means a wet or dry piping system that can either be categorized as a closed, flow-through, or combination.

L. “Premises” means a tract of land including its buildings or other appurtenances.

M. “Premises isolation” means a method of protecting the public water system by installation of air gaps or approved backflow prevention assemblies at or near the service connection or alternative location acceptable to the city’s cross-connection control specialist to isolate the consumer’s water system from the city’s distribution system.

N. “Double check valve assembly” (DCVA) means an assembly composed of two single, independently acting check valves, including tightly closing shutoff valves located at each end of the assembly, and suitable connections for testing the water-tightness of each check valve. This assembly shall only be used to protect against a non-health hazard.

O. “Double check detector assembly” (DCDA) means a specifically designed assembly composed of a line-size approved double check valve assembly with a bypass containing a specific water meter and an approved double check valve assembly. The meter shall register accurately for only very low rates of flow up to three gpm (gallons per minute) and shall show a registration for all rates of flow. This assembly shall only be used to protect against a non-health hazard. This assembly is primarily used on fire sprinkler systems.

P. “Reduced pressure backflow assembly” (RPBA) means an assembly incorporating two check valves and an automatically operating differential relief valve, located between the two shutoff valves, and equipped with necessary appurtenances for testing. This assembly may be used for non-health and health-hazard applications.

Q. “Reduced pressure detector assembly” (RPDA) means a specifically designed assembly composed of a line-size approved reduced pressure backflow assembly with a bypass containing a specific water meter and an approved reduced pressure backflow assembly. The meter shall register accurately for only very low rates of flow up to three gpm and shall show a registration for all rates of flow. This assembly shall be used to protect against a non-health hazard or a health-hazard. The assembly is primarily used on fire sprinkler systems with chemical injection. (Ord. 002/2012 § 1; Ord. 784, 1985)

13.06.050 Cross-connection prohibited – Exceptions.

All cross-connections, whether or not controlled by automatic flushing devices such as check valves or by hand-operated mechanisms such as a gate valve or stopcocks, are prohibited unless the city of Monroe’s cross-connection control specialist determines there is no actual or potential hazard present. All cross-connections must be observed by the city’s cross-connection control specialist and assigned the appropriate method of backflow protection. (Ord. 002/2012 § 1; Ord. 784, 1985)

13.06.060 Failure to discontinue.

Failure on the part of persons, firms, businesses or corporations, receiving water services from the city of Monroe, and who fail to follow the city’s cross-connection control program requirements will be sufficient cause for the discontinuance of the public water service to the premises on which the cross-connection exists. (Ord. 002/2012 § 1; Ord. 784, 1985)

13.06.070 Cross-connection corrections.

The city of Monroe’s cross-connection control specialist has the option to make periodic inspections of the premises served by the public water supply to check for the presence of cross-connections. Any cross-connection found in such inspection shall be ordered to be corrected, according to the city's cross-connection control specialist. (Ord. 002/2012 § 1; Ord. 784, 1985)

13.06.080 Backflow prevention device – Installation required when.

Backflow prevention devices shall be installed at the service connection or within any premises even though a cross-connection may not exist at the time the backflow device is required to be installed. This shall include, but is not to be limited to, the following situations:

A. Industrial, commercial and warehouse buildings;

B. Premises having an auxiliary water supply;

C. Premises having internal cross-connections that are not correctable, or intricate plumbing arrangements which make it impractical to ascertain whether or not a cross-connection exists;

D. Premises where entry is restricted so that inspections for cross-connections cannot be made with sufficient frequency, or at sufficiently short notice, to assure that cross-connections do not exist;

E. Premises having a repeated history of cross-connections being established, or reestablished;

F. Premises on which any substance is handled under pressure so as to permit entry into the public water supply or where a cross-connection could reasonably be expected to occur. This shall include the handling of process water and cooling waters;

G. Premises where material of toxic or hazardous nature is handled such that if backsiphonage should occur, a serious health hazard may result;

H. The following types of facilities will fall into one of the above categories where an approved backflow preventer shall be installed at these facilities as set forth in this section:

1. Hospitals, mortuaries, and clinics.

2. Laboratories.

3. Sewage treatment plants.

4. Food and beverage processing plants.

5. Manufacturing plants.

6. Chemical plants using a water process.

7. Petroleum processing or storage plants.

8. Multi-unit buildings.

9. Strip-malls.

10. Fairgrounds.

11. Others specified by Washington State Department of Health. (Ord. 002/2012 § 1; Ord. 784, 1985)

13.06.085 Fire system requirements.

For service connections other than a flow-through or combination fire protection system the cross-connection control specialist shall ensure backflow protection is installed in an approved location.

A. A closed commercial fire system is required to have one of the following types of backflow protection installed in-line to isolate the fire system from the public water system:

1. Double check detector assembly.

2. Reduced pressure detector assembly if the use of chemical addition or the use of an auxiliary water supply is used.

B. A closed residential fire system is required to have one of the following types of backflow protection installed in-line to isolate the fire system from the public water system:

1. Double check valve assembly.

2. Double check detector assembly.

3. Reduced pressure backflow assembly if the use of chemical addition or the use of an auxiliary water supply is used.

4. Reduced pressure detector assembly if the use of chemical addition or the use of an auxiliary water supply is used.

Flow-through or combination fire protection systems must be constructed of potable water piping and materials in accordance with the Uniform Plumbing Code. (Ord. 002/2012 § 1)

13.06.086 Hydrant-meters.

Hydrant-meters may be rented out on a case-by-case basis as determined by public works staff. Any persons or party renting a hydrant-meter must comply with the provisions of MMC 13.04.380, 13.04.410, 13.04.420, and 13.04.500 (which address connecting to a hydrant, obstruction, permission, and penalties). (Ord. 002/2012 § 1)

13.06.090 Backflow prevention device – Degree of hazard determination.

The type of protection device required shall depend on the degree of hazard which exists as follows:

A. An approved air-gap separation shall be installed where the water supply may be contaminated with sewage, industrial waste of a toxic nature or other contaminant which would cause health or system hazard.

B. In the case of a substance which may be objectionable but not hazardous to health, a double check valve assembly, air-gap separation or a reduced pressure backflow assembly shall be installed. (Ord. 002/2012 § 1; Ord. 784, 1985)

13.06.100 Backflow prevention device – Location.

Backflow prevention devices required in this chapter shall be installed in a location designated by the cross-connection control specialist. (Ord. 002/2012 § 1; Ord. 1260, 2002; Ord. 784, 1985)

13.06.110 Backflow prevention device – Installation supervision.

Approved backflow preventers required in this chapter shall be installed under the supervision of, and with the approval of, the city of Monroe's cross-connection control specialist. (Ord. 002/2012 § 1; Ord. 784, 1985)

13.06.120 Protective device – Approval required.

Any protective device required in this chapter shall be a model approved by the Washington State Department of Health. (Ord. 002/2012 § 1; Ord. 784, 1985)

13.06.130 Backflow prevention device – Annual inspection and tests.

Backflow prevention assemblies installed under this chapter shall be inspected and tested annually or more often if determined by the city of Monroe's cross-connection control specialist. The devices shall be repaired, or replaced whenever they are found to be defective. Inspections, tests, repairs and records thereof shall be done under the city of Monroe's cross-connection control specialist's supervision. (Ord. 002/2012 § 1; Ord. 784, 1985)

13.06.140 Failure to comply – Termination of service.

Failure of any customer, any district or any organization to cooperate in the installation, maintenance, testing of approved backflow preventers or the requirements of an approved air-gap separation shall be grounds for termination of the water service at a point where such flow, which is to be determined by the city of Monroe's cross-connection control specialist, would best prevent possible contamination of the public supply. (Ord. 002/2012 § 1; Ord. 784, 1985)

Appendix W-E

Conditions of Service

Chapter 13.04

WATER REGULATIONS, RATES AND CHARGES

Sections:

13.04.005 Adoption of a water system plan.

The Monroe city council hereby adopts the water system plan, attached to the ordinance codified in this section as Exhibit A and incorporated herein by this reference. (Ord. 027/2009 § 1)

13.04.010 Definitions.

A. "Additional unit" means any unit other than "sleeping room."

B. "City" means the city of Monroe, Washington.

C. "Combination commercial and single residential unit" is defined as any building or portion thereof containing living quarters in connection with the operation of a store, office, or other commercial business as otherwise defined herein.

D. "First unit" means any unit selected by the owner or operator, and may include the unit in which the owner or operator resides, and whether the unit is of a permanent or temporary nature.

E. "Hotels, motels, and apartment houses" include the ordinary definition of same and further, for the purposes of this chapter, excludes premises of four dwelling units or less.

F. "Multiple commercial units" are defined as buildings or structures, or portions thereof, where two or more offices, stores or businesses are conducted.

G. "Multiple residences" are defined as duplexes, triplexes and fourplexes, or any single building containing four or fewer one-person or one-family dwelling units.

H. "Person" means and includes natural persons of either sex, associations, copartnerships or corporations, whether acting by themselves or by a servant, agent, or employee; the singular number shall be held and construed to include the plural and the masculine pronoun to include the feminine.

I. "Single commercial unit" means any and all premises wherein or whereupon one business or enterprise is conducted for profit or of a public nature, including fraternal and church properties, and retail or wholesale establishments, without living quarters attached and except as otherwise defined herein.

J. "Single residential" means any one-family dwelling unit physically separated from any other one-family dwelling, whether the same be on the same lot or property, or otherwise.

K. "Sleeping room" means an accommodation of a hotel, motel or apartment house providing facilities for sleeping only, or including personal toilet and bath, but not including facilities for cooking, food storage and serving of meals, and designed primarily for overnight accommodation only, as distinguished from facilities designed for permanent living quarters.

L. "Trailer courts" means premises established chiefly for the accommodation of trailers and mobile homes for substantially transient and temporary occupancy, whether the unit is owned by the occupant or the operator of the trailer court.

M. “Trailers and mobile homes” are defined as dwelling units designed for facility of movement from one place to another on wheels and excludes any permanent type dwelling unit. (Ord. 1260, 2002; Ord. 426, 1965; Ord. 327, 1954)

13.04.020 Application for connection.
Any person desiring to have premises connected with the water supply system of the city of Monroe shall make application therefor at the office of the water collector.

Applications therefor shall be made upon a printed form furnished for that purpose, which application shall contain the address of the owner, a legal description of the premises where such water supply is desired, and shall fully state all the purposes for which the water is to be used, the number of family units to be supplied, the size of the service pipe, and shall be signed by the owner of the premises to be served or his duly authorized agent. Tenants, as such, are not considered agents of the owner, and without specific written authority from the owner placed on file with and at the time of application, no application for water service by a tenant will be considered or processed. At the time of filing such application the applicant shall pay the fees for installation of water service hereinafter provided. (Ord. 327, 1954)

13.04.025 Water system capital improvement charge.
A water system capital improvement charge shall be assessed at time of application for a new connection to the Monroe water system or at time of expansion or change of use of a facility when the water usage is expected to increase. A water system capital charge shall not be assessed when an additional meter is purchased for an already served parcel when the water usage is not expected to increase. No refunds will be given if a change in use or occupancy causes the expected water usage to decrease.

Capital improvement charges shall be as established by the city council by periodic resolution. The amount set by such resolution shall be the amount paid per equivalent residential unit (ERU). Single-family residences will be charged for one ERU. Multifamily structures shall be charged for one ERU per residential unit. Exception: One-bedroom or studio residential units located in the downtown commercial zone, which structures are mixed commercial and residential use, shall be charged .333 EU per unit. ERUs for nonresidential new customers shall be based on the size of water meter needed to supply the customer’s calculated peak demand:

Meter size	ERUs
5/8 x 3/4 inch	l
l inch	2.5
1-1/2 inches	5
2 inches	8
3 inches	16
4 inches	25
6 inches	50
8 inches	80

or the expected water usage, whichever is greater. When using expected water usage one ERU is defined as having an average annual monthly consumption of one thousand cubic feet. All expected water usage including, but not limited to, domestic supply, irrigation, and process water will be included to determine the appropriate fee. This charge will be determined by the city engineer and any decision may be appealed to the city council for a final determination. In no case shall the ERU amount be less than one. (Ord. 024/2004; Ord. 1237, 2001; Ord. 1209, 2000)

13.04.026 Exemption for homeless transitional shelters.

A. The capital improvement fees imposed by MMC 13.04.025 shall not apply to transitional housing for homeless persons operated by federal, state, county or municipal agencies or public benefit nonprofit corporations. In order to qualify for this exemption, the transitional housing must focus upon providing counseling, training and/or opportunities to the homeless to enable them to find employment and support themselves. All persons who use the transitional home shall either be homeless individuals, support staff or others involved in the operations of the shelter. For purposes of this section, homeless persons shall be deemed to be individuals who do not have the resources for a fixed place to sleep at night. Such persons must qualify as “very low-income” individuals as defined in the city of Monroe comprehensive plan.

B. As a condition of granting this exemption, the property owner shall record a covenant prepared by the city that provides that if the use is subsequently changed in a manner that no longer qualifies it for the exemption in MMC 13.04.026(A), MMC 13.04.025 shall be applied at the time the exempted use was changed as if the exempted use had never occurred. Under these circumstances, a capital improvement fee assessed for a change in use shall be based upon the change in use from the use immediately preceding the exempted use to the use to which the exempted use was converted. Similarly, if the exempted use was the first water use of the property, the capital improvement fee assessed at the time the exempted use is changed shall be assessed as if the changed use were the first water use of the property.

C. This exemption shall only apply to the first thirty equivalent residential units (ERUs) that qualify. Any exempted uses that are subsequently discontinued shall not qualify as one of the thirty ERUs. (Ord. 007/2008 § 1; Ord. 018/2005)

13.04.030 Furnishing information – Action for failure.

The owners of all premises being served with a water supply from the city water system at the effective date of the ordinance codified in this chapter shall be required to furnish within ninety days therefrom full and complete data and information required upon an original application.

If any person shall fail, neglect or refuse to comply with this section, the city may shut off the water furnished to the premises of the one so failing, neglecting or refusing and may charge a fee as established by the city council by periodic resolution for shutting the water off and turning the water on again. (Ord. 914, 1989; Ord. 327, 1954)

13.04.040 Contract provisions.

The application provided for in MMC 13.04.020 and 13.04.030 shall contain a contract on the part of the person making the same to pay for the water applied for at the rate and in the manner specified in such contract, and shall reserve to the city of Monroe the right to charge and collect the rates and enforce the penalties provided for in this chapter, in the manner herein provided, to change the rates at any time by ordinance, to temporarily discontinue the service at any time without notice to the consumer, and shall specify that the contract is subject to all the provisions of this chapter, and of any ordinance of the city of Monroe relating to the subject, hereafter passed, and shall provide that the city shall not be held responsible for any damage by water or other cause resulting from the defective plumbing or appliances on the premises supplied with water, installed by the owner or occupants of the premises, and shall provide that in case the supply of water shall be interrupted or fail by any reason, the city shall not be held liable for damages for such interruption or failure, nor shall such interruptions or failures for any reasonable period of time be held to constitute a breach of contract on the part of the city or in any way relieve the consumer from performing the obligations of his contract. (Ord. 327, 1954)

13.04.050 Contract to be in effect.

All contracts shall take effect from the day they are signed and rates shall be charged from the day the premises are connected with the city’s water supply. (Ord. 327, 1954)

13.04.060 Connection specifications.

Upon presentation of receipt for the installation fees, the public works director shall cause the premises described in the application to be connected with the city's water main by a service pipe extending at right angles from the main to the property line, provided such main be available adjacent to the property to be serviced, and such connection shall include a meter and stopcock placed within the lines of the street or curb, which connection shall thereafter be maintained and kept within the exclusive control and ownership of the city, and in no case shall the owner of any premises have the right to claim or reclaim any part thereof; provided, however, that when the service connection cannot be protected within the lines of the street or curb or when the main may be on privately owned premises the city may enter upon the applicant's premises for the purpose of installing and maintaining such connection as herein provided. No service connection shall be made or allowed from the city's mains to any premises supplied by water from any other source unless a special permission is given by the city council, which special permission may be terminated at any time the city council may elect.

No water service shall be furnished by direct line from the city's mains to any steam boiler on any person's premises. (Ord. 1260, 2002; Ord. 327, 1954)

13.04.065 Developer-installed service connections and meters.

A. Developers of all new subdivisions who will be serving the lots with city water shall be required to install all the water service lines from the water main to the lot property line before the paving of the street. The city engineer shall establish standards for these installations.

B. A meter installation charge, for installation of a water meter on these developer-installed service lines, shall be due when an application for water service for each individual lot is made. This meter charge shall be paid in lieu of the city's service installation charge. The meter installation charge for a three-quarter inch meter shall be as established by the city council by periodic resolution. The charge for larger meters shall be set by the public works director and recover all city material and labor costs. (Ord. 1260, 2002; Ord. 914, 1989; Ord. 785, 1985)

13.04.070 Temporary private service – Access to property.

The city will maintain temporary private services in all cases wherein for any reason the permanent service installations must necessarily be disturbed by the city, and as soon as practicable thereafter permanent services will be restored. During such times and in such cases the city shall have access upon private property of any premises so served as may be necessary to maintain this service. (Ord. 327, 1954)

13.04.080 Connection to sewer system.

In every case where any premises are connected with and use the city sewer system, then such premises shall be connected with the city's water system and shall use water therefrom in its use of the city's sewer system. (Ord. 327, 1954)

13.04.090 Size of connection – Fee according to schedule of rates.

No service connection less than three-fourths inch in size shall be installed. The fees for the installation of any water service as herein provided shall be according to the schedule of rates hereinafter in this chapter set forth and shall be due and payable at the time application therefor is made. (Ord. 327, 1954)

13.04.095 Connection to city-owned mains – Computation of charges.

All connection charges for service from water mains owned by the city outside of the boundaries of local improvement districts and not subject to a recovery contract shall be computed at a rate of three dollars per linear foot for all installations completed prior to January 1, 1970. For all water mains owned by the city, installed after January 1, 1970, not subject to recovery contracts, the connection charge shall be based on the actual construction cost per front foot as established by the city engineer. These front-footage charges are declared to represent a fair pro rata share of the cost of construction for an eight-inch main with appurtenances, without regard to the actual size of mains constructed. The revenues collected from these connection charges shall be deposited in the capital improvement fund. (Ord. 914, 1989; Ord. 785, 1985)

13.04.100 Service pipes to conform.

Before water will be turned on to service any premises connected with the city's mains, the service pipes upon such premises must be made to conform with existing ordinances for the time being regulating plumbing standards for the city. (Ord. 327, 1954)

13.04.110 Furnishing water to additional premises – Application.
It shall be unlawful for any person whose premises are supplied with water to furnish water to additional premises, whether on the same lot or on a different lot, unless application is first made in writing to do so upon a printed form furnished for the purpose and in the same manner as an original application for the installation of water service. Unless such application has been made and approved, all service pipes must be so arranged or installed that the supply to each house or business unit may be separately controlled by a meter. (Ord. 644, 1977; Ord. 327, 1954)

13.04.120 Additional premises – No applications – Double rate.
When additional premises are connected without the application prescribed in the preceding section, such premises may be charged at a double rate for the time they are in use, and the service may be shut off, and a charge as established by the city council by periodic resolution for shutting off the water and for turning on such service may be made.

In case water shall be turned off as provided in this section, the same shall not be turned on again until all rates and charges against the premises have been paid in full. Change of ownership or occupation shall not affect the application of this section. (Ord. 914, 1989; Ord. 327, 1954)

13.04.130 Changing connections.
When new buildings are to be erected on the site of old ones and it is desired to increase the size of, or change the location of, the old service connection, or where a service connection to any premises is abandoned or no longer used, the public works director may cut out or remove such service connection after which, should a service connection be required to the premises, a new service shall be placed upon the owner making an original application and paying for a new connection in the regular manner. (Ord. 1260, 2002; Ord. 327, 1954)

13.04.150 Shutoff – No remission.
When water has been shut off for any cause, and is turned on again or allowed or caused to be turned on by the owner, no remission of rates will be made on account of its having been shut off, and the public works director may shut off the water at the main, or remove a portion of the service connection in the street and shall charge the actual cost of cutting and reinstating the water supply to the owner of the property, except as herein otherwise provided. (Ord. 1260, 2002; Ord. 327, 1954)

13.04.155 Vacation/vacancy credit.
Single-family dwelling accounts shall be eligible for vacation/vacancy credits for any absence of thirty days or more with a maximum of ninety days in any concurrent twelve-month period. Low-income senior citizen accounts satisfying the criteria set forth in MMC 13.04.322, and city of Monroe irrigation accounts, shall be eligible for vacancy credits for any absence or nonuse of thirty days or more with a maximum of one hundred eighty days in any concurrent twelve-month period. Utility accounts must be current, no vacancy credits shall be granted for an account that is delinquent. Credits shall be computed on a percentage of days used. The city will provide a vacancy credit application in the event the city operates the utility and the contractor will provide a vacancy credit application in the event a contractor operates the utility. Vacancy credit applications must be filed forty-eight hours in advance. Persons filing vacancy credit applications found to be false shall, in addition to any other penalties, be ineligible to receive future vacancy credits. Failure to apply for continuation of services within seven days of the renewed occupancy of the premises shall result in charges being imposed for water services without regard for any period of vacancy. (Ord. 019/2011 § 2; Ord. 008/2005; Ord. 027/2003; Ord. 1119, 1997)

13.04.160 Charges – Lien – Fees for turning off and on.
All water rates will be charged against the premises for which the service was installed. All charges for water, when the same become delinquent and unpaid, shall be a lien against the premises to which the same has been furnished. In case any charges for water shall become a lien against the premises, the water shall be cut off until such charges, with additional charges as established by the city council by periodic resolution for the expense of shutting the water off and again turning on such water, are paid. (Ord. 914, 1989; Ord. 327, 1954)

13.04.165 Charges – Utility lien search – Property closing request – Water meter reading.
All requests for a utility and lien search or water meter reading at time of sale of property, shall pay a fee as established by the city council by periodic resolution. (Ord. 010/2005)

13.04.170 Metered service only.
All water service supplied from the city's mains shall be by metered service only. (Ord. 327, 1954)

13.04.180 Powers to regulate use in emergency.
The city of Monroe in all cases of emergency, whenever the public safety, health, or the equitable distribution of water so demands, may direct the public works director to change, reduce, or limit the time of use or discontinue the use of water if in its judgment public necessity demands. (Ord. 1260, 2002; Ord. 327, 1954)

13.04.190 Causing water to fall on people.
It shall be unlawful for any person willfully to place any automatic sprinkling device or willfully to place or hold any hose in such position or manner that water therefrom falls on any person while on any public street or sidewalk. (Ord. 327, 1954)

13.04.200 Penalty for violating MMC 13.04.190.
If any person shall violate any provision of MMC 13.04.190, the city may shut off the water furnished to the premises upon which such violation is made, and may charge fees as established by the city council by periodic resolution for shutting the water off and for again turning on such water. (Ord. 914, 1989; Ord. 327, 1954)

13.04.210 Water shortage – Restricted use – Penalty.
The city reserves the right in case of a shortage of water from any cause to make an order forbidding or suspending the use of water for sprinkling or irrigation, or to change the hours during which the same may be done, by giving notice through the city official newspaper, or by public address system, and any person violating such order shall be subject to a penalty as established by the city council by periodic resolution, and water shut off and not turned on again until such penalty has been paid in addition to the fee for shutting off and turning on as in this chapter provided. (Ord. 914, 1989; Ord. 327, 1954)

13.04.220 Fire.
It shall be unlawful for any person to use water for irrigation or sprinkling during the progress of any fire in the city, unless for the protection of property, and all irrigation and sprinkling shall stop when an alarm of fire is sounded, and shall not begin again until the fire is extinguished. (Ord. 327, 1954)

13.04.230 Right to shut off – Nonliability.
The city reserves the right at any time, without notice, to shut off the water supply for repairs, extensions, nonpayment of rates, or any other reason, and the city shall not be responsible for any damage, such as bursting boilers supplied by direct pressure, the breaking of any pipes or fixtures, stoppages or interruption of water supply, or any other damage resulting from the shutting off of water. (Ord. 327, 1954)

13.04.240 Owner responsible for damaged meters.
The owner of any service connections shall be responsible for damage to meters serving the premises caused by hot water and shall be charged for repairs to meters caused by such damage. (Ord. 327, 1954)

13.04.250 Public works director to have free access.
It shall be unlawful for any person to fail, neglect, or refuse to give the public works director or his duly authorized representative free access at all reasonable hours to all parts of premises supplied with water from the city's mains for the purpose of inspecting the condition of pipes and fixtures, noting the amount of water used and the manner in which it is used. (Ord. 1260, 2002; Ord. 327, 1954)

13.04.260 Penalty for violating MMC 13.04.250.
If any owner or occupant of any premises supplied with city water shall violate any provision of MMC 13.04.250, the city may shut off such service; and such owner or occupant shall be required to pay any and all delinquent and unpaid charges against such premises together with a charge, as established by the city council by periodic resolution for shutting off the water and for turning on such water, before the same shall be again turned on. (Ord. 914, 1989; Ord. 327, 1954)

13.04.270 Violation – Water shutoff.
In case of violation of any of the preceding sections, the city may cause written notice thereof to be served on the owner or occupant of the premises where such violation takes place, which notice shall require the payment of the

charges hereinbefore provided, and if such charges be not paid within twenty-four hours from the time of the service of such notice, the water shall be turned off from such premises and shall in no case be turned on until the charges have been paid. (Ord. 327, 1954)

13.04.280 Meters – Damaged – Out of order.

All meters on services of consumers within, or without, the city limits, until otherwise authorized by the city, shall be and remain the property of the city and will not be removed unless the use of water on the premises is to be entirely stopped or the service connection discontinued or abandoned. In all cases where meters are lost, injured or broken by carelessness or negligence of owners or occupants of premises, they shall be repaired or replaced, by or under the direction, of the public works director, and the cost charged against the owner or occupant, and in case of nonpayment the water shall be shut off and will not be turned on until such charge and the charge for turning off and turning on the water are paid. In the event of the meter getting out of order or failing to register properly, the consumer shall be charged on an estimate made by the city on the average monthly consumption during the last three months that the same was in good order or from what the city may consider the most reliable date at its command. (Ord. 1260, 2002; Ord. 327, 1954)

13.04.290 Meter accuracy questioned – Procedure.

When the accuracy of record of a water meter is questioned by a user, he shall make a written complaint in that regard setting forth in detail facts and reasons upon which his complaint is based, together with a request to have the meter tested for recording accuracy, and present same to the water collector. The public works director shall make investigation and employ such means as may be indicated thereby to determine the matter.

In the event that the meter in question shall be removed and tested for accuracy and that test discloses an error against the consumer of more than three percent on the meter’s registry, the excess of the consumption on the three previous readings shall be credited to the consumer’s meter account.

In the event that the meter in question shall be removed and tested for accuracy and that test discloses no error against the consumer, there will be a meter check charge as established by the city council by periodic resolution.

No meter shall be removed, or in any way disturbed, nor the seal broken except in the presence or under the direction of the public works director. (Ord. 1260, 2002; Ord. 914, 1989; Ord. 755, 1983; Ord. 337, 1956; Ord. 327, 1954)

13.04.300 Meter removal or reinstallation.

When it is desired to have a meter removed or reinstalled, the owner of the premises supplied or to be supplied with such meter shall file an original application at the office of the city engineer and shall pay the costs in full for such removal or reinstallation as upon an original application. (Ord. 1260, 2002; Ord. 327, 1954)

13.04.310 Purpose of this section and MMC 13.04.320.

The purpose of this section and MMC 13.04.320 is to make certain adjustments in the existing water rates and classifications of water use in the city and to attempt to resolve certain inequities and inequalities which may have heretofore existed, to the end that fair and reasonable water rates satisfactory to the water customers of the city may be imposed. (Ord. 684, 1979; Ord. 426, 1965)

13.04.320 Rates established.

A. The rates for water service for the water system of the city shall be as established by the city council by periodic resolution. Rates shall be generally classified as follows:

1. Wholesale. Water primarily purchased for resale to members or third parties. The wholesale purchaser must provide its own water delivery system to its water purchasers. It must also have its own storage capacity sufficient to meet Washington State Department of Health standards without reliance upon city capacity.

2. Retail. Water use that does not qualify as wholesale as defined above.

The rates classifications created by this subsection shall not affect any valid preexisting water contracts.

B. Whenever the rates established by council resolution provide for additional unit charges, the same shall be deemed to mean that each additional unit shall be charged with the number of cubic feet minimum, as determined by periodic council resolution, the total of which may be added to the prime unit minimum charge before extra charges are added at the rates established by periodic council resolution.

C. For service outside the city limits (retail or wholesale rate classes), the charges shall be one hundred fifty percent of the standard in-city rate as established by the city council by periodic resolution. “Outside of the city limits” shall mean any property that qualifies for one or more of the following:

1. A majority of the property is situated outside of city limits;

2. A majority of fixtures on the property are outside of city limits; or

3. A majority of the value of improvements is outside city limits.

“Property” for purposes of determining outside service shall include the property served by a wholesale customer of the city’s water system, i.e., if the wholesale customer resells to residential or commercial properties, the location of those properties shall be considered in determining whether the service is “outside city limits.”

D. Irrigation water meters turned off during winter months for winterizing shall not be assessed charges for services while water is off. When irrigation meter is turned on, charges will be assessed. (Ord. 005/2006 § 1; Ord. 039/2004 § 1; Ord. 027/2003; Ord. 1284, 2002; Ord. 1245, 2001; Ord. 1219, 2000)

13.04.322 Senior citizen and disabled discount.

For senior citizens with very low income or disabled persons hereinafter defined, the single-family residential housekeeping unit charge shall be as established by the city council by periodic resolution. The rate established for seniors is restricted to single-family residences or other residences with a single water meter per unit primarily occupied by a senior citizen or senior citizens being fifty-five years of age or older having an annual household income of fifty percent or less of the area median income for Snohomish County, as published by the Washington State Office of Financial Management. In the event that such income determination is no longer published, the city may use such other reasonable methods of determining average median income as it may choose. Discount rate is restricted to minimum residential meter size. To qualify as a disabled person, the disability is defined as the inability to do any substantial gainful activity due to any medically determinable physical or mental impairment which can be expected to result in death, or which has lasted or can be expected to last for a continuous period of not less than twelve months. To qualify for the disabled discount, said rate is restricted to single-family residences primarily occupied by a disabled person. The discount rates provided for herein are available only upon application, which is required to be updated annually by the customer. (Ord. 024/2009 § 4 (Exh. B); Ord. 012/2009 § 2; Ord. 003/2003)

13.04.323 Low-income senior citizen discount – Nonprofit multifamily.

For low-income senior citizens as hereinafter defined, the nonprofit multifamily residential utility rate shall be as established by periodic resolution of the city council. The rate established under this section is restricted to multifamily residences that are: (A) exclusively occupied by low-income senior citizens, and (B) owned or operated by entities with nonprofit public benefit status as defined by RCW 24.03.490. For purposes of this section, “low-income senior citizens” are defined as persons being fifty-five years of age or older and having an annual household income of fifty percent or less of the area median income for Snohomish County, as published by the Washington State Office of Financial Management. In the event that such income determination is no longer published, the city may use such other reasonable methods of determining average median income as it may choose.

The discount rates provided for herein are available only upon application, which is required to be updated annually by the customer. Such annual update shall provide current documentation of the customer’s nonprofit public benefit status and certify that all residents of the multifamily facility are low-income senior citizens as defined herein. (Ord. 017/2013 § 1)

13.04.325 Consumption estimates.

An estimate on the average monthly consumption, based on previous history of usage, may be made in the event that the meter is not read during the billing cycle. (Ord. 992, 1992)

13.04.330 Billing.

All water rates and charges shall be billed monthly on the first day of the billing month, shall be due and payable not later than the last day of the month, and shall become delinquent after that date. (Ord. 027/2003)

13.04.332 Violation – Returned check – Water shutoff.

In the event the city receives notice from the bank of nonsufficient funds or other reason for returned check which was tendered to the city of Monroe for utility payment, the city shall notify the owner or tenant of the premises of such violation. The owner or tenant shall be required to provide sufficient funds to the city of Monroe for the amount of the returned check plus the return check fee within forty-eight hours. In the event the owner or tenant of the premises does not respond, the city may turn off water to such premises and shall in no case be turned on until the charges have been paid in full unless special arrangements are made with the finance director or designee. The time period described herein shall not extend shutoff dates as described in MMC 13.04.360. (Ord. 1235, 2001)

13.04.335 Payment allocation.

All payments on a combined utility billing shall be applied first to fees or penalties, second to utility taxes, third to storm drainage, fourth to solid waste, fifth to recycling, sixth to sewer, and seventh to water. (Ord. 011/2009 § 1; Ord. 003/2003; Ord. 992, 1992)

13.04.340 Purpose of MMC 13.04.350.

The purpose of MMC 13.04.350 is to increase meter installation rates, both within and without the city limits, in order to conform to the average actual cost of the installations to the city, the council having investigated and determined that there had been no increase in these rates for over ten years, and that the city has actually been losing money on the installations. (Ord. 692, 1979; Ord. 427, 1965)

13.04.350 Meter installation rates established.

Fixed and other charges for water meter installations shall be as established by the city council by periodic resolutions.

In any instance where the actual cost to the city for the necessary material, labor, administration, equipment rentals and equipment used exceed the above stated charge, then the charge shall be equal to said cost of labor, materials and expenses as determined by the public works director.

Upon application for the installation of a meter for commercial use or purposes, the city will specify the minimum size of the meter to be installed.

In any case where water meters are being exchanged for larger or smaller meters, at the request of the customer and at his expense, then there shall be allowed to the customer a credit exchange as established by the city council by periodic resolution. (Ord. 1260, 2002; Ord. 914, 1989; Ord. 692, 1979; Ord. 660, 1978; Ord. 585, 1974; Ord. 528, 1970; Ord. 427, 1965; Ord. 327, 1954)

13.04.360 Unpaid bills – Notice.

All water bills unpaid by the thirtieth day of each month shall be deemed delinquent and service may be shut off and remain shut off until all arrearages shall have been paid together with a shutoff fee and further fee for turning on the same, as established by the city council by periodic resolution. All delinquent accounts shall be charged a penalty per unit per month on the unpaid delinquent amount, such penalty to be as established by the city council by periodic resolution.

At least ten days before water service is scheduled to be terminated, the finance director or designated city official shall notify in writing the owner and the occupant of the property. The owner shall be notified by mail at the address on the account, and the occupant shall be notified by mail, door hanger, or other form at the serviced property. Mailed notices shall be deemed received three business days after mailing. All notices shall contain the following: (A) reason for water termination; (B) delinquent amount that must be paid to avoid interruption of service; (C) instructions on scheduling an informal hearing to demonstrate that the account is not delinquent; and (D) day on or after which water service will be terminated.

After notification, the owner and the occupant shall be afforded the opportunity to present to the finance director or designated city official empowered to resolve billing disputes, evidence that the delinquent charges have been paid.

Such opportunity shall be afforded before water service is terminated; provided, that the owner or occupant requests an informal hearing within three days of presumptive receipt of the notice. Failure to receive mail will not be recognized as a valid excuse for failure to pay rates when due. Changes in ownership of property and change in mailing addresses must be provided in writing to city of Monroe utility department staff. The owner or occupant has the burden to prove that the delinquent charges have been paid. After reviewing the evidence presented by the owner or occupant, the finance director or designated city official shall decide whether or not the account remains delinquent. The owner or occupant shall be notified of the decision. This decision is not subject to appeal. If the account is found to be delinquent, water service will be terminated as previously scheduled or three days after the final decision, whichever is later. (Ord. 010/2009 § 1; Ord. 992, 1992; Ord. 914, 1989; Ord. 755, 1983; Ord. 463, 1967; Ord. 327, 1954)

13.04.370 Expense of laying mains.
All extensions of city mains to serve new customers or areas outside the corporate limits of the city shall be laid at the expense of the person or persons requesting such extensions in writing. (Ord. 327, 1954)

13.04.380 Connecting to city's fire hydrants and valves.
It shall be unlawful for any person, except when duly authorized by the public works director, to open, operate, close, turn on, turn off, interfere with, attach any pipe or hose to or connect anything with any fire hydrant, stop valve or stopcock belonging to the city. (Ord. 1260, 2002; Ord. 327, 1954)

13.04.390 Interference with municipal water system.
It shall be unlawful for any person, unless duly authorized by the public works director, to disturb, interfere with, or damage any water main, water pipe, machinery, tools, meters, or any other appliances, buildings, or grounds belonging to, connected with or under the control of the municipal water system of the city of Monroe; provided, however, that this prohibition shall not prohibit a resident from shutting off water to the premises at the meter in the event of an emergency and turning said water on when the emergency is corrected. Said actions, if undertaken by the resident or his agent, shall be done with due care and caution and shall not relieve said person from any liability for damage caused to the water meter or other property belonging to the city of Monroe in the event of their negligence. (Ord. 1260, 2002; Ord. 1081, 1996; Ord. 327, 1954)

13.04.400 Interfering with city's water supply.
It shall be unlawful for any person to trespass, to bathe in or throw any substance into any reservoir, water tank, or impounding dams of the municipal water system of the city of Monroe. (Ord. 327, 1954)

13.04.410 Obstructing fire hydrant.
It shall be unlawful for any person to obstruct the access to any fire hydrant or to open or operate any fire hydrant, or attempt to draw water therefrom, or to willfully or carelessly injure the same, except in the performance of official duties. (Ord. 327, 1954)

13.04.420 Permission to make connections required.
It shall be unlawful for any person to make connections with any fixtures or connect any pipe with any water main or water pipe belonging to the water system, without first obtaining permission to do so from the city engineer. (Ord. 1260, 2002; Ord. 327, 1954)

13.04.430 Authority of city council.
The city council shall have authority to decide any question which may arise and which is not fully covered in this chapter and its decision shall in such cases be final. (Ord. 327, 1954)

13.04.440 Standby water connections – Application and approval.
Upon application to and approval by the city, a water user may be provided standby water connections for fire protection only. (Ord. 914, 1989; Ord. 541, 1971)

13.04.450 Installation costs and payment for standby water connections.
All charges and costs of installation of such standby water connections shall be paid by the customer, and shall include the regular cost of installation of the size line desired by the customer, plus ten percent. No meter shall be involved. (Ord. 541, 1971)

13.04.460 Proof of intent to use standby water connections only for fire protection – Monthly fee for use.
Prior to any approval by the city, the customer shall provide prints or plans of internal distribution systems sufficient to satisfy the city that the connection is intended for fire protection only.

After installation, the regular standby water connection charges shall be as established by the city council by periodic resolution. (Ord. 914, 1989; Ord. 541, 1971)

13.04.470 MMC 13.04.440 through 13.04.480 not applicable to council entering into separate contracts.
MMC 13.04.440 through 13.04.480 shall not apply to any circumstances or customers in connection with which the council has entered or will enter into a separate contract for the supplying of water for fire protection. (Ord. 541, 1971)

13.04.480 Use of standby connection for other than fire prevention – Penalties.
Should any customer use any such connection for purposes other than fire protection during an actual fire or for immediate protection from an existing fire, the customer may be punished, upon conviction thereof, by a fine of not more than five thousand dollars or imprisonment in jail for not more than one year, or by both such fine and imprisonment. In addition thereto, the council may cancel and terminate the connection. (Ord. 003/2003; Ord. 541, 1971)

13.04.490 Billing of property owners.
Property owners shall be responsible and billed for utility service at all served properties; provided, that the owner may authorize direct billings to be made to and in the name of a tenant or other occupant(s) of the premises to which water service is furnished at the mailing address provided in MMC 13.04.030. Such authorization shall be evidenced by the owner's execution of an agreement in a form provided by the city. No such arrangement shall in any manner relieve the owner of the premises from ultimate liability for the payment of the charges for furnishing water nor in any way affect the lien rights of the city against the premises to which water service is furnished. Failure to receive mail properly addressed to the mailing address provided above shall not be a valid defense for failure to pay the delinquent charges and penalties. (Ord. 016/2011 § 1; Ord. 755, 1983)

13.04.500 Penalties.
Any person who shall violate any provision of this chapter shall, unless otherwise provided, be punished by a fine in the maximum amount of one thousand dollars and/or imprisonment for a term not to exceed ninety days. (Ord. 1081, 1996)

Appendix W-F

Population Forecast Methodology

MEMORANDUM

Date: **February 3, 2015**

To: Ron Dorn

CC: Craig Chambers

From: Abby Weber

Subject: Final Methodology for Population Analysis for City of Monroe Water System Plan Update

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The data and methodology used to establish baseline and projected population estimates for two contributing populations – residents and employees– for the City of Monroe Sanitary Water System Plan Update are presented in this memo.

The baseline year varied based on available data, but generally reflects the year of the most recent data available for each contributing population. Year 2013 is the most recent full year for which water demand data is available. As a result, 2013 is used as the basis for calculating unit water demands for the various demand classifications. Year 2015 is the "current year". Population figures for 2013 and 2015 were acquired by interpolation between the baseline and future projections. The target years for population projections are 2021 (used for 6-year CIP) and 2035 (used for 20 year CIP).

The projection methodology uses Snohomish County's adopted 2035 Population and Employment Growth Targets for the Monroe UGA for target year 2035, and uses the adopted target as an interpolation point for 2015 and 2021. Beyond the current Monroe UGA, growth was calculated using rural lands data from the County and Small Area Forecast data from PSRC.

Conversations regarding demographic data and local long-range planning efforts with the City of Monroe and Snohomish County staff; staff and facility planners at the school district and at individual schools; and Studio Cascade, the City's consultant on the 2015 Comprehensive Plan update, have informed this methodology and ensured consistency.

DATA

The following resources and data were utilized in establishing baseline population and projections:

- 2010 Census

    - Monroe population data by census block
- 2012 American Community Survey (ACS)
    - Monroe self-employment estimate (8.634%)
- Snohomish County
    - 2012 Snohomish County Buildable Lands Report (BLR)
        - Parcel-level shapefile
            - Total HU and employment capacity per parcel
    - Countywide Planning Policies for Snohomish County
        - Adopted 2035 Population and Employment Growth Targets
    - Micro Analysis Zone 2035 population forecast data (custom request)
        - County recommended using 'Alternative 3 – Snohomish County Tomorrow population allocation, with map changes' as 2035 population target on rural lands
    - Parcel shapefile
        - Land use per parcel
    - Snohomish County Property Use Codes
- Office of Financial Management (OFM)
    - Current population estimates
- Puget Sound Regional Council (PSRC)
    - Land Use Baseline
        - By TAZ (custom request)
        - By Jurisdiction – City of Monroe
    - King County Census Block shapefile
- Washington State Employment Security Department
    - Covered Employment estimates (custom request provided by PSRC)
- Studio Cascade
    - Updated FLUM
        - Zoning shapefile

RESIDENTIAL

Baseline

Year 2010 served as the residential population baseline. Population estimates were calculated using 2010 census population data and county parcel data. Census block data and parcel data were joined spatially using GIS, and a residential density was calculated for each census block (the ratio of population to total residential acreage). Residential parcels were identified using Snohomish County Property Use Codes and GIS parcel data. The residential density was then applied to the acreage of each individual residential parcel to produce a population estimate per parcel. The parcel population values were re-aggregated by pressure zone.

Baseline populations were similarly established for the current water service area and the retail water service area.

Projected

Population figures were interpolated for 2013, 2015, and 2021 between 2010 baseline estimates and 2035 projections for each pressure zone. The CPP 2035 Population Growth Target pertains only to the current Monroe UGA, projections beyond the Monroe UGA were conducted separately. Additionally, the State Corrections and Southwest UGA Study Area projections were calculated separately and added to pressure zone DOC 330 and Downtown 298. Each methodology is discussed below.

Monroe UGA

Countywide Planning Policies for Snohomish County adopted a 2035 Population Growth Target of 24,754 for the Monroe UGA. This adopted target was distributed throughout the Monroe UGA based on development capacity.

The population analysis utilized the Snohomish County 2012 Buildable Lands Report (BLR) data to establish the development capacity per parcel. BLR data was obtained for the Monroe UGA. The BLR identifies parcels as vacant, partially used, or re-developable given a 2025 planning horizon. The BLR provides the additional housing unit capacity per parcel. This data was revised to reflect Studio Cascade's recommended zoning and density changes on the Future Land Use Map.

The development capacity is calculated for each parcel as its additional capacity divided by the total Monroe UGA capacity, resulting in the percentage of total growth captured per parcel, or development capacity. The 2035 Population Growth Target was distributed to each parcel based on development capacity, and re-aggregated by pressure zone. Population figures were then interpolated for 2013, 2015, and 2021 between 2010 baseline data and 2035 Population Growth Targets.

A build-out date was calculated based the residential build-out total population for use in UGA Expansion projections. A trendline formula was established between Snohomish County's CPP 2011 population estimate and 2035 population target, solve for the build-out year (x) where y is the population of the build-out year. This gives a build-out year of 2056 for the Monroe UGA under the proposed FLUM.

Southwest UGA Study Area

The Southwest UGA Study Area population growth analysis was conducted separate from the current Monroe UGA. Given the areas current status of rural lands, year 2013 and 2015 population assumed no population growth from the 2010 baseline figure. Based on conversations with Studio Cascade, the area would most likely be considered for inclusion in the UGA in 2017 and be zoned a combination of residential Low Density SFR, Mixed Use, and Commercial. Build-out population capacity was established by subtracting critical areas from residential parcels, and applying a residential density of 4 units per acre to Low Density SFR parcels and 16 units per acre to Mixed Use parcels. Using 2017 as the year to be included in the UGA and 2056 as the build-out year, population figures were interpolated for 2021 and 2035. The estimated growth was added to each target year for pressure zones DOC 330 and Downtown 298.

State Corrections

The State Corrections population growth analysis was conducted separately since County population targets refer to the general residential population rather than Department of Corrections (DOC) inmates. The 2011 Capital Improvement Plan (CIP) was obtained from the DOC. The CIP provided a 20-year inmate growth rate of 13.5%, from this a rate 16.9 inmate per year growth was calculated. The estimated growth was added to each target year for pressure zone DOC 330.

Unincorporated Rural Area

The population analysis for unincorporated Snohomish County rural land was conducted separate from the current Monroe UGA. Population forecast data by Micro Analysis Zone (MAZ) was obtained from Snohomish County. The MAZ data forecasts population growth for three development alternatives for 2020, 2030 and 2040. The County recommended using Alternative 3, as it was the basis for Snohomish County Planning and Development Service's recommended alternative. A population figure was interpolated for 2035 between 2030 and 2040, distributed to vacant residential lands within each MAZ, and aggregated by pressure zone.

Population figures were then interpolated for 2013, 2015, and 2021 between 2010 baseline data and the 2035 interpolated MAZ distribution.

EMPLOYMENT

Baseline

Year 2013 served as the baseline employment population year. Employment population projections were calculated using 2013 Covered Employment estimates and 2012 American Community Survey (ACS) self-employment estimates. Covered employment estimates were provided by Puget Sound Regional Council (PSRC) staff by custom data request. Covered employment refers to positions covered by the WA Unemployment Insurance Act, and accounts for approximately 85-90% of all employment. The Act exempts self-employed individuals, which are accounted for by increasing covered employment figures by the ACS self-employment estimate of 8.634%.

Projected

Population figures were interpolated for 2015 and 2021 between 2013 baseline estimates and 2035 projections for each pressure zone. The CPP 2035 Employment Growth Target pertains only to the current Monroe UGA, projections beyond the Monroe UGA were conducted separately. Both methodologies are discussed below.

Monroe UGA

Countywide Planning Policies for Snohomish County adopted a 2035 Employment Growth Target of 11,781 for the Monroe UGA. This adopted target was distributed throughout the Monroe UGA based on development capacity. The population analysis utilizes Snohomish County 2012 BLR data to establish the development capacity per parcel. BLR GIS data was obtained for the Monroe UGA, which provides the additional employment capacity per parcel. BLR capacity data was revised to reflect Studio Cascade's recommended zoning and density changes on the Future Land Use Map. Revised employment capacities were calculated as a function of buildable acreage and employment densities. The BLR establishes employment densities based on zoning and recent development activity (1995-2010).

Use	Employees per Acre
Commercial	16.68
Mixed Use	15

The development capacity is calculated for each parcel as its additional employment capacity divided the total Monroe UGA employment capacity, resulting in the percentage of employment population growth captured per parcel. The 2035 Employment Growth Target was distributed to each parcel based on development capacity, and re-aggregated by pressure zone. Employment figures were then interpolated for 2015 and 2021 between 2013 baseline data and 2035 Population Growth Targets.

Southwest UGA Study Area

The Southwest UGA Study Area population growth analysis was conducted separate from the current Monroe UGA. Given the areas current status of rural lands, year 2015 population assumed no population growth from the 2010 baseline figure. Based on conversations with Studio Cascade, the area would most likely be considered for inclusion in the UGA in 2017 and commercial zoning designations would be a combination Mixed Use and Commercial. Build-out employment capacity was established by subtracting critical areas from commercial parcels, and multiplying the remaining buildable acreage by the employment density. Using 2017 as the year to be included in the UGA and 2056 as the build-out year, population figures were interpolated for 2021 and 2035. The estimated growth was added to each target year for pressure zones DOC 330 and Downtown 298.

State Corrections

The State Corrections population growth analysis was conducted separately. DOC employment projections were calculated as a ratio of the total inmate population. Historical employment and inmate was obtained from the DOC, and an inmate to employee ratio was established. This ratio was applied to inmate growth to calculate employment for each target year. The estimated growth was added to each target year for pressure zone DOC 330.

Unincorporated Rural Area

The water service area extends beyond the Monroe UGA, beyond the scope of the BLR and CPP UGA growth targets. For unincorporated rural lands, the employment population analysis utilizes Land Use Baseline (LUB) data by Traffic Analysis Zone (TAZ) obtained from PSRC by special request. The LUB provides forecasted employment growth for 2020, 2030, and 2040. A value for 2035 employment growth was interpolated and then distributed to vacant parcels.

Year 2035 employment population projections for urban and rural lands were aggregated by pressure zone. Employment populations were then interpolated for 2015 and 2021 between 2013 baseline data and 2035 Population Growth Targets.

Population

Pressure Zones within Current Water Service Area											
	Baseline Population			2013	2015	2021	2035			
	GIS Calculations		Total	Total	Total	Total	Monroe UGA	Rural	"UGA Expansion"	Total
Pressure Zone	2010 Population	Unaccounted CB Population	Adjusted 2010 Baseline	(interpolated)	(interpolated)	(interpolated)	(CPP 2035 Target distributed by BLR)	2035 Alt3 MAZ data	(interpolated, baseline-build out))	
Airport/Foothills 430	725		725	829	898	1,107	867			1,592
DOC 330	563	2,469	3,032	3,314	3,400	3,901	72	3	1,592	5,071
Downtown 298	11,617	115	11,732	11,879	11,977	12,271	1,073	35	117	12,957
Lord Hill 260	25		25	25	25	25		0		26
Lord Hill 350	110		110	110	110	111		1		112
Lord Hill 565	214		214	214	214	215		3		216
North Hill 635	708		708	732	749	798		205		913
Rivemont/Calhoun 389 (combined with	728	53	781	796	805	834	75	44		901
Sofie Road 310	19		19	19	19	20		2		21
Spring Hill 565	226	5	231	231	232	232		3		234
The Farm 440	1,224	12	1,236	1,318	1,373	1,538	688			1,923
Trombley 458	541	29	570	664	726	915	782	1		1,353
Wagner 517 (combined with Chain Lake	1,366	12	1,378	1,574	1,704	2,095	1,463	166		3,007
Woods Creek 316	102		102	104	105	109	7	10		119
TOTAL			**20,863**	**21,809**	**22,339**	**24,171**				**28,446**

Pressure Zones within Retail Service Area											
	Baseline Population			2013	2015	2021	2035			
	GIS Calculations		Total	Total	Total	Total	Monroe UGA	Rural	"UGA Expansion"	Total
Pressure Zone	2010 Population	Unaccounted CB Population	Adjusted 2010 Baseline	(interpolated)	(interpolated)	(interpolated)	(CPP 2035 Target distributed by BLR)	2035 Alt3 MAZ data		
Airport/Foothills 430	725		725	829	898	1,106	867			1,592
DOC 330	741	2,469	3,210	3,404	3,431	3,756	72	6	856	4,516
Downtown 298	11,625	115	11,740	11,887	11,985	12,279	1,073	34	117	12,965
Lord Hill 260	19		19	19	19	19		0		19
Lord Hill 350	158		158	158	158	159		2		160
Lord Hill 565	268		268	268	269	269		3		271
North Hill 635	904		904	932	951	1,007		234		1,138
Rivemont/Calhoun 389	836	53	889	904	914	944	75	49		1,013
Sofie Road 310	70		70	70	71	71		3		73
Spring Hill 565	280	5	285	285	286	287		4		289
The Farm 440	1,224	12	1,236	1,319	1,374	1,539	688			1,924
Trombley 458	541	29	570	664	727	915	782	1		1,354
Wagner 517	1,666	12	1,678	1,875	2,006	2,400	1,463	177		3,318
Woods Creek 316	256		256	260	263	271	7	26		289
TOTAL			**22,008**	**22,874**	**23,350**	**25,022**				**28,921**

Employment

Pressure Zones within Current Water Service Area								
	Baseline Population			2015	2021	2035		
				Total	Total	Monroe UGA	Rural	Total
Pressure Zone	2013 Covered Employment - PSRC	Adjusted	Covered + Self Employment Estimate	(interpolated)	(interpolated)	(CPP 2035 Target)	(LUB by TAZ)	
Airport/Foothills 430	83		90	93	100	28		118
DOC 330	1,454		1,580	1,595	1,640	132	35	1,889
Downtown 298		6,770	7,355	7,624	8,433	2,598	367	10,320
Lord Hill 260	0		0	0	0			0
Lord Hill 350		11	12	13	15		7	19
Lord Hill 565		6	7	8	11		12	18
North Hill 635	67		73	75	83		28	101
Rivemont/Calhoun 389		10	11	11	13	0	6	17
Sofie Road 310	0		0	0	0		0	0
Spring Hill 565		9	10	14	28		49	59
The Farm 440	25		27	27	27	0		27
Trombley 458	10		11	11	11	0	1	12
Wagner 517	105	12	127	130	139	0	34	161
Woods Creek 316		12	13	17	29	0	44	57
TOTAL	**1,744**		**9,314**	**9,618**	**10,529**	**2,758**	**583**	**12,798**

Pressure Zones within Retail Service Area								
	Baseline Population			2015	2021	2035		
				Total	Total	Monroe UGA	Rural	Total
Pressure Zone	2013 Covered Employment - PSRC	Adjusted	Covered + Self Employment Estimate	(interpolated)	(interpolated)	(CPP 2035 Target)		
Airport/Foothills 430	83		90	93	100	28		118
DOC 330	1,467		1,594	1,641	1,816	132	393	2,262
Downtown 298	6,789		7,375	7,655	8,495	2,598	482	10,455
Lord Hill 260	0		0	0	0			0
Lord Hill 350	15		16	17	19		7	23
Lord Hill 565	12		13	17	30		47	60
North Hill 635	73		79	82	91		31	111
Rivemont/Calhoun 389	16		17	18	19	0	6	23
Sofie Road 310	18		20	20	20		0	20
Spring Hill 565	9		10	14	28		51	60
The Farm 440	25		27	27	27	0		27
Trombley 458	10		11	11	11	0	1	12
Wagner 517	122	12	146	149	160	0	38	184
Woods Creek 316		12	13	17	30	0	46	59
TOTAL	**8,639**		**9,411**	**9,762**	**10,846**	**2,758**	**1,101**	**13,414**
					10,688			12,066

(Blank) = Not disclosed (8.634% self employment)

(Dash) = zero employment

*Adjustments based on review of aerial imagery and comparison with Retail Service Area counts

**Assumptions/adjustments made where covered employment figures were not disclosed

Appendix W-G

Water Use Efficiency Program

WATER USE EFFICENCY
2014 – 2019

Proposed WUE Goals and Measures

Regional Goal: The City of Monroe has co-adopted a regional goal as part of the group of Everett Water wholesale customers. The regional conservation goal is to reduce the regional demand for water by 1.86 MGD by 2018.

City of Monroe Goal: Reduce the 3-year running average of distribution system leakage from 11.9% to less than 10% before the end of 2016. The City's goal to be under 10% leakage will be an important part of contributing and accomplishing the regional goal.

Measures: In an effort to achieve the WUE goals the City has implemented six measures. Each measure was closely evaluated and, that it would be a sensible contributor to City's WUE program. The following six measures are what the City is looking to adopted for the 2014 – 2019 program.

1. Develop a conservation minded rate structure
2. Conservation education program developed for 2^{nd} – 12^{th} graders
3. Indoor and outdoor water conservation kits for single and multi-family homes
4. Rainwater harvesting for City water-use vehicles
5. Reclaimed water-use at the City's WWTP
6. Large water users audits performed by contracted professional

Measure #1, the City is evaluating a water rate structure that emphasizes water conservation. The goal of developing a new conservation minded rate structure is to have a large portion of the charges be based on the quantity of water the customer consumes. The City's goal is to reward customers who are efficient water users. The City plans to investigate a new water rate structure by 2018.

Measure #2, as a member of the Everett Water Utilities Committee (EWUC) the City of Monroe participates in the Committee's Conservation Education Programs offered to grade school students throughout the district. Triangle Associates was hired to develop education programs and support materials that will reach students and families educating them on the impacts of water use behaviors. In 2013 Triangle Associates taught 18 classes at three of the district's elementary schools.

Measure #3, distribution of indoor and outdoor conservation kits to single-family and multi-family dwellings. Indoor kits contain a massage shower-head (2 gallons per minute), faucet aerators (1 gallon per minute), and Teflon tape. Outdoor kits contain a garden hose nozzle and garden hose repair ends. Lawn watering timers and leak detection strips are also available separately. All of these conservation tools are free to City of Monroe water customers and are available at City Hall.

Measure #4, rainwater harvesting for the City's water-use vehicles. Since 2008 the City has been maintaining a rainwater collection system where rainwater is collected from the roof of the City's decant facility and drains into two large containers. With a simple pump system the City's water-use vehicles are able to use rainwater for several City programs and projects.

Measure #5, the use of reclaimed water at the City's wastewater treatment facility saves the City approximately 10.5 MG of potable water annually. Reclaimed water is used for hosing down tanks, seal water for pumps and other equipment, and polymer make-up processes. The City has explored using reclaimed water for other large water users. Sky River Park, which is near the wastewater facility, is a 32 acre City park that is a probable candidate for future reclaimed water irrigation use.

Measure #6, the EWUC voted to incorporate a conservation effort for large customer audits. The City will select some of its largest water users for the program, and determine which one(s) will be chosen for audit. The audits will performed by a contracted professional. The idea is to work with local businesses and determine efficient water use.

The City held a Public Forum at City Hall on June 17, 2014.

WATER USE EFFICENCY
WATER LOSS ACTION PLAN
2014

The City of Monroe water system has a three-year average leak rate greater than the 10% standard set by the Department of Health, which takes the City out of compliance with WAC 246-290-820. As a result the City is required to develop and implement this water loss action plan, which must be included when submitting a planning document to the Department for approval.

The Department has provided four questions below for the City to answer to satisfy the City's requirement of completing a water loss action plan.

1. **Water loss control methods to implement to strive for the 10% standard.**

   Leak Detection Program – recently purchased FCS Permalog leak detection equipment is being used to monitor the City's distribution system for leaks. The City's LDP began in 2013. One major leak was discovered and dramatically reduced system leakage by an estimated 1.6 MG per year. The LDP will aggressively work to complete the entire searching the entire distribution system for leaks by the end of 2014.

   Meter replacement – the City of Monroe recently inherited the Sky Meadow Water system, which has approximately 380 connections. Currently the City is in the process of replacing all the meters in the Sky Meadow area with new Sensus iPeal meters. Once all the meters are replaced the City will be able to calculate if there is a difference in average consumption throughout this portion of the distribution system.

   Meter calibration – the City is looking to invest within the next few years a meter calibration and/or meter replacement for some of the City's larger water users. This program is still in the pre-planning stages, but will be something the City looks to engage in to help with the City's goal to lower the three-year average leak rate to under 10%.

   Water Loss Control Training – attend a water loss control action group meeting. The Water Loss Action Group was established in 2013. Becoming a member and attending a water loss control training will be scheduled as time and travel can be arranged.

2. **An estimate of how long it will take you to achieve the standard**

In the last quarter of 2013 the City changed how meter data and water loss was being calculated. Since the new method of calculating water usage was put into work the City's leak rate has dramatically decreased. The City anticipates achieving the Department's standard of under 10% water loss by 2015.

3. A budget that demonstrates how you will pay for controlling leakage.

Money is available from various budgets throughout the Operations and Maintenance Division to assist as needed. The City holds a solid inventory of replacement parts and has a budget available to fix and repair leaks as soon as they are found.

4. Any technical or economic concerns that prevent you from complying with the standard.

The City sees no reason that it cannot meet the Department's 10% standard for water loss.

<u>Appendix W-H</u>

Not Used

Appendix W-I

2013 Consumer Confidence Report

2013

Drinking Water Quality Report

MONROE
WASHINGTON
City of Monroe Public Works Department

Clean, Safe Drinking Water Delivered to Your Tap

Your drinking water comes from Spada Lake Reservoir, located about 25 miles north-east of Monroe at the headwaters of the Sultan River. This 50-billion-gallon storage facility serves as a collection point for rain and snowmelt from the Cascade Mountains. It was created in 1964 through a partnership between the City of Everett and the Snohomish County PUD as part of the Jackson Hydroelectric Project.

Spada Lake Reservoir is located in the Upper Sultan River Watershed, an area encompassing more than 80 square miles. This is one of the wettest watersheds in the continental United States. The average annual rainfall is about 165 inches—five times the rainfall in Everett.

Water quality in the Sultan Basin is carefully monitored. To protect the naturally pristine water in Spada Lake Reservoir, the watershed is patrolled and human activities are limited to minimize the impact on water quality. We continue to evaluate and adjust our security measures on an ongoing basis.

Taste, Quality and Value

Water is a life-essential resource. Yet, at about a penny a gallon, it costs very little compared to its value.

Your water rates pay for everything it takes to operate our water system, from storage and treatment, to delivering the water to your tap. Your water rates also help pay for water system improvements that ensure that we will provide high-quality drinking water for generations to come.

As this year's Drinking Water Quality Report shows, this is an exceptional value for the clean, safe, great-tasting drinking water you receive.

BACKFLOW ASSEMBLY TESTING: Keeping Contaminants Out of Your Drinking Water

Cross-connections are channels for contaminants to spread throughout the public water distribution system. It is the City's main goal to eliminate cross-connections whenever possible. However, when cross-connections cannot be eliminated, they must be controlled by the installation of an approved backflow assembly. Backflow assemblies are often required to be installed on actual or potential hazards to the drinking water system such as: irrigation systems, boilers and properties with wells—*to name a few.*

Water can be pulled backwards when water pressure drops within the distribution system. Pressure drops are not uncommon, and without a proper functioning backflow assembly protecting hazardous connections, contaminants can easily be pulled back into the drinking water supply.

Water inside an irrigation system can sit in the system for months, contains chemicals and holds harmful bacteria—*not something you want mixed in with your drinking water!* Backflow assemblies are required on irrigation systems and must be tested each spring by a certified backflow assembly tester. Boilers and properties with wells are also common hazards to the public drinking water system where the City of Monroe requires backflow protection. If you have questions regarding cross-connections and backflow assembly testing, please contact the City of Monroe's Cross-Connection Control Office at 360-863-4616.

THE Drinking Water Treatment Process

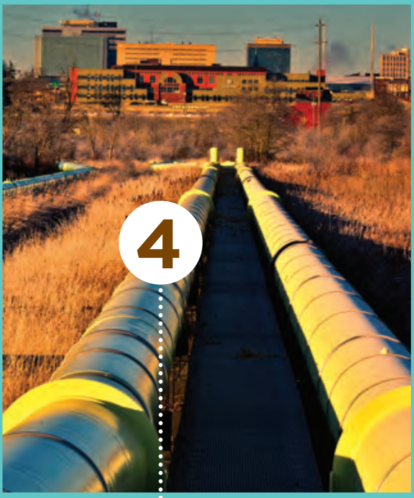
From Spada Reservoir, the water travels through a pipeline to Chaplain Reservoir which holds about 4.5 billion gallons of water. This is where the Everett Drinking Water Treatment Plant is located. At the plant, the water is treated with advanced filtration and disinfection.

First, a coagulant is added to the water to cause particles to clump together. Next, the water passes through large filters that remove the particles. These particles can include sediment and natural materials as well as viruses, bacteria and other disease-causing organisms. Finally, sodium hypochlorite solution is added to the water to kill any organisms that were not removed by the filtration process.

During the treatment process, polymers are added as part of the filtration process, fluoride is added for dental health purposes and soda ash is added to adjust the pH level of water so it is less corrosive on pipes and plumbing fixtures. These additives are carefully monitored and the water is continually tested to make sure it is safe to drink.

1. Precipitation and snowmelt from the mountains are collected in Spada Lake Reservoir.

2. The water treatment process begins at Lake Chaplain Reservoir, where the Everett Water Treatment Plant is located.



3. The Everett Drinking Water Treatment Plant treats water using coagulation, flocculation, filtration and disinfection.

4. Water transmission pipelines carry drinking water across Snohomish County.

5. Treated water is delivered to about 600,000 people or 80 percent of the businesses and households in Snohomish County.

Your Drinking Water Facts and Figures

The following statements are required by the US Environmental Protection Agency (EPA).

All water sources (both tap water and bottled water) contain impurities. As water flows over the surface of the land or through the ground, it dissolves naturally occurring minerals and, in some cases, radioactive material, and can pick up substances resulting from the presence of animals or from human activity. Contaminants that may be present in source water include:

- Microbial contaminants such as viruses and bacteria, which may come from sewage treatment plants, septic systems, agricultural livestock operations and wildlife.
- Inorganic contaminants, such as salts and metals, which can be naturally occurring or result from urban surface water, industrial or domestic wastewater discharges, oil and gas production, mining or farming.
- Pesticides and herbicides, which may come from a variety of sources such as agriculture, urban surface water and residential uses.
- Organic chemical contaminants, including synthetic and volatile organic chemicals, which are by-products of industrial processes and petroleum production, and may also come from gas stations, urban stormwater runoff and septic systems.
- Radioactive contaminants, which can be naturally occurring or be the result of oil and gas production and mining activities.

In order to ensure that tap water is safe to drink, US Environmental Protection Agency (EPA) prescribes regulations which limit the amount of certain contaminants in water provided by public water systems. Food and Drug Administration (FDA) regulations establish limits for contaminants in bottled water which must provide the same protection for public health.

Drinking water, including bottled water, may reasonably be expected to contain at least small amounts of some contaminants. The presence of contaminants does not necessarily indicate that water poses a health risk. More information about contaminants and potential health effects can be obtained by calling the EPA Safe Drinking Water Hotline at 1-800-426-4791.

Some people may be more vulnerable to contaminants in drinking water than the general population. Immuno-compromised people, such as people with cancer undergoing chemotherapy, people who have undergone organ transplants, people with HIV/AIDS or other immune system disorders, some elderly, and infants can be particularly at risk from infections. These people should seek advice about drinking water from their health care providers. EPA and US Center for Disease Control (CDC) guidelines on appropriate means to lessen risk of infection by Cryptosporidium and other microbial contaminants are available from the Safe Drinking Water Hotline at 1-800-426-4791.

CRYPTOSPORIDIUM

Cryptosporidium is a one-celled intestinal parasite that if ingested may cause diarrhea, fever, and other gastrointestinal distress. It can be found in all of Washington's rivers, streams, and lakes and comes from animal or human wastes deposited in the watershed. *Cryptosporidium* is resistant to chlorine, but is removed by effective filtration and sedimentation treatment such as that used at the Everett Water Treatment Plant. It can also be inactivated by certain types of alternate disinfection processes such as ozonation and UV light contactors. Past monitoring results suggest that *Cryptosporidium* is present in our source water only occasionally and at very low concentrations. In 2013, Everett Water Treatment Plant staff collected monthly samples for *Cryptosporidium* oocysts from the source water at the plant intakes. No oocysts were detected.

TREATMENT POLYMERS

During water treatment, organic polymer coagulants are added to improve coagulation and filtration that remove particulates from water. The particulates that are removed can include viruses, bacteria and other disease causing organisms. The USEPA sets limits on the type and amount of polymer that a water system can add to the water. In addition to the EPA limits, the State of Washington requires that all polymers used be certified safe for potable water use by an independent testing organization (NSF International). During treatment, Everett Water Treatment Plant staff adds only NSF approved polymers and the levels used are much less than the safe limits set by the USEPA.

2013 Water Quality Analysis Results

DETECTED REGULATED CONTAMINANTS

Parameter	Major Source	Units	Ideal Level/Goal (MCLG)	Maximum Allowable (MCL)	Range or Other	Average or Highest Result	Comply?
Nitrate	Erosion of natural deposits, animal waste	ppm	10	10	0.023–0.105	0.062	Yes
Total Coliform Bacteria[1]	Naturally present in the environment	% Positive	0	5% Positive per Month	None	0%	Yes
Fluoride[2]	Dental health additive	ppm	2	4	0.5–0.9	0.8	Yes
Residual Disinfectant Level (free chlorine)	Added as a drinking water disinfectant	ppm	4.0 (MRDLG)	4.0 (MRDL)	0.2–0.93	0.57	Yes
Haloacetic Acids (5) (HAA5)	By-product of drinking water chlorination	ppb	NA	60	10.9–31.6	21.1	Yes
Total Trihalomethanes (TTHM)	By-product of drinking water chlorination	ppb	NA	80	15.6–46.0	27.7	Yes
Turbidity[3]	Soil erosion	NTU	NA	TT	100%	0.17	Yes

[1]No total coliforms were detected in 2013.

[2]0.8 ppm is the lowest level allowed under current State regulations.

[3]In 2013, no filtered water turbidity results were above the EPA 0.3 NTU limit so 100% met the requirement.

DETECTED UNREGULATED CONTAMINANTS

Parameter	Units	Ideal Level/Goal (MCLG)	Range Detected	Average Value
Bromodichloromethane	ppb	0	0.8–2.1	1.3
Chloroform (trichloromethane)	ppb	300	14.6–43.9	24.1
Dichloroacetic Acid	ppb	0	4.2–12.1	8.2
Trichloroacetic Acid	ppb	300	6.7–19.5	13.0

These substances are individual disinfection by-products for which no MCL standard has been set, but which must be monitored.

LEAD, COPPER AND pH

Parameter & Units	Major Source	Ideal Level/Goal (MCLG)	Action Level (AL)	90th % Level	Homes Exceeding the AL
Lead, ppb[1]	Corrosion of household pumbing	0	15	8.6	None
Copper, ppm[1]	Corrosion of household plumbing	1.3	1.3	0.0894	None
pH, s.u.[2]	Soda ash added to increase pH	Daily Avg 7.6	Min Daily Avg 7.4	Average 7.6	Minimum 7.4

[1]This data is for household taps. The results for water before it enters homes are lower. This indicates there is virtually no lead or copper in the water, but household plumbing may contribute to the presence at the tap.

[2]The average daily pH cannot be below 7.4 for more than nine days every six months. In 2013, the average daily pH never dropped below 7.4.

Important Terms:

- **AL:** Action Level – The concentration of a contaminant, which, if exceeded, triggers a treatment or other requirements that a water system must follow.
- **MCL:** Maximum Contaminant Level – The highest level of a contaminant that is allowed in drinking water. MCLs are set as close to the MCLGs as feasible using the best available water treatment technology.
- **MCLG:** Maximum Contaminant Level Goal – The level of a contaminant in drinking water below which there is no known or expected risk to health. MCLGs allow for a margin of safety.
- **MRDL:** Maximum Residual Disinfectant Level – The highest level of a disinfectant allowed in drinking water. There is convincing evidence that addition of a disinfectant is necessary for control of microbial contaminants.
- **MRDLG:** Maximum Residual Disinfectant Level Goal – The level of a drinking water disinfectant below which there is no known or expected risk to health. MRDLGs do not reflect the benefits of the use of disinfectants to control microbial contaminants.
- **N/A:** Not Applicable
- **ppb:** Parts per Billion – 1 part per billion = 1ug/L = 1 microgram per liter.
- **ppm:** Parts per Million – 1 part per million = 1mg/L = 1 milligram per liter.
- **TT:** Treatment Technique – A required process and performance criteria intended to reduce the level of a contaminant in drinking water.

USEPA required lead statement. The USEPA drinking water regulations require this statement be included with the lead and copper sampling results regardless of the levels observed: If present, elevated levels of lead can cause serious health problems, especially for pregnant women and young children. Lead in drinking water is primarily from materials and components associated with service lines and home plumbing. The City of Everett Public Works Department is responsible for providing high quality drinking water, but cannot control the variety of materials used in plumbing components. When your water has been sitting for several hours, you can minimize the potential for lead exposure by flushing your tap for 30 seconds to two minutes before using water for drinking or cooking. If you are concerned about lead in your water, you may wish to have your water tested. Information on lead in drinking water, testing methods and steps you can take to minimize exposure is available from the Safe Drinking Water Hotline or at http://www.epa.gov/safewater/lead.

We're in this Together

ENSURING AN ADEQUATE SUPPLY

Water is a precious resource. Conservation helps us meet the needs of people, industries, businesses and farms, while also keeping fish and other aquatic life alive and well. Monroe and several other water systems whom purchase their water from Everett work together to establish a regional conservation program. The program is planned and developed collaboratively among Everett wholesale customers and funded from Everett's water system revenues.

Over the last decade, more than $6.5 million has been invested in regional water conservation activities. This includes such things as youth education, indoor and outdoor water conservation kits, rebates for water-efficient clothes washers and toilets, leak detection, business water audits and school irrigation audits. Through these efforts, we collectively saved about 3.6 million gallons per day (MGD) through 2012—enough water to fill more than 85,000 bathtubs a day.

The regional conservation program is planned and implemented in six-year cycles, as part of Everett's comprehensive water plan, which is submitted every six years. The first plan covered the period from 2001 through 2006; the second from 2007 through 2012. Everett is currently in the process of updating its comprehensive plan and planning the conservation activities that will be implemented through 2018.

In the interim, regional conservation efforts are focused on youth education and the distribution of conservation kits. In 2013, 18 water conservation workshops were conducted in classrooms throughout the Monroe School District, reaching nearly 500 students. The City of Monroe also distributed 250 indoor conservation kits and 400 outdoor conservation kits to local residents and businesses. These 2013 activities contributed to saving approximately 0.72 MGD regionally.

CONSERVATION TIPS:

- **Install water-efficient showerheads and take shorter showers.**
- **Fix leaky faucets and toilets. Leaks waste a lot of water.**
- **Install low-flow toilets. This can reduce indoor water use by as much as 20 percent.**
- **Only run full loads in your dishwasher and clothes washer.**
- **Use a soaker hose on steep slopes to prevent wasteful runoff.**
- **Water small areas by hand to avoid watering the sidewalk and driveway.**
- **Replace grass in seldom-used areas of your yard with groundcovers and plants that use less water.**
- **Adjust your mower to a higher setting. A taller lawn retains moisture and requires less water.**
- **Put a layer of mulch around plants and trees. Mulch holds moisture and discourages weed growth.**

Partnership *for* Safe Water

PARTNERSHIP FOR SAFE WATER

The Partnership for Safe Water is a voluntary effort supported by more than 200 water utilities, the US Environmental Protection Agency (EPA), the American Water Works Association and other prominent drinking water organizations in the United States. The goal of the program is for participating utilities to use a continuous improvement process developed by the Partnership members.

The program is designed to help drinking water utilities optimize their treatment plants to produce drinking water of a higher quality than is required by regulations. To participate, each treatment plant must demonstrate that it can consistently meet the Partnership's high water-quality standards.

Since the City of Everett began participating in the program more than a decade ago, it has met the performance standards set by the Partnership. Recently, Everett renewed its commitment to continuously improve performance at its water treatment plant and is implementing some of the Partnership's tools to optimize performance at the plant.

The City of Everett will continue to participate in this cooperative effort to strive for excellence. We believe this is the best way to ensure our customers will always receive the highest quality drinking water possible.

City of Monroe
Public Works
Department

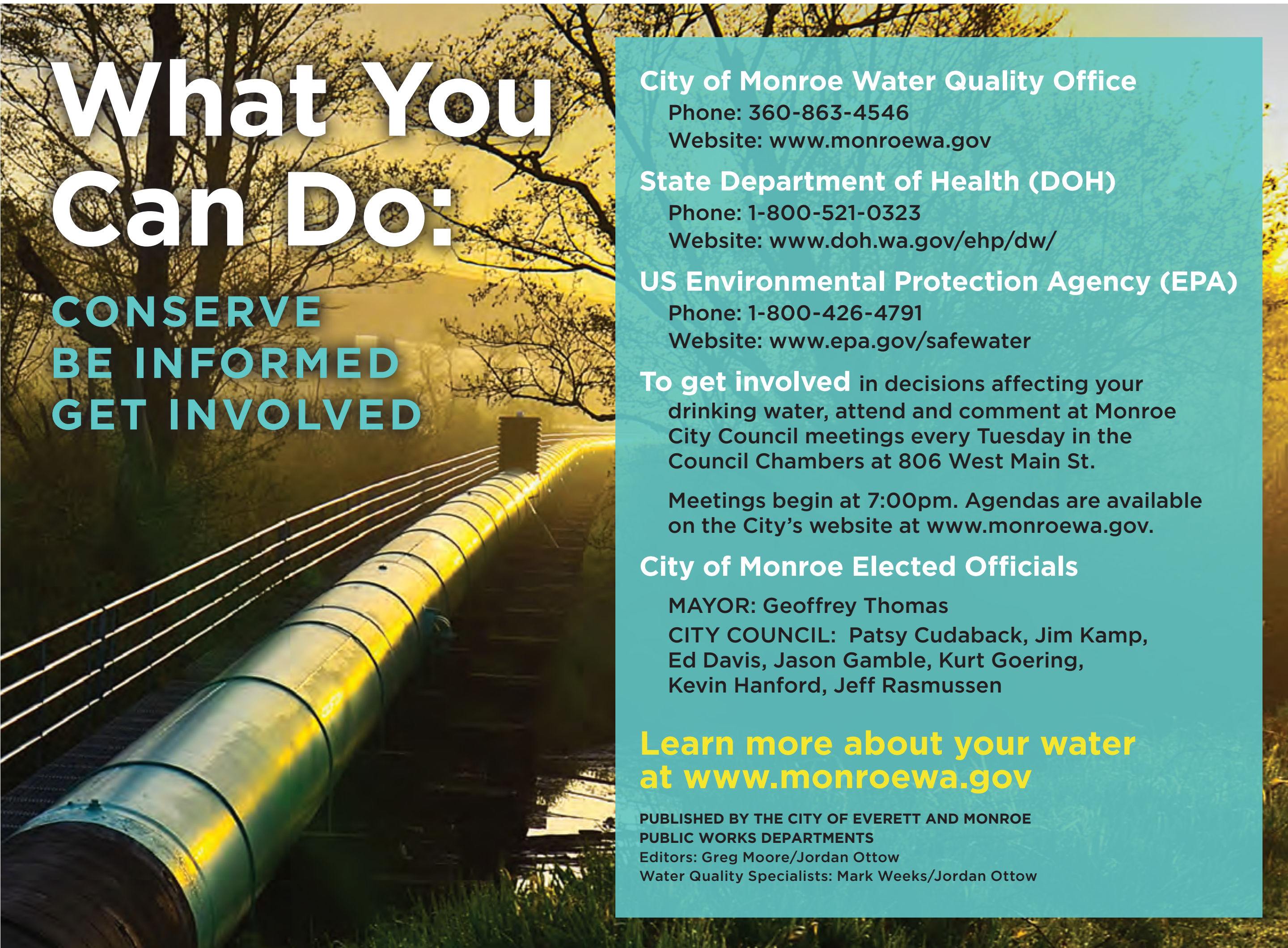
806 West Main Street
Monroe, WA 98272

INSIDE: Your Drinking Water Quality Report

In 2013, your water was tested for more than 100 possible contaminants. What does all the information in this report mean? Simply put, the data confirms that your drinking water meets or exceeds all government standards and is safe to drink.

Your Opinion Matters

Let us know how we're doing and what you think about your water. Call 360-863-4546 or email us at jottow@monroewa.gov.



What You Can Do:

CONSERVE
BE INFORMED
GET INVOLVED

City of Monroe Water Quality Office
Phone: 360-863-4546
Website: www.monroewa.gov

State Department of Health (DOH)
Phone: 1-800-521-0323
Website: www.doh.wa.gov/ehp/dw/

US Environmental Protection Agency (EPA)
Phone: 1-800-426-4791
Website: www.epa.gov/safewater

To get involved in decisions affecting your drinking water, attend and comment at Monroe City Council meetings every Tuesday in the Council Chambers at 806 West Main St.

Meetings begin at 7:00pm. Agendas are available on the City's website at www.monroewa.gov.

City of Monroe Elected Officials

MAYOR: Geoffrey Thomas
CITY COUNCIL: Patsy Cudaback, Jim Kamp, Ed Davis, Jason Gamble, Kurt Goering, Kevin Hanford, Jeff Rasmussen

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Editors: Greg Moore/Jordan Ottow
Water Quality Specialists: Mark Weeks/Jordan Ottow

Appendix W-J

Coliform Monitoring Plan

Coliform Monitoring Plan Template

Coliform Monitoring Plan for: Monroe Water System

A. System Information

Plan Date: 5/5/2014

Water System Name **Monroe Water Systems**	**County** **Snohomish**	**System I.D. Number** **55820**
Name of Plan Preparer **Jordan Ottow**	**Position** **Water Quality Lead**	**Daytime Phone #** **360-863-4546**
Sources: DOH Source Number, Source Name	DOH Source #: S01, S02, S03 Source Name: Everett	
Storage: List and Describe	North Hill 1.15 MG, Ingraham 2 MG, Trombley/Res 5 4.5 MG, DOC .75 MG, Springhill 100,000g, Sky Meadow 100,000g, Lord Hill 137,500g	
Treatment: Source Number & Process	DOH Source #: 92. Process: off-site generated hypochlorite (stored).	
Pressure Zones: Number and name	TBD	
Population by Pressure Zone	TBD	
Number of Routine Samples Required Monthly by Regulation: 20 (25 in Sept)	**Number of Sample Sites Needed to Represent the Distribution System: 20**	

B. Laboratory Information

Laboratory Name **Monroe Waste Water Treatment Plant Labratory**	**Office Phone #** **360-863-3220**
Address **522 S. Sam St.** **Monroe, WA 98272**	**After Hours #** **425-754-3771**
Hours of Operation **M – F, 7am-3:30pm**	
Contact Name **Linda Gleason – Lab Analyst**	
Emergency Laboratory Name **AM Test Laboratory**	**Office Phone #** **425-885-1664**
Address **13600 NE 126th Pl. #C** **Kirkland, WA 98034**	**After Hours #**
Hours of Operation **M-F, 7am – 5pm**	
Contact Name **Chris Young – Water Quality**	

C. Wholesaling

	Yes	No
	X	
Water System Name: Marbelo Water System Contact Name: Dave or Sandra Telephone Numbers: 206-282-4200		
	X	
Water System Name: Washington State Department of Corrections Contact Name: Kelly Dykes Telephone Numbers: 360-794-2349		

D. Routine, Repeat, and Triggered Source Sample Locations*

Upstream sample site = (us)   Downstream sample site = (ds)

Investigative sample = i

Location/Address for Routine Sample Sites		**Location/Address for** Repeat Sample Sites		
X1. **12845 Phillips Ridge Rd.**		**1-1. 12845 Phillips Ridge Rd.**		
		1-2. 12821 Phillips Ridge Rd. (us)		
		1-3. 12859 Phillips Ridge Rd. (ds)		
		1-4.		
X2. 17288 Beaton Rd.		**2-1. 17288 Beaton Rd.**		
		2-2. 17301 Beaton Rd. (Us)		
		2-3. 17201 Beaton Rd. (Ds)		
		2-4.		
X3. 16886 Wales St.		**3-1. 16886 Wales St.**		
		3-2. 16904 Wales St. (Us)		
		3-3. 16807 Wales St. (Ds)		
		3-4.		
X4. 17510 Mountain View Rd.		**4-1. 17510 Mountain View Rd.**		

		4-2. 17528 Mountain View Rd. (Us)		
		4-3. 17492 Mountain View Rd. (Ds)		
		4-4.		
X5. 16022 -169th Pl. SE, Snohomish		**5-1. 16022 -169th Pl. SE**		
		5-2. 16030 -169th Pl. SE (Us)		
		5-3. 16016 -169th Pl. SE (Ds)		
		5-4.		
X6. 15113 -141st Ave. SE, Snohomish		**6-1. 15113 -141st Ave. SE. Snoho**		
		6-2. 15004 -141st Ave. SE. Snoho (Us)		
		6-3. 15131 -141st Ave. SE. Snoho (Ds)		
		6-4.		
X7. 12814 -127th Ave. SE, Snohomish		**7-1 12814 -127th Ave. SE**		
		7-2. 12830 -127th Ave. SE (Us)		
		7-3. 12808 -127th Ave. SE (Ds)		
		7-4.		
X8. 12125 Treosti Rd., Snohomish		**8-1. 12125 Treosti Rd.**		
		8-2. 12320 Old Sno-Monroe Rd. (Us)		
		8-3. 11431 Old Sno-Monroe Rd.(Ds)		
		8-4.		
X9. 16923 W. Main St.		**9-1. 16923 W. Main St.**		
		9-2. 16624 -167th Ave. SE. (Us)		
		9-3. 17150 W. Main St. (Ds)		
		9-4.		
X10. 17585 -163rd Pl. SE.		**10-1. 17585 -163rd Pl. SE.**		
		10-2. 17581 -163rd Pl. SE. (Us)		
		10-3. 16700 -177th St. (Ds)		

		10-4.		
X11. 17839 -160th Pl. SE.		**11-1. 17839 -160th Pl. SE.**		
		11-2. 17729 -160th Pl. SE. (Us)		
		11-3. 17851 -160th Pl. SE. (Ds)		
		11-4.		
X12. 17201 -136th Pl. SE.		**12-1. 17201 -136th Pl. SE.**		
		12-2. 17167 -136th Pl. SE. (Us)		
		12-3. 17225 -136th Pl. SE. (Ds)		
		12-4.		
X13. 18470 Blueberry Ln.		**13-1. 18470 Blueberry Ln.**		
		13-2. 18510 Blueberry Ln. (Us)		
		13-3. 18450 Blueberry Ln. (Ds)		
		13-4.		
X14. 324 Elizabeth St.		**14-1. 324 Elizabeth St.**		
		14-2. 320 Elizabeth St. (Us)		
		14-3. 336 Elizabeth St. (Ds)		
		14-4.		
X15. 408 Park St.		**15-1. 408 Park St.**		
		15-2. 440 Park St. (Us)		
		15-3. 330 Park St. (Ds)		
		15-4.		
X16. 330 Sumac Dr.		**16-1. 330 Sumac Dr.**		
		16-2. 315 Sumac Dr. (Us)		
		16-3. 522 S. Sam St. (Ds)		
		16-4.		
X17. 135 Charles St.		**17-1. 135 Charles St.**		
		17-2. 131 Charles St. (Us)		

		17-3. 144 Charles St. (Ds)		
		17-4.		
X18. 15423 Calhoun Rd.		18-1. 15423 Calhoun Rd.		
		18-2. 15403 Calhoun Rd. (Us)		
		18-3. 15427 Calhoun Rd. (Ds)		
		18-4.		
X19. 13223 Wagner Rd.		19-1. 13223 Wagner Rd.		
		19-2. 13305 Wagner Rd. (Us)		
		19-3. 22122 -132nd St. (Ds)		
		19-4.		
X20. 20309 -118th St.		20-1. 20309 -118th St.		
		20-2. 20317 -118th St. (Us)		
		20-3. 20305 -118th St. (Ds)		
		20-4.		
X21. 12531 Chain Lk. Rd.		21-1. 12531 Chain Lk Rd.		
		21-2. 12514 Chain Lk. Rd. (Us)		
		21-3. 12606 Chain Lk. Rd. (Ds)		
		21-4.		
X1i. Spinghill Reservoir		1i-1. 15006 -139th Ave. SE. Snoh		
		1i-2. 15505/6 -139th Ave. SE Snoho. (Us)		
		1i-3. 15505 139th Ave. SE. Snoh (Ds)		
		1i-4.		
X2i. Sky Meadow Reservoir		2i-1. 14212 -134th Dr. SE. Snoho.		
		2i-2. 14212 -134th Dr. SE. Snoho (Us)		
		2i-3. 13626 -134th Dr. SE. Snoho (Ds)		
		2i-4.		

X3i. Lord Hill Reservoir		3i-1. 12918 -150th St. SE. Snoho		
		3i-2. 14815 -127th Ave. SE. Snoho (Us)		
		3i-3. 14731 -127th Ave. SE. Snoho (Ds)		
		3i-4.		
X4i. DOC		4i-1. 17302 170th Dr.		
		4i-2. 17001 Tester Rd. (Us)		
		4i-3. 16744 170th Dr. SE. (Ds)		
		4i-4.		
X5i. Ingraham Reservoir		5i-1. 13803 Ingraham Rd.		
		5i-2. 13705 Ingraham Rd. (Us)		
		5i-3. 13930 Ingraham Rd. (Ds)		
		5i-4.		
X6i. North Hill Reservoir		6i-1. 10805 -202nd St. SE		
		6i-2. 20218 Pipeline Rd. (Us)		
		6i-3. 10814 -202nd St. SE (Ds)		
		6i-4.		
X7i. North Hill Pump Station		7i-1. 20218 Pipeline Rd.		
		7i-2. Wagner Tap (Us)		
		7i-3. North Hill Reservoir (Ds)		
		7i-4.		
X8i. Trombley Reservoir/ Reservoir 5		8i-1. 13125 -191st Ave. Se		
		8i-2. 13104 197th Ave. SE (Us)		
		8i-3. 13311 191st St. SE (Ds)		
		8i-4.		

Important Notes for Sample Collector:

1. Schedule a date to collect samples with the WWTP lab early in the month and early in the week.
2. Do not collect samples in a week when there is a holiday or when a key staff member is on vacation.
3. Assess the representative status of each sample site each time a sample is collected. If a sample site appears to have abnormalities the sampler should locate a substitute sample site. Circumstances that would be considered "abnormal" would include, but is not limited to be construction at the facility where the sample is located, modification of the plumbing at the sample site, or an activity where at the sample site that may have compromised the sanitary integrity of the sample faucet. Inform Water Quality Lead (WQL) the sample site may need to be changed. WQL will update the CMP if site needs to be changed.
4. Measure the free chlorine at each sample site and record measurement on the lab form.
5. Always review the lab results. Notify WQL immediately if a sample comes back unsatisfactory.

E. Routine Sample Rotation Schedule

Each month that colifrom samples are collected the route is changed so that the sample collector isn't repeating the same route consecutively. The sample collector begins the route in a different section of the distribution system each month to vary the time of day a specific site is sampled from month to month.

F. *E. coli*-present response plans

Distribution System *E. coli* Response Plan
If we have *E. coli* in our distribution system we will immediately: 1. Call DOH. 2. Collect repeat samples per Part D. Collect additional investigative samples as necessary. 3. Put together a response team that is familiar with the distribution system. 4. Shut off pumps as needed. 5. Assess the area and develop a plan to isolate the affected area. 6. Check with staff to determine whether anything unusual was happening in the water system service area, especially since the previous month's samples. 7. Review new construction activities, water main breaks, and pressure outages that may have occurred during the previous month. 8. CCS should look into possible cross-connections in the specified area. 9. Water quality collector should assess sample sites. 10. Look for obvious leaks or breaks. 11. The system was effectively disinfected following any construction or repair work 12. Discuss with DOH whether to issue a Health Advisory based on the findings in the previous steps.

Reservoirs and Storage Tanks *E. coli*-Present Response Plan
If we have *E. coli* in a reservoir or storage tank we will immediately: 1. Call DOH. 2. Members of the response team will hand deliver DOH approved door hangers notifying the customers to not drink the water. Contact phone numbers and instructions will be included. This is to be done in the first 24 hours of discovery of the unsatisfactory sample.

3. There are no openings that allow entry of surface water, debris, insects, etc.
4. The access hatch has an overlapping, watertight cover and a neoprene-type seal.
5. Vents are clean, directed downward, and screened (minimum 24-mesh).
6. Overflow and drain lines are protected with screens or angle-flap valves and discharge above ground. The drainpipe should not be submerged in nonpotable water.
7. There are no signs of dirt, insects, growth, sediment, or debris inside the tank
8. There are no cracks, leaks, or vegetative growth on the outside of the tank.

G. Distribution System *E*. coli Response Checklist

Distribution System *E. coli* Response Checklist				
Background Information	**Yes**	**No**	**N/A**	**To Do List**
We inform staff members about activities within the distribution system that could affect water quality.	X	☐	☐	☐
We document all water main breaks, construction & repair activities, and low pressure and outage incidents.	X	☐	☐	☐
We can easily access and review documentation on water main breaks, construction & repair activities, low pressure and outage incidents.	X	☐	☐	☐
Our Cross-Connection Control Program is up-to-date.	X	☐	☐	☐
We test all cross-connection control devices annually as required, with easy access to the proper documentation.	X	☐	☐	☐
We routinely inspect all treatment facilities for proper operation.	X	☐	☐	☐
We have procedures in place for disinfecting and flushing the water system if it becomes necessary.	X	☐	☐	☐
We can activate an emergency intertie with an adjacent water system in an emergency.	☐	X	☐	☐
We have a map of our service area boundaries.	X	☐	☐	☐
We have consumers who may not have access to bottled or boiled water.	☐	☐	X	☐
There is a sufficient supply of bottled water immediately available to our customers who are unable to boil their water.	☐	☐	X	☐
We have identified the contact person at each day care, school, medical facility, food service, and other customers who may have difficulty responding to a Health Advisory.	☐	☐	☐	X
We have messages prepared and translated into different languages to ensure our consumers will understand them.	☐	☐	☐	X
We have the capacity to print and distribute the required number of notices in a short time period.	X	☐	☐	☐
Policy Direction	**Yes**	**No**	**N/A**	**To Do List**

We have discussed the issue of *E. coli*-present sample results with our policy makers.	☐	☐	☐	X
If we find *E. coli* in a routine distribution sample, the policy makers want to wait until repeat test results are available before issuing advice to water system customers.	☐	☐	☐	X
(Cont.)				

Distribution System *E. coli* Response Checklist				
Potential Public Notice Delivery Methods	**Yes**	**No**	**N/A**	**To Do List**
It is feasible to deliver a notice going door-to-door.	X	☐	☐	☐
We have a list of all of our customers' addresses.	X	☐	☐	☐
We have a list of customer telephone numbers or access to a Reverse 9-1-1 system.	X	☐	☐	☐
We have a list of customer email addresses.	☐	X	☐	☐
We encourage our customers to remain in contact with us using social media.	☐	☐	X	☐
We have an active website we can quickly update to include important messages.	X	☐	☐	☐
Our customers drive by a single location where we could post an advisory and expect everyone to see it.	☐	X	☐	☐
We need a news release to supplement our public notification process.	☐	X	☐	☐

H. System Map

Appendix W-K

Lead and Copper Rule
Compliance Monitoring Plan

DRAFT
Revised Everett Regional Lead and Copper Rule Compliance Monitoring Plan

November 6, 2008

LCR action limits   Lead 15 μg/L
Copper 1.3 mg/L

Draft Table of Contents

Section Title *Page*

1.0 Purpose of the regional monitoring program

The fundamental premise for the regional LCR monitoring program as defined by the Washington State Dept of Health Office of Drinking Water (WA DOH) is for the bulk of the consecutively connected water distribution systems that make up the Everett Water Service Area to conduct LCR compliance monitoring as a single water distribution system. Coordinated monitoring across the greater water service area is thought to provide a more accurate and comprehensive measure of the effectiveness of the corrosion treatment process that is employed at Everett's water treatment plant which serves all of the participating systems.

This 2008 revised Everett regional LCR compliance plan has been developed to bring the program up to date with the EPA guidance for regional LCR monitoring programs and also with the changes in the state and federal regulatory environment that have occurred since the original 1992 Everett consecutive systems LCR monitoring plan was developed and implemented.

2.0 Regulatory background

On June 7, 1991, EPA published a regulation to control lead and copper in drinking water. The rule replaced the previous standard for lead of 50 ppb at the entry point to the distribution system. This regulation is known as the Lead and Copper Rule (also referred to as the LCR or 1991 Rule). Lead and copper enter drinking water primarily through corrosion of plumbing materials. The rule established a maximum contaminant level goal (MCLG) of zero for lead in drinking water and a treatment technique to reduce corrosion within the distribution system.

The treatment technique for the LCR requires systems to monitor drinking water at selected customer taps. If lead concentrations exceed an action limit (AL) level of 15 ppb or copper concentrations exceed an action limit (AL) level of 1.3 ppm in more than 10% of customer taps sampled, the system must undertake a number of additional actions to control corrosion. If the AL level for lead is exceeded, the system must also inform the public about steps they should take to protect their health and may have to replace lead service lines under the system's control. Once a system demonstrates the effectiveness of its corrosion control program via more frequent monitoring, a system is allowed to reduce LCR tap sample monitoring frequency and quantity.

3.0 Description of the Everett water supply system

Everett's source is surface water supplied from the 70 square mile Sultan Basin watershed located on the western front of the Cascade Mountains 30 miles east of the City of Everett. Runoff is stored in Spada Lake Reservoir (50 billion gal max storage) which is located at the bottom of the watershed. Facilities include a second raw water storage basin located 8 miles west at Lake Chaplain Reservoir (approx 6 billion gal max storage), a 132 MGD direct filtration treatment plant (disinfection with chlorine, coagulation, flocculation, filtration, fluoridation, and corrosion control treatment via pH adjustment with soda ash) located at the south end of Lake Chaplain Reservoir, and three 18-21 mile long large diameter water transmission pipelines connecting the treatment plant to the City of Everett. In addition to Everett, the system supplies twelve other larger WA DOH Class A water systems (1000 to 55,000 connections) and over thirty small class A systems, either via direct intertie to the transmission pipelines or by third party intertie to the distribution system of one of the direct supply systems. The total population served by the regional supply system is approximately 525,000. See Appendix 1 for a map of the greater Everett water service area.

4.0 History of the Everett regional LCR program

The initial implementation of the 1991 LCR required large systems to begin tap monitoring prior to medium and small systems. The City of Everett and its largest wholesale customer Alderwood Water District began compliance tap monitoring in the spring of 1992. Both systems exceeded the action limit for lead in the first round of monitoring.

(micrograms)
µg/L

Following the initial round of monitoring by Alderwood and Everett, the Washington State DOH approached Everett about developing a regional LCR tap monitoring program for all Class A water systems supplied by Everett. City and WA DOH staff developed a consecutive systems plan for an Everett regional group composed of all of the Class A systems supplied by Everett. The regional group collected the first round of consecutive system tap samples in the fall of 1992. The 90th percentile lead results for the samples collected in this round were just below the lead action limit at 13 µg/L. Lead service lines were found to be nonexistent in the regional service area. To further evaluate lead sources in the distribution systems, the first round of regional of monitoring also employed a fractionated sample collection method that collected incremental samples from test faucets, home piping and adjoining water mains. The results from this incremental round identified the main source of lead in the Everett service area testing locations to be lead leached from brass faucets.

Everett made adjustments to the corrosion treatment process at the treatment plant in 1993, and conducted a LCR required corrosion treatment optimization study in 1994. Following the first corrosion treatment optimization adjustment, the 90th percentile results for LCR tap sampling conducted in 1993 were 10 µg/L. Following the completion of the corrosion optimization study the City made further refinements to the corrosion treatment process. The 90th percentile lead results from further rounds of testing in 1996 and 1997 declined to 8 and 6 µg/L respectively.

In 1999, WA DOH approved optimized treatment status for the Everett system and set pH as the optimized corrosion treatment control parameter for the treatment plant. In addition, WA DOH also approved reduced monitoring for the regional program to once every three years at a reduced quantity of sampling locations (125). Beginning with the 2000 monitoring round, the 90th percentile results for lead in the three most recent rounds of monitoring reached and have remained at 3 µg/L (five times below the action limit). The 90th percentile results for copper also reflect declines similar to lead, declining from 0.407 mg/L in 1993 to 0.068 and 0.072 mg/L in 2003 and 2006 respectively.

5.0 Revised Everett Regional Sampling Plan

5.1 Overview

DOH has delegated the authority and responsibility for management of the revised regional LCR monitoring plan to the City of Everett, Public Works Department. Along with coordinating each round of tap monitoring conducted under this plan and reporting the results to the participant systems and to WA DOH ODW, Everett staff will also be responsible for determining system eligibility and participation in the monitoring program. Each participating system will be responsible for collecting samples at LCR compliant monitoring locations by the deadlines described in the regional plan. Any participating systems that obtain initial individual tap sample results that are higher than the lead or copper action limits are obligated to conduct follow up monitoring and investigation at the above-action-limit sites to determine the representativeness of the initial tap sample results and to evaluate the cause of the high values. If a system obtains follow-up results over the action limits that cannot be explained, the system will be removed from the regional monitoring plan and referred to DOH for further monitoring or investigation to determine the extent and cause of the unexplained high follow-up monitoring result(s). Once a participating system has satisfied WA DOH as to the cause(s) of their previously unexplained high sample results, or corrected any problems that were determined to cause the high results, the system will be allowed to return to the regional monitoring program. Any system that fails to meet it's obligations to or agreements with the regional monitoring program will be ineligible for future participation in the program.

5.2 Participation Requirements and System Eligibility

5.2.1. Participation Agreement

Prior to the start of each round of tap monitoring, a regional LCR monitoring program participant agreement will be mailed to each eligible water system. An official representative of the water system must sign the agreement and return it to the Everett regional LCR coordinator by the deadline specified at the time the agreements are sent out. See Appendix 2 for a general copy of the agreement.

5.2.2. Conditions of Participation

- Participant systems agree to conduct monitoring as directed by Everett staff and as detailed in this plan.

Everett to be in charge

- Systems agree to abide by decisions made by Everett staff as to their systems eligibility to participate.

Keep Everett informed

- Systems are responsible for keeping Everett LCR coordination staff informed and updated on the identity of their key contact(s) for LCR monitoring, and their contact information.
- Participating systems are responsible for keeping themselves informed as to their systems specific requirements and responsibilities under the plan and the LCR regulations.

Samples over the MCL must be reported to Everett and DOH

- Whenever one or more of their initial monitoring sample results are higher than the action limit values for lead and copper, systems agree to conduct follow up monitoring and report the results to Everett and DOH ODW according to the regional plan.

5.2.3. Certification of separation by multiple source systems

At the start of each monitoring round water systems that supply water from other sources in addition to water from the Everett system must also certify in writing that:

- The system will only collect samples for the Everett regional LCR program from areas of their system that exclusively receive Everett water.
- That the area of the distribution system from which regional samples are collected has been hydraulically isolated from the system's other water sources for at least one year prior to the start of sample collection for the monitoring round.

The certification submittal must also include:

- An estimate of the population served with Everett water.
- A water distribution system map of the service area that indicates the location of the source water isolation valves and the locations of the Everett regional LCR sampling sites.

5.2.4. Prior failure to participate

Several small Class A water systems served by Everett are ineligible to participate in the regional program because they failed to deliver their assigned sample(s) during past monitoring rounds. These systems will remain ineligible to participate under this revised plan. These systems should consult with their DOH regional engineer to determine their LCR monitoring requirements.

5.3 Approximate LCR regional plan monitoring schedule

The following is an approximate schedule that will be followed during years in which tap monitoring is required:

- March 1st (or the first business day in March) Everett LCR coordination staff will mail sampling program agreements and notices to the water system LCR contacts.

Coordination meeting

- April 15th. Everett will conduct an optional coordination meeting for the participating systems. The meeting will cover the schedule, sampling procedures, reporting deadlines, etc.

LCR intent letter due

- May 1st. Participating systems will be required to return their notice of intent to participate and a copy of the participation agreement signed by the system official to the Everett LCR coordination staff no later than May 1st. Multiple source systems must also provide their certification of separation at this time.

sample kit pick-up

- July 15th. Everett will make sampling kits and sample collection information forms available for pickup by participating systems (approximately two weeks prior to the start of routine tap monitoring).
- July 31st. Regional program systems must pick up their sample kit(s) by this date.

sample collection dates

- August 1st through September 30thth. Systems must collect tap samples and water quality parameters samples between these dates. Samples will be analyzed by the Everett Environmental Laboratory (EEL) or by a contract lab selected by the EEL if the laboratory is unable to conduct the required sample analysis.

  Note: water quality parameters monitoring will also be conducted in the Everett, Edmonds, and Alderwood systems during this time period.

follow-up samples to be taken if needed

customers shall be contacted if follow-up samples are over the limit & provide education on potential health impacts

- August 15th to October 30th. Follow up monitoring by systems which obtained sample results higher than the action limits for copper or lead during the initial round of tap monitoring must be conducted. The analyzing laboratory (usually EEL) must analyze the samples on a "quick-turn-around" basis. Systems that obtain initial follow up results that are greater than the action limits for lead or copper must also contact the customers from whom those results were obtained and provide public education on the potential health impacts. When possible, the system will collect the follow up sample(s) within five working days of receipt of the results and prior to September 30th.
- September 30th (or later). Systems that obtain sample results above the action limits from follow-up samples will be removed from the program and referred to DOH for guidance on conducting additional more intensive follow up monitoring within their service area.

5.4 Sample quantity assignments

5.4.1 Routine lead and copper tap samples

WA DOH has defined 100 samples as the minimum quantity of lead and copper tap samples required for each round of Everett regional tap monitoring (this quantity is twice the number required by the LCR regulations for an individual system of population 100,000 or greater).

To ensure the minimum quantity requirement is met, 105 to 115 samples will be targeted for collection.

Everett coordinating staff will apportion the sample collection assignments to the participant systems. Small systems will be assigned a single sample. With the exception of the three multiple source systems, sample quantity assignments for all of the medium and large system sample quantities will be based on the fraction of the total regional system population that each system's total service population comprises. The system population used for the apportioning calculation will be that reported on the WA DOH Sentry website, at the time the Everett staff is planning the upcoming round of sample collection. Sample quantity assignments for the three multiple source system's will be based on the population served with Everett water as reported on their regional LCR system separation certificate for the current round of monitoring. The fraction or percentage of the total population for each medium to large system will be multiplied by the number of samples left to assign after each small system has been assigned a sample.

See Appendix 3 for an example of a system participant and sample apportionment list.

5.4.2. Water quality parameters (WQP) samples

WQP samples (temperature, pH, conductivity and alkalinity) will be collected from established representative sites in the Everett, Alderwood, and Edmonds water distribution systems. To minimize variability due to sample collection and analysis errors and bias, all WQP samples will be collected and analyzed by a water quality technician or analyst from the City of Everett EMC group. The technician/analyst will coordinate with the respective staffs of Alderwood and Edmonds to collect the WQP samples required from those two systems.

See Appendix 4 for an example WQP site list from the 2006 sample round.

5.5. Site selection

Each participating system is responsible for selection of sample sites that meet the selection criteria laid out in the LCR regulations as described in [40CFR141.86(a)].

5.6. Site replacement due to volunteer customer participant attrition

use same sample sites as in the past if possible

The EPA LCR monitoring guidance and the federal regulations "encourage" the use of the same sample sites during each round of monitoring. However, due to the long term and permanent nature of the monitoring requirements combined with the use of volunteer customer taps, many of the sites that were used originally have eventually become unavailable for monitoring. Many of the original home owners have what is site criterea?

moved, died or declined further participation in the program. When new sample sites must be added, each system participating in the regional LCR program is responsible for obtaining replacement sites that meet the LCR site criteria in [40CFR141.86(a)].

Notify DOH if system monitoring sites change

Each participating system is also responsible for notifying DOH of any monitoring location changes they make within their system.

5.7. Sample collection methods

Samples are taken by customer volunteers

Each system must collect samples according to the requirements of the LCR regulations [40CFR141.86(b)]. A sample collection instruction form will be provided with each lead and copper sample container. Systems are responsible for ensuring their customer volunteers follow the monitoring instructions and that they fill out the sample information form and sign the statement located on bottom of the form. The statement certifies the customer followed the sample collection procedures. As required by recent EPA guidance, customer sampler instructions will include an instruction to leave tap screens in place during sample tap set up and sample collection.

screens must remain on the faucet

See Appendix 5 for a copy of the sampling procedure instructions.

5.8. Sample transport and storage

samples must be delivered to the lab the same day they are taken

Samples should be stored in insulated coolers with cold packs and delivered to the laboratory the same day that they are collected. Samples that are held for more than 72 hours prior to delivery to the laboratory will not be accepted. Any samples rejected for excess hold time must be recollected from the same location as the original.

5.9. Sample analysis

5.9.1 Analytical Laboratory.

Lead, copper, alkalinity, and conductivity samples will be analyzed at the Everett Environmental Laboratory (EEL) using methods approved for analysis for the LCR. The laboratory will follow the LCR sample preservation and holding requirements. Accreditation with the Washington State Dept of Ecology (DOE) laboratory program for the required methods will be maintained during all LCR sample analysis.

5.9.2. Alternate laboratory requirements.

If the EEL is unavailable to conduct sample analysis, the EEL staff will select a third party contract laboratory that is DOE accredited to analyze the LCR regional program lead and copper samples. The Everett regional LCR coordinator will be consulted before any substitute contract laboratory is selected. The EEL must verify that the contactor can meet the same method requirements, detection limits, and reporting limits that the EEL provides.

5.9.3. Field analysis.

pH and temperature measurements for water quality parameters (WQP) monitoring will be conducted by Everett field staff using approved methods.

6.0 Follow up monitoring and investigation requirements

6.1 Overview

Systems participating in the regional monitoring program are required to resample any location where the routine results are greater than the LCR action limits for lead or copper (15 ug/L for lead and 1.3 mg/L for copper) and to investigate the probable causes for the high routine tap sample result(s). Each system that obtains high routine sample results will conduct the follow-up monitoring as soon as possible, but not more than five working days after, notification of the results by the lab or the Everett LCR coordinator. Initial follow-up procedures for high routine sample results are detailed in 6.2

Follow-up samples will need to be under the action limit or the system will be turned over to DOH for guidance

Systems that obtain high repeat results (greater than the action limits) from follow-up monitoring will be temporarily removed from the regional program and referred to WA DOH for guidance on conducting additional intensive follow-up monitoring and investigation to determine if their system has a system specific water corrosion problem.

6.2. Initial follow-up procedures for routine samples above the AL

6.2.1. Each system will interview the customer volunteer to verify whether or not the sample set-up and collection procedure was followed during collection of the original routine tap sample. The system will also attempt to determine if the customer has made any plumbing changes, particularly faucet replacements, in the year prior to sample collection.

public education see Everett's "Concerned About Lead" brochure

6.2.2. Each system will provide additional information about lead in tap water to any customer volunteer (such as Everett's "*Concerned About Lead?*" brochure) whose tap results are greater than the action limits for lead and copper.

6.2.3. Each system that obtains results above the action limits for lead or copper will arrange to resample those locations within five working days of their receipt of the high initial results. Systems will use the standard LCR regional tap monitoring procedure (Appendix 2) to collect the follow-up sample(s) and will not make any modifications to the procedure. The same taps that were used to collect the original routine sample will be used to collect the investigative resample(s).

6.2.4. Each system should request the laboratory to analyze the samples and report the results on a short turn around basis.

Follow-up samples must also be followed w/ water quality parameter (WQP) samples & @ 5 additional locations in the system

6.2.5. Each system conducting initial follow up for lead or copper at a tap in their system must also collect water quality parameters (WQP) samples from the test tap and at least five other locations within the system. Each of the WQP samples will be analyzed for pH, alkalinity, conductivity, and temperature.

6.2.6. Within five working days of receiving the analytical results from the laboratory, any system that conducts follow up or investigation on initial

Contact info for WA DOH & Everett LCR Coordinator

sample results above the action limits will report the results and any findings of the follow-up via email, fax, or telephone to the WA DOH engineer and to the Everett LCR regional coordinator.

Jeslyn & Mark Weeks?

6.3. Requirements for additional follow-up if repeat results are above the Action Limit (AL)

6.3.1. Intensive follow-up monitoring will not be required if the following conditions are met:

- The other routine sample(s) that were collected from the water system are below the LCR action limits for lead and copper;
- The results of the single repeat follow-up sample(s) are below the action limits;
- The probable cause of each individual high result can be reasonably identified (i.e. new faucet installed, customer held water in plumbing longer than instructed, etc);
- The results of the follow-up WQP samples from the system are similar to the expected values for pH, alkalinity, and temperature.

6.3.2. Follow-up sample results with unidentified causes

If a follow-up repeat sample is above an action limit and the cause of the high result cannot be reasonably identified, the following actions will be taken:

- The system will be temporarily removed from the regional tap monitoring program.
- The system will consult with WA DOH regarding conduct of additional lead/copper tap monitoring, system WQP monitoring, and any additional investigation into the cause(s) of the high result(s) to determine if a corrosion problem exists within the system.
- Systems that complete investigation of their unexplained high results to the satisfaction of the DOH engineer and demonstrate that they do not have a system specific corrosion problem will be eligible to return to the regional monitoring program for future LCR required tap monitoring.
- Systems will be reinstated to the regional monitoring program following WA DOH approval and notification to the Everett LCR staff of such change in LCR monitoring status.

6.3.3. Failure to conduct follow-up monitoring

Failure by a system to conduct follow-up monitoring will result in permanent expulsion from the regional LCR tap monitoring program.

Compliance must be met and maintained for the system to remain part of the LCR tap monitoring program.

The system will return to individual system monitoring status and will be referred to WA DOH for guidance, citation, or enforcement action.

6.4. Most common causes of high lead or copper results

The following are some of the most common causes for routine results over the action limits for lead that have been identified during past rounds of lead and copper tap monitoring. These causes should be considered when investigating initial tap monitoring results over the action limits for lead or copper:

6.4.1. Customer volunteers did not follow the sampling procedure and did not adequately flush their service line and plumbing before starting the sample hold time interval.

6.4.2. Customer volunteers did not follow the sampling procedure and held the water in the plumbing for longer than the 12 hour maximum that the regulation sampling procedure allows.

6.4.3. Customer volunteer installed a new brass faucet one year or less prior to collecting their LCR tap sample.

lead tools or parts to change the plumbing system

6.4.4. Customer volunteer used lead containing materials to change or renovate the plumbing that supplies the test tap (New solder will leach at higher rates than older solder that has been oxidized and passivated).

6.4.5 Customer used the plumbing system to ground the household electrical system or a household appliance.

7.0 Reporting

7.1. Laboratory to Everett LCR coordinator and participant systems

7.1.1. Preliminary routine tap monitoring informal reports

The Everett LCR coordinator will arrange with the laboratory to obtain results of any routine tap sample results that are over the action limits as soon as possible.

The laboratory will report the results of any routine tap sample results that are greater than 15 ug/L for lead or 1.3 mg/L for copper to the system that collected the sample(s) and to the Everett LCR coordinating staff.

The preliminary reports on any high results must include the following information:

- System name
- Sample site street address
- Laboratory sample ID
- Lead and copper results for each sample.

7.1.2. Final comprehensive regional and individual system reports.

The laboratory will provide a comprehensive electronic report of results in the required WA DOH format to the Everett regional LCR coordinator by November 1st of the year in which monitoring occurred. Along with the compiled regional report, the report file workbook must include separate reports (one per tab) of the results for each individual system. The system name, sample site street address, laboratory sample ID, and the results for each sample must be reported on the compiled regional report sent to WA DOH. The Everett regional LCR plan coordinator will review the final report and send it to WA DOH and to each participating system.

See Appendix 6 for an example report excerpted from the final DOH report from the 2006 round of monitoring.

(*Note: Appendix 6 contains a copy of the 2006 comprehensive report and an example report of one individual system. Future reports will be modified to include the system name, PWSID #, sample location address and lab sample ID number for each sample.*)

7.1.3. Follow-up monitoring results reports

The laboratory will report the results of any follow-up monitoring conducted at LCR tap sample sites for lead or copper to the contact person for the system that collected the samples and to the Everett LCR coordinator. At a maximum, the sample results must be reported within 30 days of their receipt at the laboratory. Within five days of receiving the report, each water system must send their follow-up lead and copper results on the report to the DOH engineer and to the Everett LCR coordinator.

The Everett LCR coordinator is responsible for consulting with DOH to determine which follow-up samples must be included on the final LCR report and which (if any) will be invalidated and removed from the report. The LCR coordinator will also keep the lab informed as to which samples must be included on the final report.

7.1.4. Intensive monitoring reports after follow-up sample collection and analysis.

Systems that are required by WA DOH to undertake further investigation and monitoring within their system after obtaining repeat unexplained high results will coordinate directly with the laboratory and WA DOH on how and where to report their intensive follow-up results.

7.2. Everett to WA DOH

7.2.1. Final LCR report

Everett LCR coordination staff will email copies of the final tap sample report to the WA DOH regional engineer. If directed to by the WA DOH regional engineer, Everett will also email the report to other WA DOH staff. The final report is due to WA DOH not later than ten days after the year in which monitoring is conducted (January 10th of the year following the monitoring year).

Along with the lead and copper results, the final report must include the following information for each sample:

- the laboratory sample ID
- the address of the sampling location
- the name of the water system where the sample was collected
- the water system ID the system where the sample was collected

Except when invalidated by WA DOH, all sample results obtained from initial follow-up monitoring will be listed on the final compiled Everett regional LCR report and included in the 90th percentile calculation for the regional program. This would include repeat follow-up samples collected after September 30th.

7.2.2. Follow up tap sample results reports.

When follow-up investigative monitoring is conducted by a participant system, the water system will report the results of the monitoring to the regional LCR coordinator and the WA DOH engineer within five

report follow-up samples w/in 5 days

working days of receiving the report(s). The WA DOH engineer or other WA DOH staff will inform the Everett coordinator whether the sample results should be invalidated or included on the final LCR regional monitoring report to DOH. Except when invalidated by DOH, all sample results obtained from repeat follow-up monitoring will be included in the final Everett regional LCR report and used to calculate the 90th percentile for the regional group.

7.3. Everett to water system participants

7.3.1. The Everett regional LCR program coordinator will send copies of the any high individual system preliminary results as soon as possible, but not more than five days after receipt of the results from the laboratory.

7.3.2. Everett will also send copies of the final comprehensive regional report to each system at the same time it provides the report to DOH.

7.4. Water systems to customer volunteers

7.4.1. Reports to customer volunteers

report results to participating customers

Participating water systems are required by WA DOH to report their individual lead and copper sample results to each of their customer volunteers. With the exception of results that are higher than the action limits for lead or copper, each water system will determine the timing and method of reporting to its customer volunteers.

7.4.2. Reports of high results to customer volunteers

Samples above the action limit... customers must be notified w/in 5 days

Although the method of notification will be determined by each system, the timing of notification of high individual results must follow the schedule requirements of the plan (within five days of receipt of the high result(s)).

8.0 Specific regional LCR violation compliance strategies

Because regional programs are not specifically described in detail in the federal or state LCR regulations, EPA and WA DOH require that the responses to certain potential violation or compliance scenarios be described and defined for the regional plan.

8.1. Failure of a participant water system to collect assigned samples

Water systems that fail to collect their assigned samples will be permanently expelled from the regional program, returned to individual system status for LCR compliance, and referred to WA DOH for guidance, citation, or enforcement action.

8.2. Failure to collect samples from LCR compliant sampling locations

Systems that fail to collect their assigned samples from sample sites that meet the criteria described in the LCR regulation [40CFR141.86(a)] will be permanently expelled from the regional program, returned to individual system status for LCR compliance monitoring, and referred to WA DOH for guidance, citation, or enforcement action.

8.3. Failure of regional group to collect the minimum number of required samples

Although the LCR regulations do not specify what follow up action would be required for a system that fails to collect the required number of samples, failure of the regional group to collect the sample minimum quantity set by WA DOH for each monitoring round of the regional monitoring program would be considered a monitoring violation for the purposes of this plan.

If the regional group fails to collect the required minimum, the participating systems would resume standard monitoring (once every 6 months) as a regional group. Resumption of reduced monitoring would begin again when approved by WA DOH, or when the regional program results meet the criteria set out in 141.86(d)(4)(v) [90^{th} percentile result for lead is ≤ 0.005 mg/L and the 90^{th} percentile result for copper is ≤ 0.65 mg/L] in two consecutive six month monitoring periods.

8.4. Exceedence of an Action Limit (AL) by the regional group

If the 90^{th} percentile results for lead or copper samples collected for the regional sample program exceed either action limit, the regional sampling program must resume monitoring every six months at the required minimum 100 sites. If the monitoring results from the two rounds of every-six-months monitoring are below the action limits, but above 0.005 mg/L for lead and 0.065 mg/l for copper, WA DOH would decide when to allow reduction of monitoring to an annual or triennial frequency. If the results for two consecutive six month or two annual monitoring rounds are less than or equal to 0.005 mg/L and 0.65 mg/L respectively [see 40CFR141.86(d)(v)], the regional systems would be able to reduce monitoring to triennial without further WA DOH approval. During increased monitoring at both six month and annual intervals, WQP monitoring will also be increased from one set of 25 per round to two sets of 25 WQP samples per round. When the program qualifies to resume reduced triennial monitoring, the WQP sample frequency would also be reduced to a single set of samples for each round.

Appendices

Appendix 2
System participation agreement (with Everett)

PARTICIPATION AGREEMENT
EVERETT REGIONAL CONSECUTIVE SYSTEMS LEAD AND COPPER RULE MONITORING PROGRAM

THIS AGREEMENT dated _____________ between the City of Everett, a municipal corporation of the State of Washington ("City") and ____, ("Participant") witnesses:

1. City and Participant acknowledge their respective responsibilities as drinking water purveyors under the USEPA's Lead and Copper Rule (40 CFR Part 141) to monitor drinking water at customer taps for possible lead and copper contamination. Accordingly, Participant agrees:

a. To conduct monitoring, as directed by City staff and as detailed in the most current version of the Everett regional LCR monitoring plan. Participant will collect and deliver samples to City in accordance with protocols and schedules established by City, DOH, Participant, and other participants;

b. To conduct follow up monitoring and investigation on any LCR sampling location where the initial routine monitoring results exceed the action limits for lead or copper and report the results to City and DOH according to the Everett regional LCR monitoring plan, the DOH, or federal regulations;

c. To select monitoring locations meeting the requirements of the LCR and 40CFR141.86(a);

d. To assist City with water quality parameters monitoring if assigned by the plan;

e. To conduct public notification if required by the plan or DOH as part of LCR compliance.

2. City agrees to establish and administrate the Everett regional consecutive systems lead and copper monitoring program. City will be responsible for regional coordination and reporting of data timely submitted to the City by all participants.

3. City will pay all costs of sample analysis, data coordination and analysis, and reporting. Participants will pay all costs of sample collection and monitoring, staff coordination and participation, and public notification materials and mailing. (City's retail water distribution system shall perform monitoring and pay its collection and monitoring costs as a participant.)

4. This agreement is directed toward monitoring for regulatory agency compliance and reporting only. The City and each participant remain responsible for LCR compliance within their respective local distribution systems.

5. This agreement may be terminated by either party by giving 90 days notice to the other.

City of Everett

Mayor:

____

Approved as to form

City Attorney:

____

Attest

City Clerk

Participant System:

____

System Representative Signature:

____

Mailing address:

____

____

DOH System ID#: ________________

Population served: ________________

Appendix 4
Example of Everett regional LCR program WQP report

2006 Everett Consecutive Systems LCR Distribution Water Quality Parameters Monitoring Report

DOH System ID#: 24050L   DOH Source ID#: S01

Site Code	Address	Pressure Zone	Date collected	Time collected	pH	Temp	Conductivity	Alkalinity	Comments
				hh:mm	s.u.	°C	siemens	mg/L as $CaCO_3$	
AWD001	15204 35th Ave SW	724	8/29/06	10:10	7.89	15.8	52.7	20.9	Sink-old AWD Maint shop
AWD003	3140 - 243rd St SW	635	8/29/06	10:42	8.70	19.9	57.4	22.3	
AWD005	1213 - 225th Pl SW	635	8/29/06	11:08	8.14	18.1	52.5	21.4	
AWD006	22923 - 13th Pl SW	520	8/29/06	11:25	7.96	17.4	55.7	21.3	
AWD007	2100 - 237th St SE	520	8/29/06	11:41	8.35	21.3	57.9	24.6	
AWD008	23610 - 49th Ave SE	520	8/29/06	12:11	8.33	16.5	58.1	22.6	
AWD009	3301 - 198th Pl SE	635	8/29/06	12:32	8.59	17.3	55.7	23.4	
AWD010	3015 - 149th St SE	635	8/29/06	12:58	8.39	18.2	54.3	21.2	
AWD011	15001 72nd Ave SW	724	8/29/06	14:28	8.42	17.0	53.7	21.1	Added 9/20/00
AWD012	12307 Alexander Road	724	8/29/06	13:58	8.04	16.7	53.6	22.0	Added 9/20/00
EDM001	7707 203rd St SW	-	8/23/06	10:10	8.04	16.8	57.7	21.0	
EDM002	21626 88th Ave W	-	8/23/06	10:33	8.28	17.5	58.3	19.4	
EDM003	1045 Daley St	-	8/23/06	10:52	8.34	19.5	59.0	21.8	
EDM004	8329 Sierra Drive	-	8/23/06	11:14	8.04	15.7	57.9	21.2	
EDM005	6405 - 170th	-	8/23/06	11:32	8.08	15.9	58.0	21.4	
DIST0086	2315 West Casino Rd	High	8/31/06	13:52	8.22	17.1	52.1	20.4	TCR-Bact site 64
DIST0089	6006 Pebble Place	Madison	8/31/06	13:00	8.70	21.7	53.0	19.7	TCR-Bact site 68
DIST0187	6814 Cady Rd.	585	8/31/06	12:48	8.14	16.6	50.7	20.9	TCR-Bact site 43 *
DIST0092	2501 - 57th St SW	Stratton Hills	8/31/06	13:35	8.47	18.0	53.3	20.8	TCR-Bact site 74
DIST0094	2508 Taylor Drive	Viewridge	8/31/06	13:19	8.27	17.7	51.0	20.2	TCR-Bact site 60
DIST0107	1601 Chesnut	Low	8/31/06	12:00	8.42	18.4	54.6	21.8	TCR-Bact site 13
DIST0079	5301 S. 2nd Ave	Lowell	8/31/06	12:30	8.22	17.8	53.0	20.8	TCR-Bact site 73
DIST0080	5026 Alta Drive	Claremont	8/31/06	12:22	8.35	18.2	52.3	21.1	TCR-Bact site 33
DIST0081	2503 - 80th Place SE	Valley View	8/31/06	14:45	9.11	22.2	60.5	24.0	TCR-Bact site 49
DIST0083	12012 - 14th Dr SE	660	8/31/06	14:15	8.67	20.7	54.7	21.6	TCR-Bact site 61

Note: "AWD" sitles located in Alderwood Water Wastewater District, "EDM" sites located in Edmonds and "DIST" sites located in Everett.
* added in 2006 (old site lost)

Appendix 5

Example customer sample collection instructions and sample information form

HOMEOWNER SAMPLING INSTRUCTIONS
2009 LEAD/COPPER SAMPLING PROGRAM

Thank you for participating in our sampling program. Please use the following procedures when collecting your sample:

Preparation before taking sample (at least 6 hours prior):

1. Use only a kitchen or bathroom **cold** water tap.
2. Leave the screen on the end of the faucet.
3. Flush the faucet thoroughly by letting the water run for about three minutes.
4. Do not use the sample faucet for at least **6 hours.** Letting the faucet sit overnight is just fine. Faucets should not be left for more than 12 hours before the sample is collected.

When ready to take sample:

5. Fill the sample bottle to the neck with the **first** draw of cold water from the faucet that has not been used for 6 hours and not more than 12 hours. After filling, tighten the cap.
6. Completely fill out the information sheet attached to these instructions. Be sure to sign and date your name and indicate whether or not you have replaced your faucet in the past 12 months.
7. Attach this sheet to your sample bottle with a rubber band and place the bottle in the plastic bag it came in.
8. On the same day you collected it, leave your sample package on your step or door knob for pick up by your water supplier.
9. If you have any questions, contact your local water district manager.

SAMPLE SITE INFORMATION

<u>To be filled in by the homeowner:</u>

Name of resident: ______________________________

Address: ______________________________

____

Telephone Number: ______________________________

In the past year, have you installed a new faucet on the sink you are collecting your sample from (yes/no)? ______________________________

If yes, how long ago? ______________________________

Water was last used:	Time: ____________	Date: ____________
Sample was collected:	Time: ____________	Date: ____________

I have read the above directions and have collected a tap sample in accordance with the attached directions.

______________________________ ______________________________
Signature Date

To be filled in by the water supplier:

WATER DISTRICT NAME: ______________________________

WATER SYSTEM ID NUMBER: ______________________________

To be filled in by the laboratory or the regional coordinator:

LABORATORY SAMPLE ID NUMBER: ______________________________

SAMPLE FIELD ID NUMBER: ______________________________

Appendix 6
Example LCR compliance reports to DOH and individual water systems

Regional Report

INORGANIC CHEMICALS (IOCS) REPORT For LEAD & COPPER

System ID No.: 24050L	System Name: City of Everett		
DOH Source No: S01	Sample Type: A	Sample Purpose: C	
Date Received: Various	Date Reported: 11/7/2006	Supervisor:	
Date Analyzed: Various	Analyst: Edge Analytical	Group: (A) B Other	
County: Snohomish	Sample Location: *(See table below)*		
Send Report To:	Bill To:		

DOH #	23 (Copper)	9 (Lead)
State Reporting Level (SRL)	0.2 mg/L	0.002 mg/L
Action Level (AL)	1.3 mg/L	0.015 mg/L
Test Method	200.8	200.8

Lab Sample #	Date Collected	Site/Location		Copper mg/L	Lead mg/L
046-27458	9/26/06	BA33489	60TH STREET WATER WORKS	0.039	<0.002
046-26499	9/25/06	BA33363	ALDERCREST WATER USERS	0.052	0.003
046-24636	9/6/06	BA27988	ALDERWOOD WD	<0.02	<0.002
046-24654	8/31/06	BA27582	ALDERWOOD WD	<0.02	<0.002
046-25227	9/12/06	BA32340	ALDERWOOD WD	<0.02	<0.002
046-25253	9/8/06	BA32253	ALDERWOOD WD	0.031	<0.002
046-25254	9/8/06	BA32254	ALDERWOOD WD	0.031	<0.002
046-25255	9/7/06	BA32051	ALDERWOOD WD	<0.02	<0.002
046-25256	9/7/06	BA32052	ALDERWOOD WD	<0.02	<0.002
046-25435	9/14/06	BA32562	ALDERWOOD WD	0.022	<0.002
046-26070	9/15/06	BA32773	ALDERWOOD WD	<0.02	0.002
046-26073	9/19/06	BA32959	ALDERWOOD WD	<0.02	<0.002
046-26302	9/20/06	BA33035	ALDERWOOD WD	<0.02	<0.002
046-26303	9/20/06	BA33036	ALDERWOOD WD	0.021	<0.002
046-26305	9/21/06	BA33144	ALDERWOOD WD	0.033	0.004
046-26306	9/21/06	BA33145	ALDERWOOD WD	<0.02	0.002
046-26307	9/20/06	BA33146	ALDERWOOD WD	<0.02	<0.002
046-26493	9/22/06	BA33279	ALDERWOOD WD	<0.02	<0.002
046-26494	9/22/06	BA33280	ALDERWOOD WD	<0.02	<0.002
046-26495	9/22/06	BA33281	ALDERWOOD WD	0.084	0.063
046-26496	9/22/06	BA33282	ALDERWOOD WD	<0.02	<0.002
046-26497	9/22/06	BA33283	ALDERWOOD WD	<0.02	<0.002
046-26498	9/21/06	BA33284	ALDERWOOD WD	<0.02	<0.002
046-26500	9/23/06	BA33344	ALDERWOOD WD	0.021	<0.002
046-26501	9/24/06	BA33345	ALDERWOOD WD	0.027	<0.002
046-26502	9/25/06	BA33346	ALDERWOOD WD	<0.020	<0.002
046-27450	9/21/06	BA33927	ALDERWOOD WD	0.038	<0.002
046-27451	9/30/06	BA33928	ALDERWOOD WD	<0.02	<0.002
046-27452	9/27/06	BA33595	ALDERWOOD WD	0.033	0.004
046-27453	9/23/06	BA33424	ALDERWOOD WD	<0.02	<0.002
046-27454	9/25/06	BA33425	ALDERWOOD WD	<0.02	0.009
046-27455	9/27/06	BA33506	ALDERWOOD WD	<0.02	<0.002

Lab Sample #	Date Collected	Site/Location		Copper mg/L	Lead mg/L
046-27456	9/26/06	BA33507	ALDERWOOD WD	<0.02	<0.002
046-27457	9/27/06	BA33508	ALDERWOOD WD	<0.02	<0.002
046-26072	9/15/06	BA32774	BLACKMANS LAKE WD	0.067	<0.002
046-20551	7/25/06	BA21414	BUNK FOSS SYSTEM	0.049	0.002
046-21683	8/11/06	BA26272	CASCADE ACRES HOA	0.049	0.002
046-23959	8/29/06	BA27426	CITY OF EDMONDS	0.020	<0.002
046-23960	8/29/06	BA27427	CITY OF EDMONDS	0.027	0.002
046-23961	8/29/06	BA27428	CITY OF EDMONDS	0.046	<0.002
046-23962	8/29/06	BA27429	CITY OF EDMONDS	0.076	<0.002
046-25251	9/12/06	BA32338	CITY OF EDMONDS	0.049	<0.002
046-25252	9/12/06	BA32339	CITY OF EDMONDS	0.037	<0.002
046-22478	8/16/06	BA26691	CITY OF EVERETT	<0.015	<0.002
046-22479	8/16/06	BA26692	CITY OF EVERETT	0.041	0.003
046-22480	8/16/06	BA26693	CITY OF EVERETT	0.020	<0.002
046-22481	8/16/06	BA26694	CITY OF EVERETT	0.079	0.002
046-22482	8/16/06	BA26695	CITY OF EVERETT	0.032	<0.002
046-22483	8/16/06	BA26696	CITY OF EVERETT	<0.015	<0.002
046-22484	8/16/06	BA26697	CITY OF EVERETT	<0.015	<0.002
046-22485	8/16/06	BA26698	CITY OF EVERETT	0.033	<0.002
046-22486	8/16/06	BA26699	CITY OF EVERETT	0.080	<0.002
046-22487	8/16/06	BA26700	CITY OF EVERETT	<0.015	<0.002
046-22488	8/16/06	BA26701	CITY OF EVERETT	<0.015	<0.002
046-22489	8/16/06	BA26702	CITY OF EVERETT	0.051	0.002
046-22490	8/16/06	BA26703	CITY OF EVERETT	0.095	<0.002
046-22491	8/16/06	BA26704	CITY OF EVERETT	0.023	<0.002
046-22904	8/17/06	BA26771	CITY OF EVERETT	<0.02	<0.002
046-22955	8/22/06	BA27056	CITY OF EVERETT	<0.02	<0.002
046-23111	8/17/06	BA26763	CITY OF EVERETT	<0.02	<0.002
046-23112	8/17/06	BA26764	CITY OF EVERETT	0.039	0.004
046-23113	8/17/06	BA26765	CITY OF EVERETT	0.072	0.002
046-23475	8/25/06	BA27235	CITY OF EVERETT	0.027	<0.002
046-23475	9/13/06	BA32486	CITY OF EVERETT	0.064	<0.002
046-25438	9/13/06	BA32487	CITY OF EVERETT	<0.02	<0.002
046-25439	9/13/06	BA32488	CITY OF EVERETT	0.039	<0.002
046-25440	9/18/06	BA32907	CITY OF EVERETT	0.023	<0.002
046-25431	9/14/06	BA32558	CITY OF LYNNWOOD	0.033	<0.002
046-25432	9/13/06	BA32559	CITY OF LYNNWOOD	<0.02	<0.002
046-25433	9/14/06	BA32560	CITY OF LYNNWOOD	0.021	<0.002
046-25434	9/14/06	BA32561	CITY OF LYNNWOOD	0.031	<0.002
046-25436	9/14/06	BA32563	CITY OF LYNNWOOD	<0.02	<0.002
046-25437	9/14/06	BA32564	CITY OF LYNNWOOD	0.051	<0.002
046-23149	8/24/06	BA27171	CITY OF MONROE	0.056	<0.002

Lab Sample #	Date Collected	Site/Location		Copper mg/L	Lead mg/L
046-23150	8/24/06	BA27172	CITY OF MONROE	0.051	<0.002
046-23151	8/24/06	BA27173	CITY OF MONROE	<0.02	<0.002
046-23152	8/24/06	BA27174	CITY OF MONROE	0.056	<0.002
046-24669	9/6/06	BA27962	CITY OF MOUNTLAKE TERRACE	<0.02	<0.002
046-24670	9/6/06	BA27963	CITY OF MOUNTLAKE TERRACE	0.363	0.009
046-24671	9/6/06	BA27964	CITY OF MOUNTLAKE TERRACE	0.044	<0.002
046-24672	9/6/06	BA27965	CITY OF MOUNTLAKE TERRACE	<0.02	<0.002
046-22205	8/15/06	BA26601	CITY OF SNOHOMISH	0.074	<0.002
046-22464	8/16/06	BA26682	CROSS VALLEY WD	0.023	0.004
046-22465	8/16/06	BA26683	CROSS VALLEY WD	<0.015	<0.002
046-22466	8/16/06	BA26684	CROSS VALLEY WD	<0.015	<0.002
046-22905	8/17/06	BA26788	CROSS VALLEY WD	<0.02	<0.002
046-21686	8/3/06	BA21496	FOBES WD	<0.02	<0.002
046-26310	9/22/06	BA33199	GRANITE FALLS WD	0.046	<0.002
046-25482	9/14/06	BA32539	HIGHLAND WD	<0.02	<0.002
046-25483	9/14/06	BA32540	HIGHLAND WD-FRIAR CRK WATER	<0.02	<0.002
046-26309	9/20/06	BA33048	HOMESTEAD ESTATES WATER SYS	0.040	<0.002
046-23474	8/24/06	BA27181	MACHIAS RIDGE ESTATES HOA	<0.020	<0.002
046-25260	9/7/06	BA32106	MARYSVILLE UTILITIES	0.071	<0.002
046-25261	9/7/06	BA32107	MARYSVILLE UTILITIES	0.045	<0.002
046-25262	9/8/06	BA32108	MARYSVILLE UTILITIES	<0.02	<0.002
046-25263	9/7/06	BA32109	MARYSVILLE UTILITIES	<0.02	0.014
046-25264	9/7/06	BA32110	MARYSVILLE UTILITIES	<0.02	<0.002
046-25265	9/7/06	BA32111	MARYSVILLE UTILITIES	<0.02	<0.002
046-21691	8/7/06	BA25693	MEADOW LAKE WATER ASSOC	0.069	<0.002
046-26090	9/14/06	BA32780	MUKILTEO WD	0.022	0.002
046-26091	9/14/06	BA32781	MUKILTEO WD	0.041	0.003
046-26092	9/14/06	BA32782	MUKILTEO WD	<0.02	<0.002
046-26093	9/14/06	BA32783	MUKILTEO WD	0.023	<0.002
046-26094	9/14/06	BA32784	MUKILTEO WD	0.047	<0.002
046-21694	8/7/06	BA25756	NORTH RIDGE WATER CORP	<0.02	<0.002
046-21693	8/7/06	BA25695	PILCHUCK 26 TRACTS	<0.02	0.003
046-21685	8/10/06	BA26090	RIVERSIDE WD #1	0.090	<0.002
046-26308	9/20/06	BA33047	ROOSEVELT WATER ASSOC	0.031	<0.002
046-21692	8/7/06	BA25694	SCHLUTER WATER ASSOC	<0.02	<0.002
046-20599	8/2/06	BA21415	SILVER LAKE WD	<0.02	<0.002
046-20600	8/2/06	BA21416	SILVER LAKE WD	<0.02	<0.002
046-20601	8/2/06	BA21417	SILVER LAKE WD	<0.02	<0.002
046-20602	8/2/06	BA21418	SILVER LAKE WD	<0.02	<0.002
046-20603	8/2/06	BA21419	SILVER LAKE WD	0.039	0.002
046-20604	8/2/06	BA21420	SILVER LAKE WD	<0.02	<0.002
046-21688	8/3/06	BA22949	SILVER LAKE WD	<0.02	<0.002

Lab Sample #	Date Collected	Site/Location		Copper mg/L	Lead mg/L
046-21689	8/3/06	BA22950	SILVER LAKE WD	<0.02	<0.002
046-25225	9/7/06	BA32060	SKY MEADOW WATER ASSOC	<0.02	<0.002
046-23164	8/24/06	BA27176	SNO PUD #1	0.047	<0.002
046-23166	8/24/06	BA27178	SNO PUD #1	0.039	<0.002
046-23156	8/23/06	BA27120	SNO PUD #1 - DUBUQUE	0.046	<0.002
046-23154	8/23/06	BA27118	SNO PUD #1 - LAKE ROESIGER	0.022	<0.002
046-23155	8/23/06	BA27119	SNO PUD #1 - LAKE ROESIGER	0.068	<0.002
046-23165	8/24/06	BA27177	SNO PUD #1 - LAKE ROESIGER	0.068	0.058
046-23157	8/23/06	BA27121	SNO PUD #1 - LAKE STEVENS	<0.02	<0.002
046-23158	8/23/06	BA27122	SNO PUD #1 - LAKE STEVENS	0.138	0.051
046-23159	8/23/06	BA27123	SNO PUD #1 - LAKE STEVENS	0.082	<0.002
046-23160	8/23/06	BA27124	SNO PUD #1 - LAKE STEVENS	0.212	0.005
046-23161	8/23/06	BA27125	SNO PUD #1 - LAKE STEVENS	0.073	<0.002
046-23162	8/23/06	BA27126	SNO PUD #1 - LAKE STEVENS	0.032	<0.002
046-23163	8/24/06	BA27175	SNO PUD #1 - LAKE STEVENS	0.071	0.003
046-23153	8/23/06	BA27117	SNO PUD #1 - STORM LAKE	0.127	<0.002
046-21687	8/3/06	BA21499	THREE LAKES WATER	0.027	0.002
046-21684	8/10/06	BA26091	WANDERING CREEK HOA	0.023	<0.002
			Total sample count	134	
			(100 required)		
			90th Percentile	**0.072**	**0.003**
			(ranked sample #121)	Copper	Lead

NOTES:

AL (Federal Action Levels are 0.015 mg/L for Lead and 1.3 mg/L for Copper. If the concentrations exceed these levels, contact your regional DOH office for further information.

SRL (State Reporting Levindicates the minimum reporting level required by the Washington Department of Health (DOH).

NA (Not Analyzed): in the results column indicates this compound was not included in the current analysis.

ND (Not Detected): in the results column indicates this compound was analyzed & not detected at a level greater than or equal to the SRL.

< (0.001): Means less than a number. It also indicates that the compound was not detected in the sample at or above the concentration indicated.

COMMENTS:

CITY OF EVERETT ENVIRONMENTAL LABORATORY

PROJECT #

24208, 24166, 24243, 24218, 24272, 24289, 24311, 24322, 24338, 24346, 24350, 24404, 24380, 24359, 24369

Client:	City of Everett	Sample Site:	ALDERWOOD WD
Program:	WFP-LCR	System ID#	01300
Contact:	Mark Weeks	Matrix:	Drinking Water
Date Received:	Various	Date Reported:	11/7/2006
Data Release:	CK	Date Sampled:	Various

ANALYTICAL RESULTS

Sample ID	Sample Date	Address	Lab ID#	Copper Method 200.8	Lead Method 200.8
BA27988	9/6/2006	6010 137TH PL SW	046-24636	<0.02	<0.002
BA27582	8/31/2006	2911 168TH ST SE	046-24654	<0.02	<0.002
BA32340	9/12/2006	700 198TH DR SE	046-25227	<0.02	<0.002
BA32253	9/8/2006	6132 137TH PL SW	046-25253	0.031	<0.002
BA32254	9/8/2006	23029 13TH PL W	046-25254	0.031	<0.002
BA32051	9/7/2006	710 DUCHESS	046-25255	<0.02	<0.002
BA32052	9/7/2006	717 198TH PL SE	046-25256	<0.02	<0.002
BA32562	9/14/2006	6217 137TH	046-25435	0.022	<0.002
BA32773	9/15/2006	19819 8th	046-26070	<0.02	0.002
BA32959	9/19/2006	2123 233RD	046-26073	<0.02	<0.002
BA33035	9/20/2006	22531 13TH	046-26302	<0.02	<0.002
BA33036	9/20/2006	5529 240TH	046-26303	0.021	<0.002
BA33144	9/21/2006	103-236TH	046-26305	0.033	0.004
BA33145	9/21/2006	117 236TH	046-26306	<0.02	0.002
BA33146	9/20/2006	24127 57TH	046-26307	<0.02	<0.002
BA33279	9/22/2006	23827 2ND	046-26493	<0.02	<0.002
BA33280	9/22/2006	219 236TH	046-26494	<0.02	<0.002
BA33281	9/22/2006	225 236TH	046-26495	0.084	0.063
BA33282	9/22/2006	218 236TH	046-26496	<0.02	<0.002
BA33283	9/22/2006	23716 3RD	046-26497	<0.02	<0.002
BA33284	9/21/2006	203 236TH	046-26498	<0.02	<0.002
BA33344	9/23/2006	1304 227th	046-26500	0.021	<0.002
BA33345	9/24/2006	1229 228th	046-26501	0.027	<0.002
BA33346	9/25/2006	23813 2nd	046-26502	<0.020	<0.002
BA33927	9/21/2006	229 238TH	046-27450	0.038	<0.002
BA33928	9/30/2006	2101 233RD	046-27451	<0.02	<0.002
BA33595	9/27/2006	225 238th	046-27452	0.033	0.004
BA33424	9/23/2006	23620 3RD	046-27453	<0.02	<0.002
BA33425	9/25/2006	23612 3RD	046-27454	<0.02	0.009
BA33506	9/27/2006	16421 31st	046-27455	<0.02	<0.002
BA33507	9/26/2006	23820 3rd	046-27456	<0.02	<0.002
BA33508	9/27/2006	23303 22nd	046-27457	<0.02	<0.002

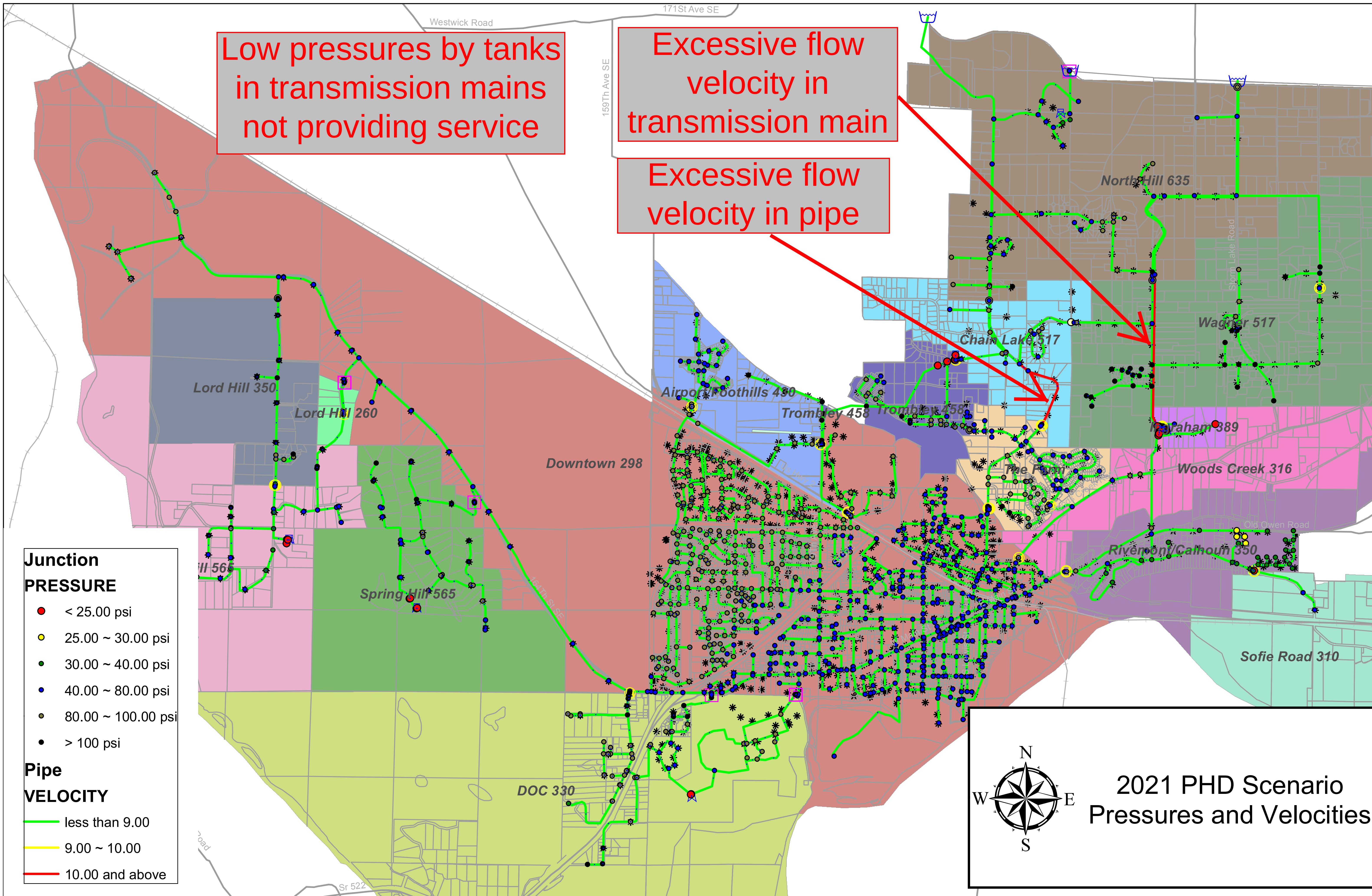
2006
Everett Regional-Consecutive System Lead and Copper Tap Sample Monitoring Plan
Sample Quantity Assignments by System

DOH SYSTEM ID#	2006 SYSTEM NAME	NUMBER OF REQUIRED TAP SAMPLES
37925	60TH STREET WATER WORKS	1
01150	ALDERCREST WATER USERS	1
01300	ALDERWOOD WATER DISTRICT	21
07250	BLACKMANS LAKE WATER DISTRICT	1
26140	BUNK FOSS SYSTEM	1
11431	CASCADE ACRES HOME OWNERS	1
16270	CROSS VALLEY WATER DISTRICT	3
22500	EDMONDS, CITY OF	6
24050	EVERETT, CITY OF	18
25750	FOBES WATER DISTRICT	1
29050	GRANITE FALLS WATER DEPT	1
16351	HIGHLAND - FRIAR CREEK WATER SYSTEM	1
32850	HIGHLAND WATER DISTRICT	1
17051	HOMESTEAD ESTATES WATER SYSTEM	1
49270	LYNNWOOD, CITY OF	6
20624	MACHIAS RIDGE HOMEOWNERS ASSOC.	1
51900	MARYSVILLE UTILITIES	8
20637	MEADOW LAKE WATER ASSOCIATION	1
55820	MONROE, CITY OF	4
57250	MOUNTLAKE TERRACE, CITY OF	4
57550	MUKILTEO WATER DISTRICT	5
61100	NORTH RIDGE WATER CORP	1
67375	PILCHUCK 26 TRACTS	1
72844	RIVERSIDE WATER DIST NO 1	1
74150	ROOSEVELT WATER ASSOCIATION	1
76650	SCHLUTER WATER ASSOCIATION	1
79250	SILVER LAKE WATER DISTRICT	6
20150	SNO PUD 1 - DUBUQUE	1
01612	SNO PUD 1 - LAKE ROESIGER	1
80907	SNO PUD 1 - LAKE STEVENS	6
44431	SNO PUD 1 - STORM LAKE RIDGE	1
94810	SNO PUD 1 - WEST MACHIAS WATER ASSOC	1
80915	SNOHOMISH, CITY OF	1
88150	THREE LAKES WATER ASSOCIATION INC	1
23486	WANDERING CREEK HOMEOWNERS ASSN	1
35	MAXIMUM POTENTIAL TOTAL (100% compliance)	111

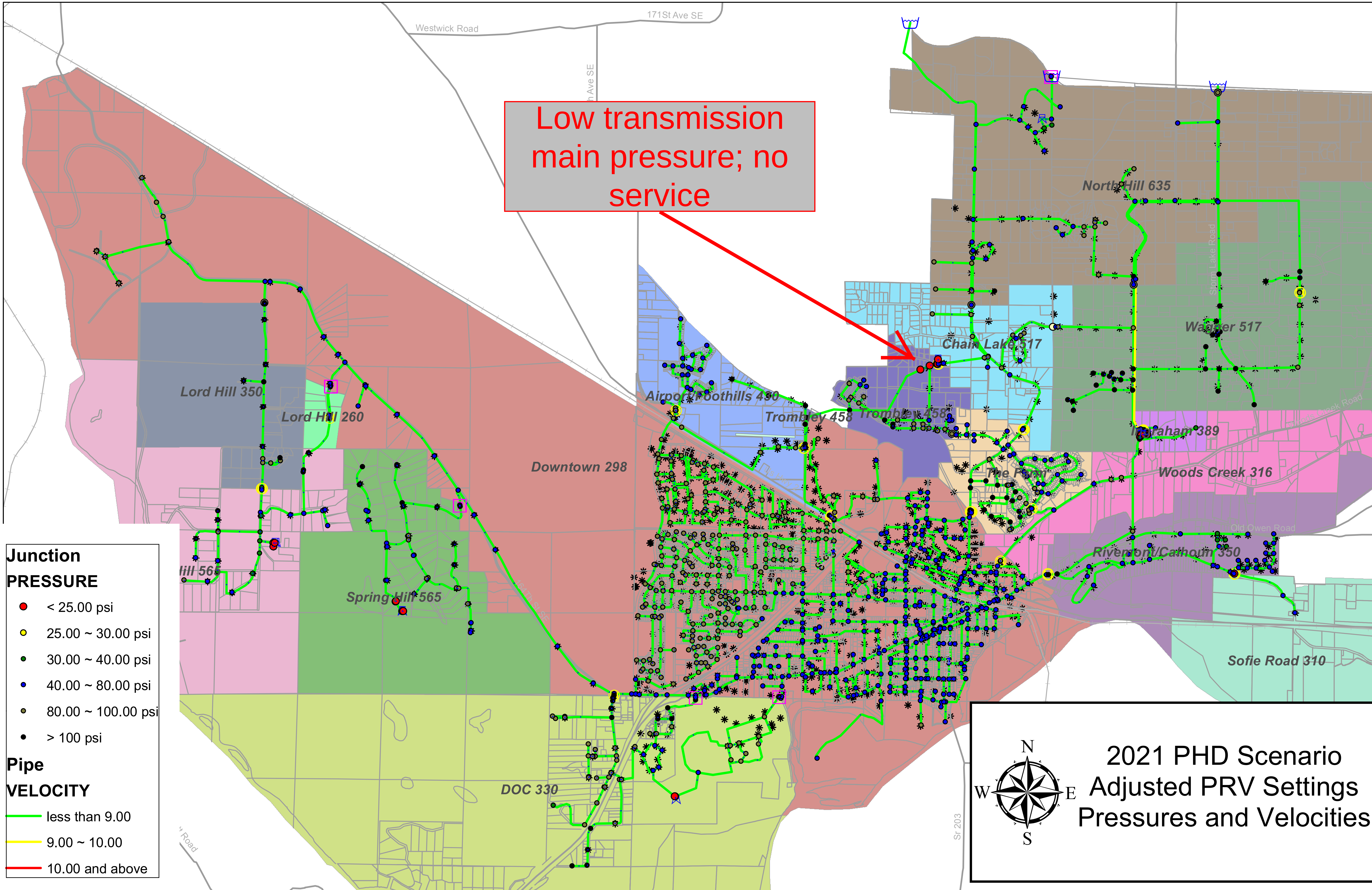
8/30/05

Appendix W-L

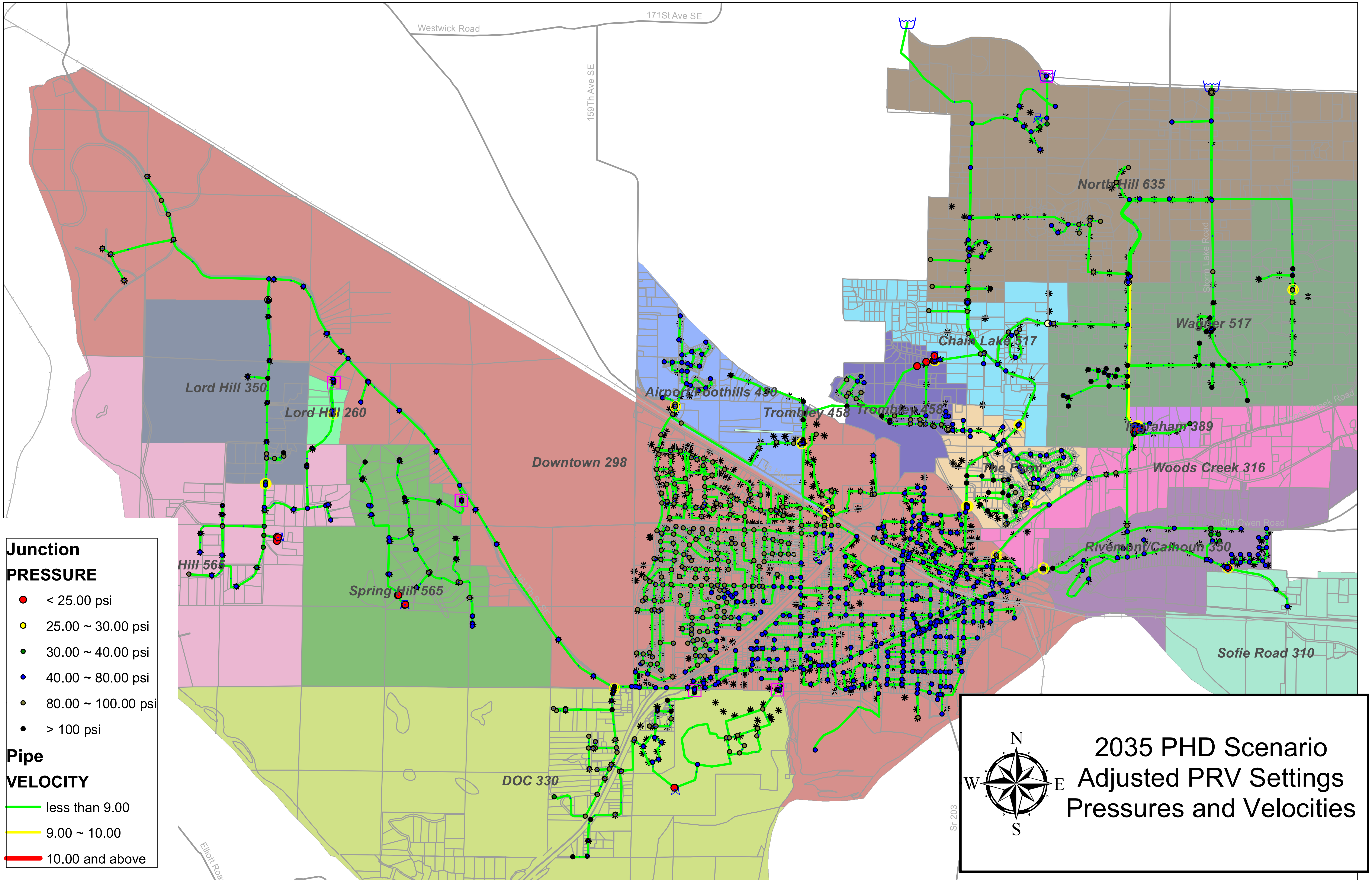
Computer Model Data and Sample Results

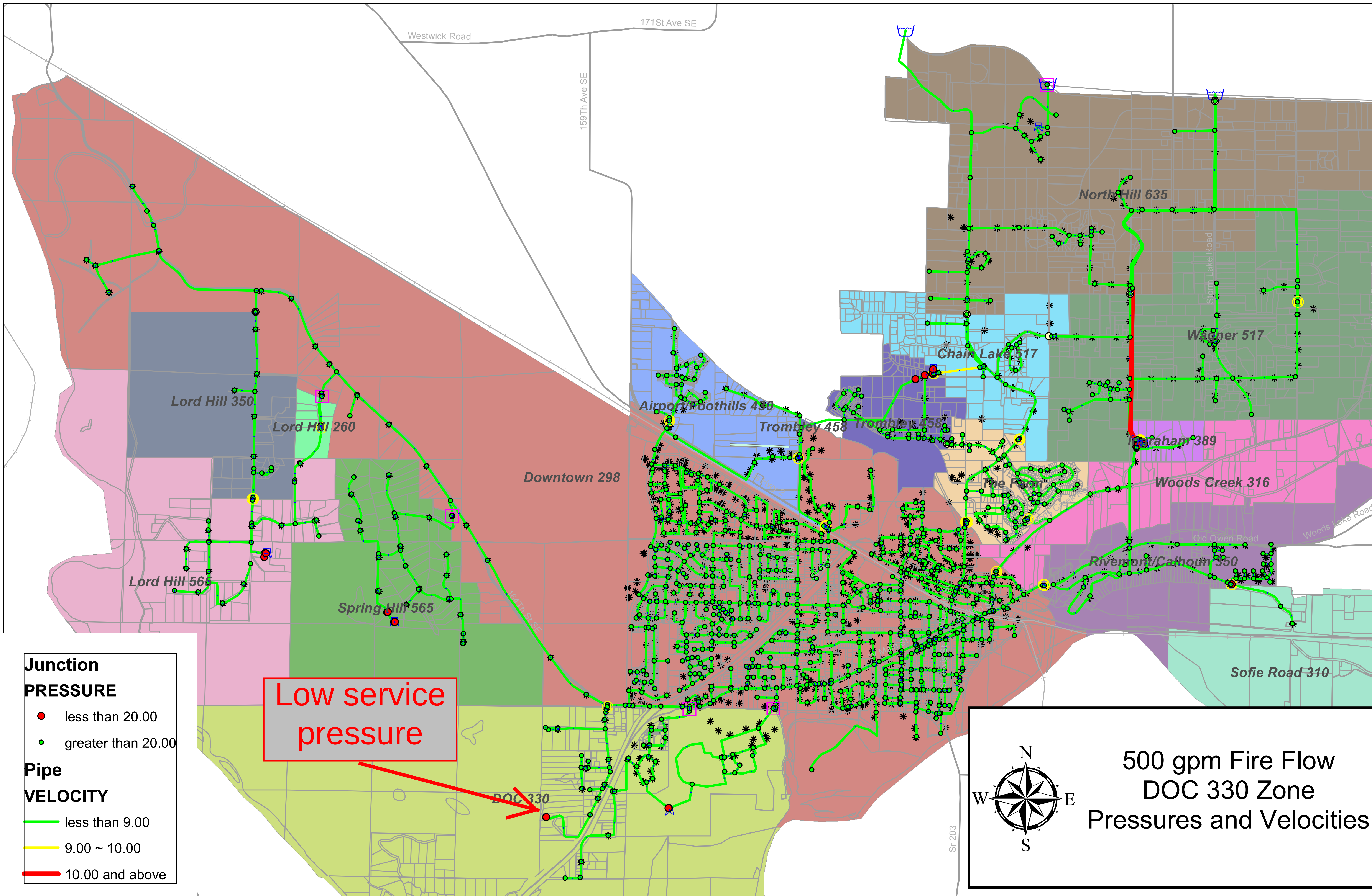


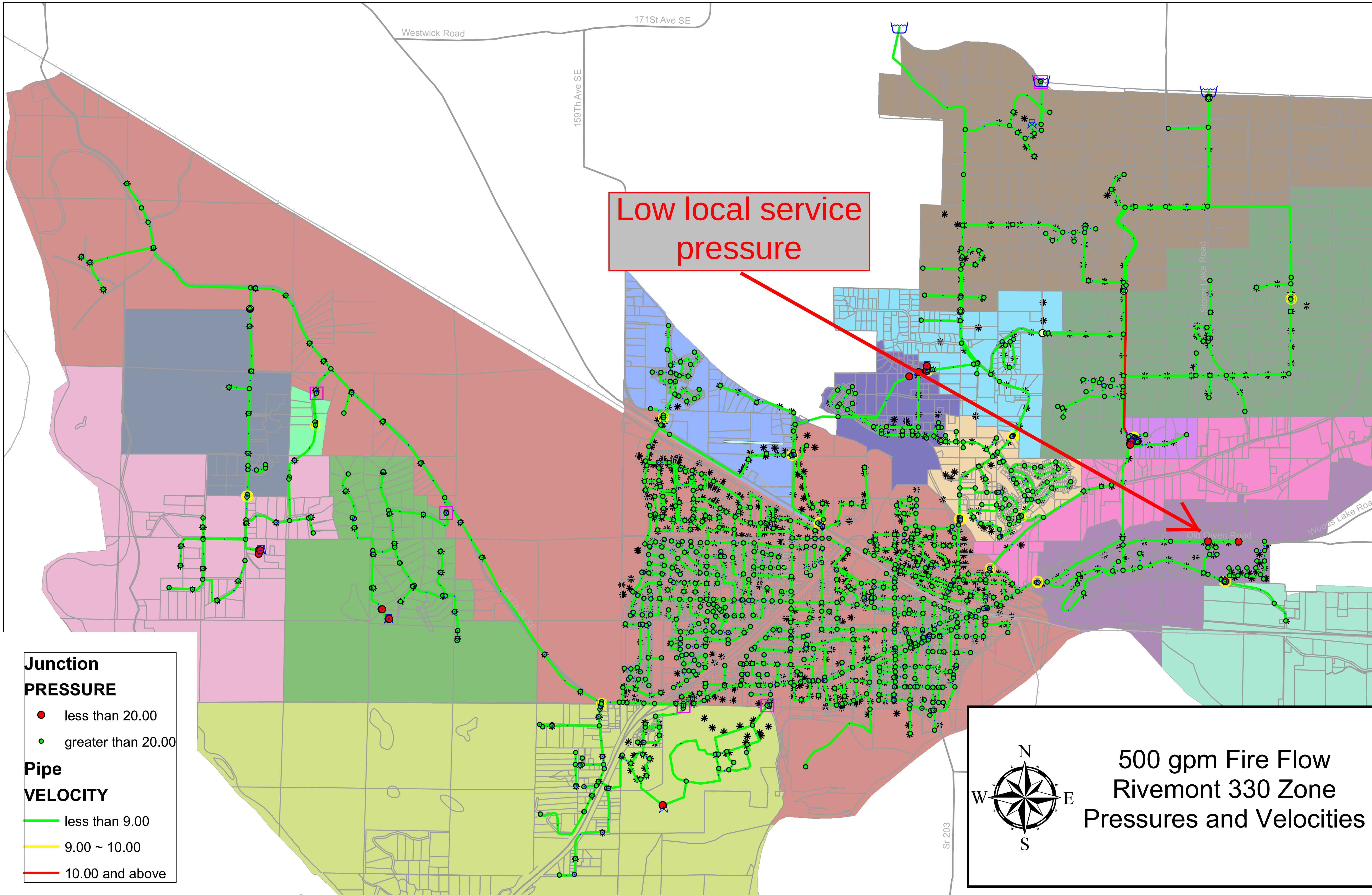
Low pressures by tanks in transmission mains not providing service
Excessive flow velocity in transmission main
Excessive flow velocity in pipe
Westwick Road
171St Ave SE
159Th Ave SE
North Hill 635
Wagner 517
Chain Lake 517
Airport/Foothills 480
Trombley 458
Lord Hill 350
Lord Hill 260
Downtown 298
Graham 389
The Farm
Woods Creek 316
Riverfront/Calhoun 350
Spring Hill 565
Sofie Road 310
DOC 330
Storm Lake Road
Old Owen Road
Sr 522
Junction
PRESSURE
< 25.00 psi
25.00 ~ 30.00 psi
30.00 ~ 40.00 psi
40.00 ~ 80.00 psi
80.00 ~ 100.00 psi
> 100 psi
Pipe
VELOCITY
less than 9.00
9.00 ~ 10.00
10.00 and above
N
S
E
W
2021 PHD Scenario
Pressures and Velocities

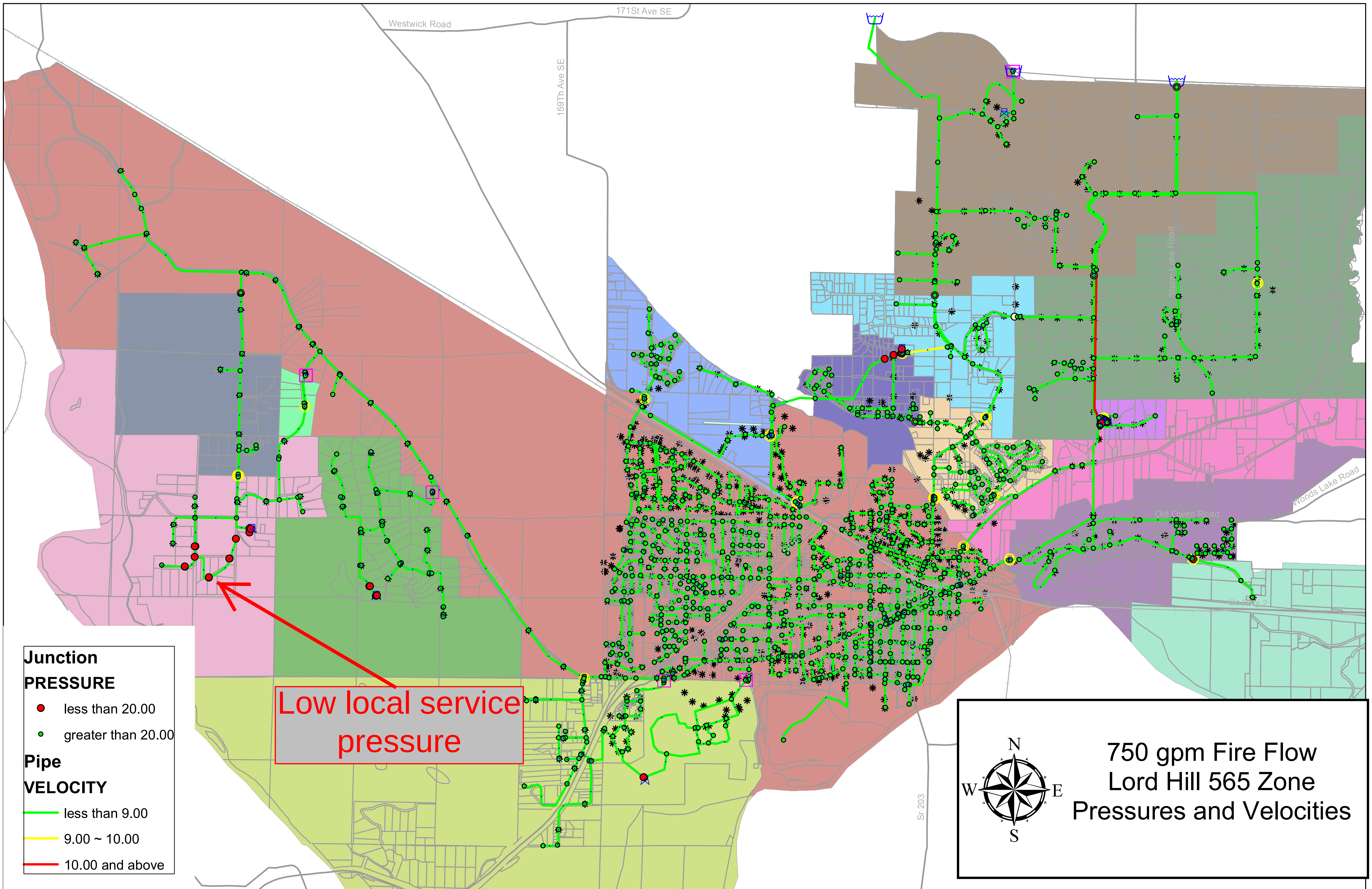


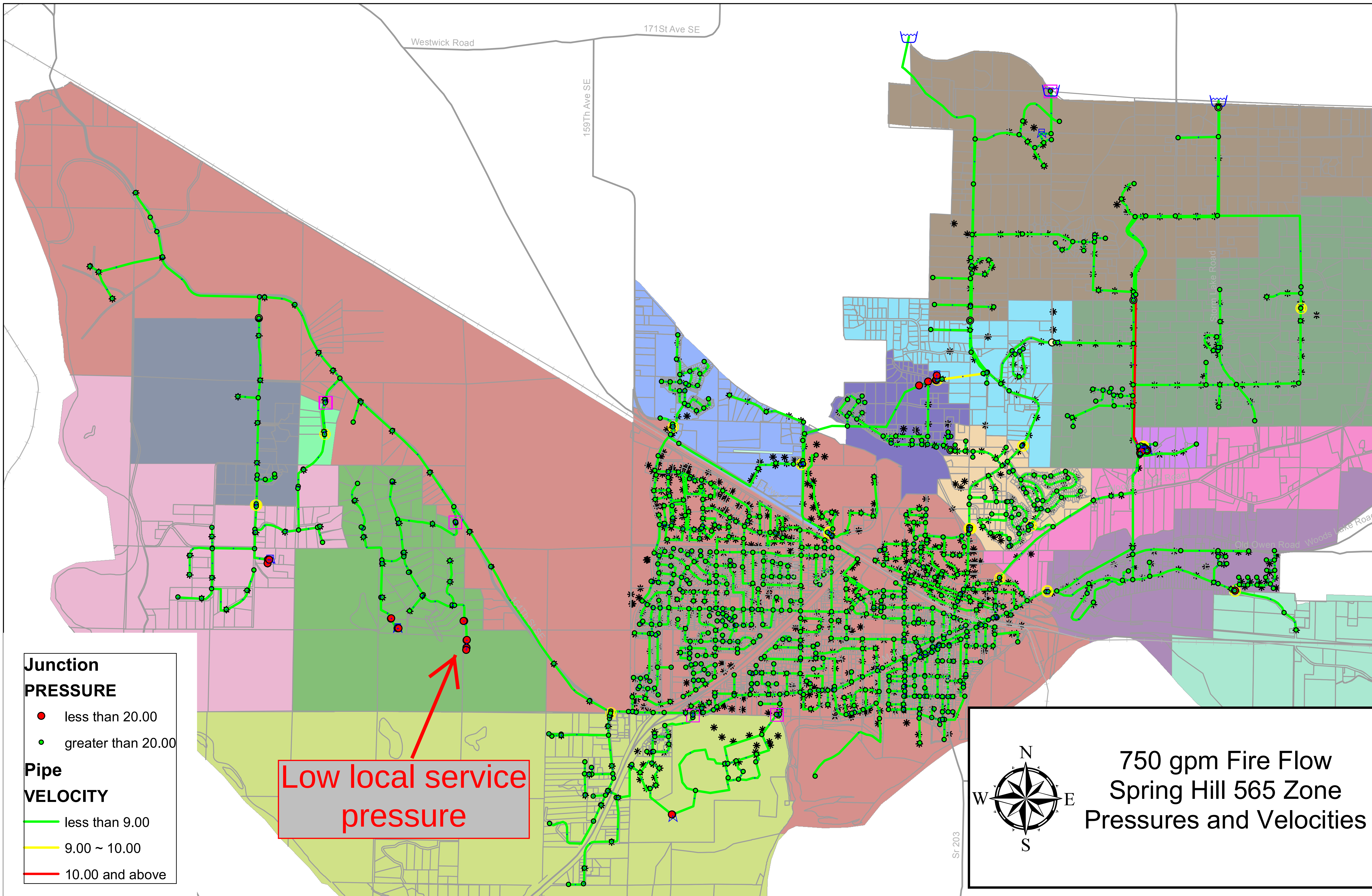
Low transmission main pressure; no service
Westwick Road
171St Ave SE
North Hill 635
Wagner 517
Chain Lake 517
Airport/Foothills 430
Trombley 458
Trombley 458
Ingraham 389
Woods Creek 316
The Farm
Lord Hill 350
Lord Hill 260
Downtown 298
Spring Hill 565
Riverpoint/Calhoun 350
Old Owen Road
Sofie Road 310
DOC 330
Sr 203
Junction
PRESSURE
< 25.00 psi
25.00 ~ 30.00 psi
30.00 ~ 40.00 psi
40.00 ~ 80.00 psi
80.00 ~ 100.00 psi
> 100 psi
Pipe
VELOCITY
less than 9.00
9.00 ~ 10.00
10.00 and above
N
W
E
S
2021 PHD Scenario
Adjusted PRV Settings
Pressures and Velocities


Westwick Road
171St Ave SE
159Th Ave SE
North Hill 635
Wagner 517
Chain Lake 517
Airport/Foothills 430
Trombley 458
Trombley 458
Ingraham 389
The Farm
Woods Creek 316
Old Owen Road
Riverview/Calhoun 350
Sofie Road 310
Lord Hill 350
Lord Hill 260
Downtown 298
Hill 565
Spring Hill 565
DOC 330
Elliott Road
Sr 203
Junction
PRESSURE
< 25.00 psi
25.00 ~ 30.00 psi
30.00 ~ 40.00 psi
40.00 ~ 80.00 psi
80.00 ~ 100.00 psi
> 100 psi
Pipe
VELOCITY
less than 9.00
9.00 ~ 10.00
10.00 and above
N
W
E
S
2035 PHD Scenario
Adjusted PRV Settings
Pressures and Velocities

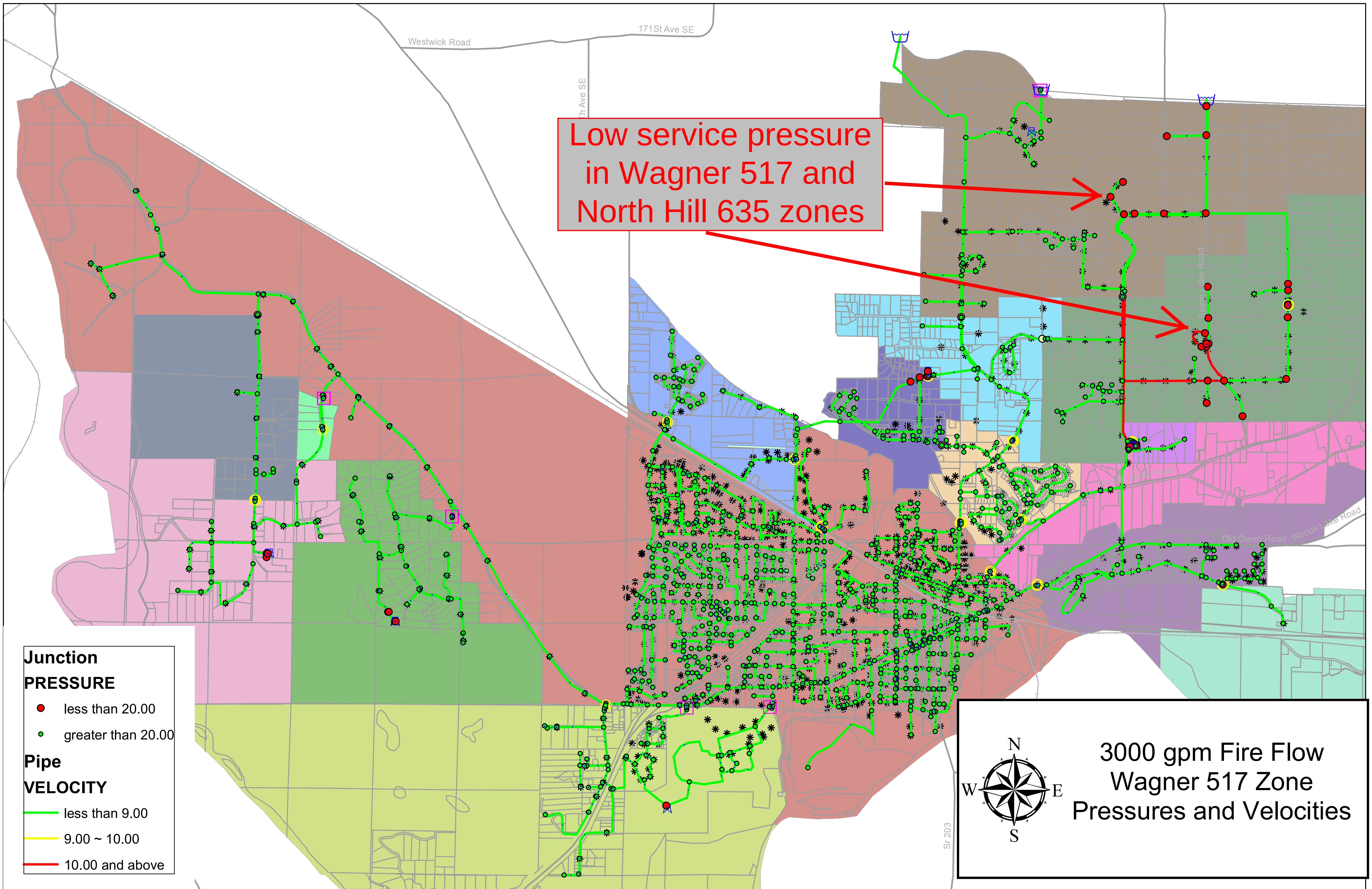

Westwick Road
171St Ave SE
159Th Ave SE
North Hill 635
Wagner 517
Chain Lake 517
Airport/Foothills 480
Trombley 458
Trombley 458
Lord Hill 350
Lord Hill 260
Downtown 298
Ingraham 389
The Farm
Woods Creek 316
Old Owen Road
Woods Lake Road
Riverpoint/Calhoun 350
Lord Hill 565
Spring Hill 565
Sofie Road 310
Storm Lake Road
Woods Creek Road
Sr 203
DOC 330
Low service pressure
Junction
PRESSURE
less than 20.00
greater than 20.00
Pipe
VELOCITY
less than 9.00
9.00 ~ 10.00
10.00 and above
N
W
E
S
500 gpm Fire Flow
DOC 330 Zone
Pressures and Velocities

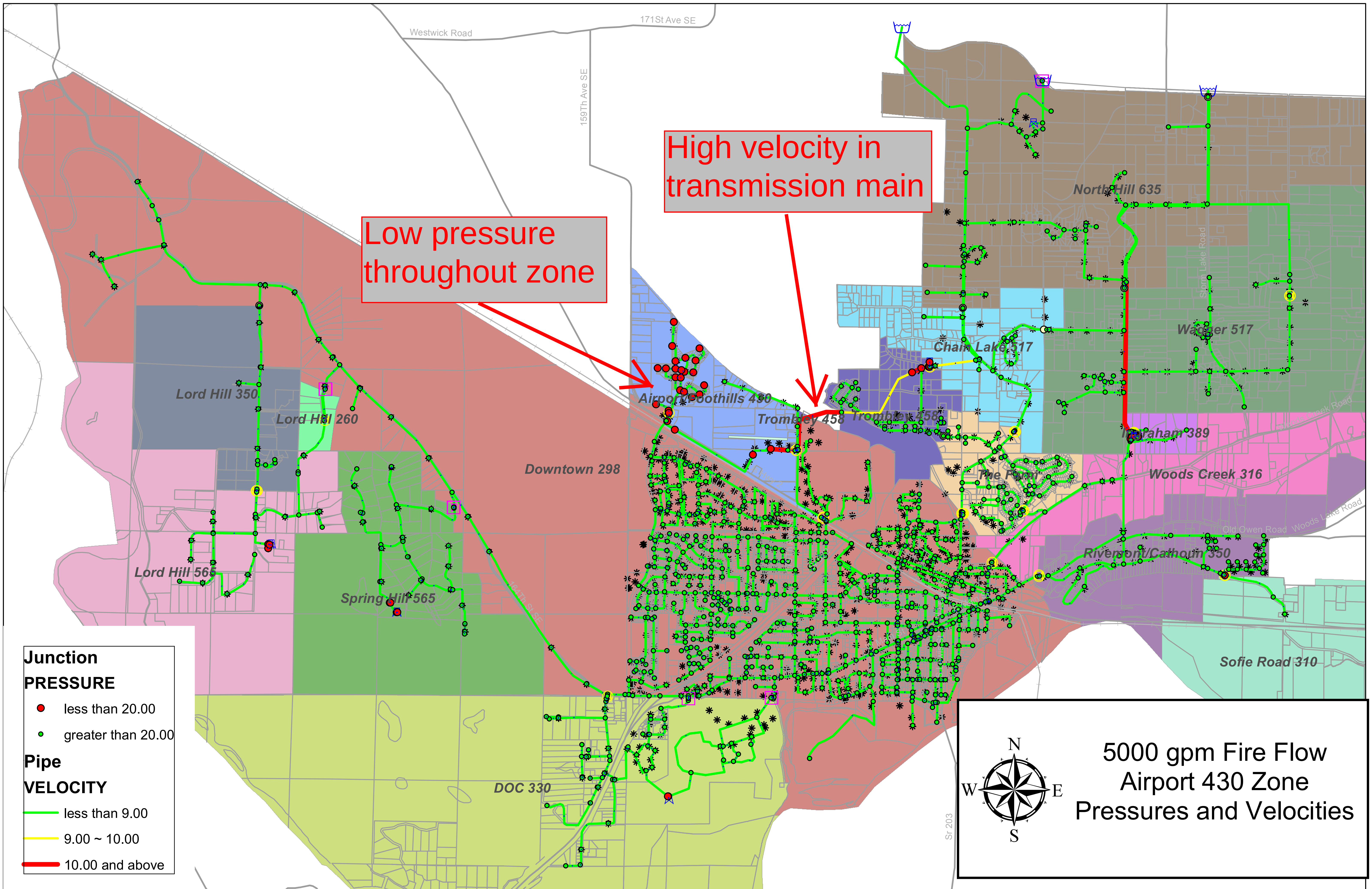

Low local service pressure
Westwick Road
171St Ave SE
159Th Ave SE
Old Owen Road
Woods Lake Road
Sr 203
Junction
PRESSURE
less than 20.00
greater than 20.00
Pipe
VELOCITY
less than 9.00
9.00 ~ 10.00
10.00 and above
N
W
E
S
500 gpm Fire Flow
Rivemont 330 Zone
Pressures and Velocities


Westwick Road
171St Ave SE
159Th Ave SE
Storm Lake Road
Woods Lake Road
Old Owen Road
Sr 203
Junction
PRESSURE
less than 20.00
greater than 20.00
Pipe
VELOCITY
less than 9.00
9.00 ~ 10.00
10.00 and above
Low local service pressure
N
S
E
W
750 gpm Fire Flow
Lord Hill 565 Zone
Pressures and Velocities

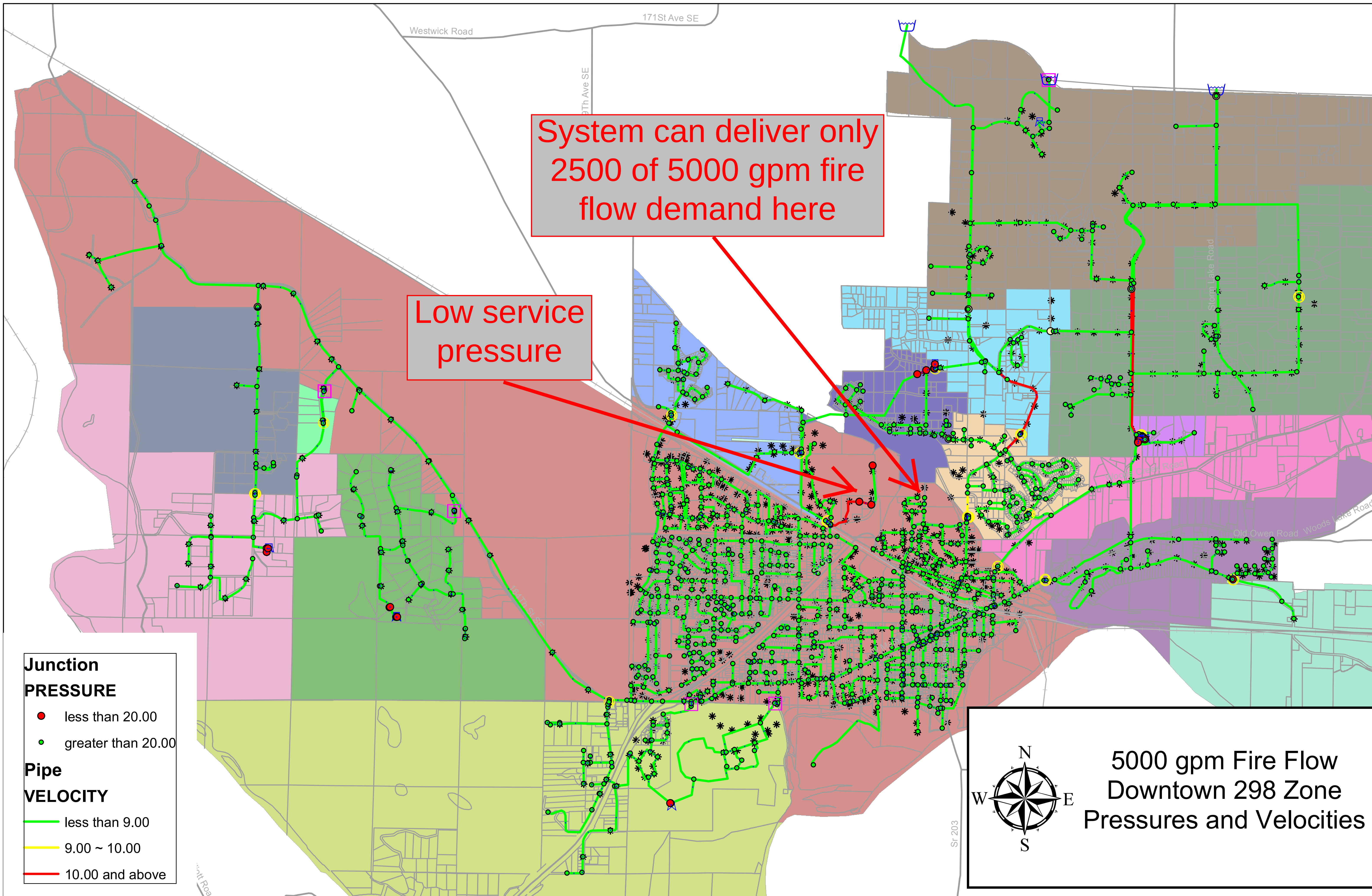


Westwick Road
171St Ave SE
159Th Ave SE
Old Owen Road
Woods Lake Road
Sr 203
Junction
PRESSURE
less than 20.00
greater than 20.00
Pipe
VELOCITY
less than 9.00
9.00 ~ 10.00
10.00 and above
Low local service pressure
N
W
E
S
750 gpm Fire Flow
Spring Hill 565 Zone
Pressures and Velocities

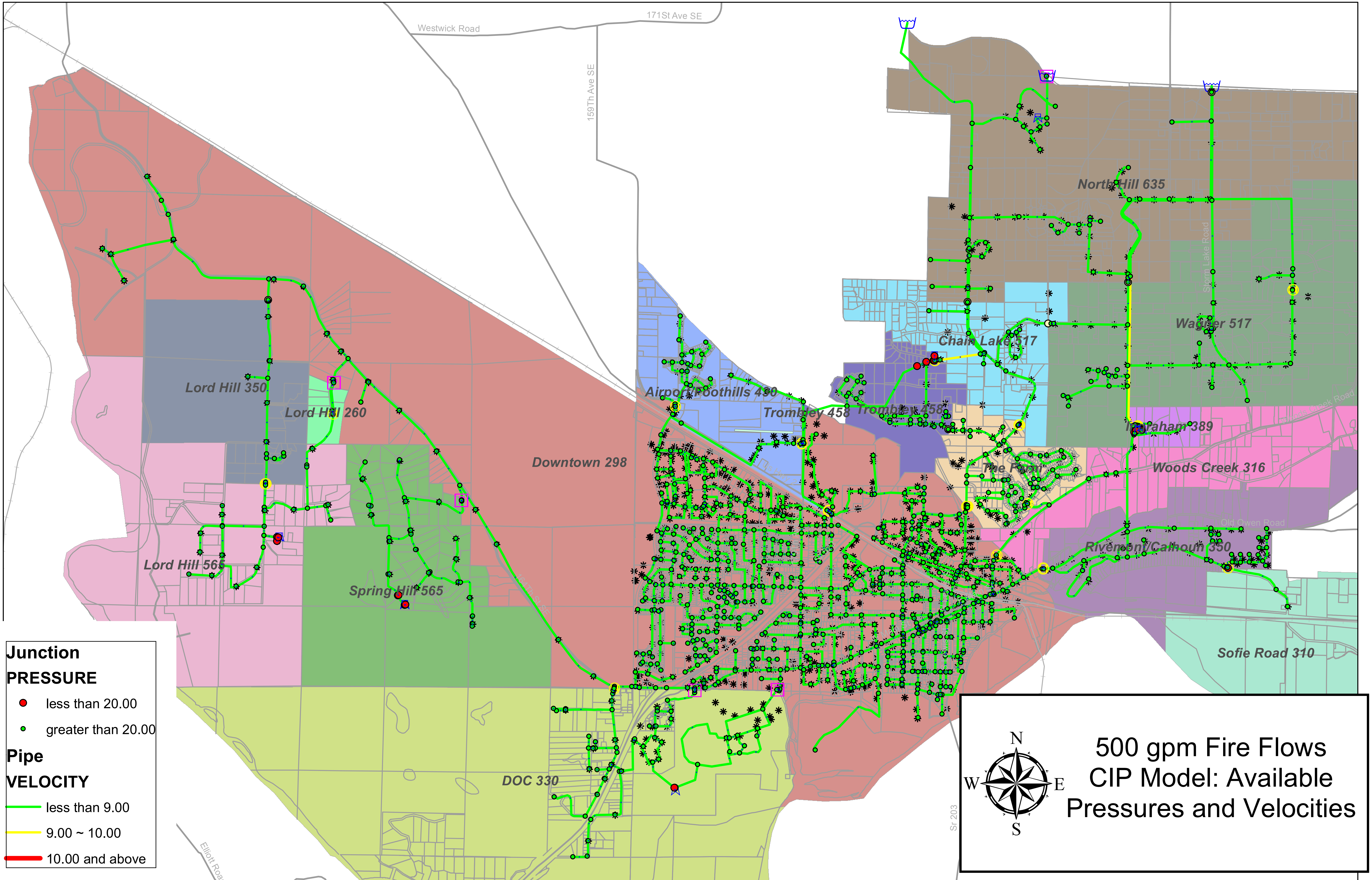

Low service pressure in Wagner 517 and North Hill 635 zones
Westwick Road
171St Ave SE
Old Owen Road
Woods Lake Road
Sr 203
Junction
PRESSURE
less than 20.00
greater than 20.00
Pipe
VELOCITY
less than 9.00
9.00 ~ 10.00
10.00 and above
N
S
E
W
3000 gpm Fire Flow
Wagner 517 Zone
Pressures and Velocities



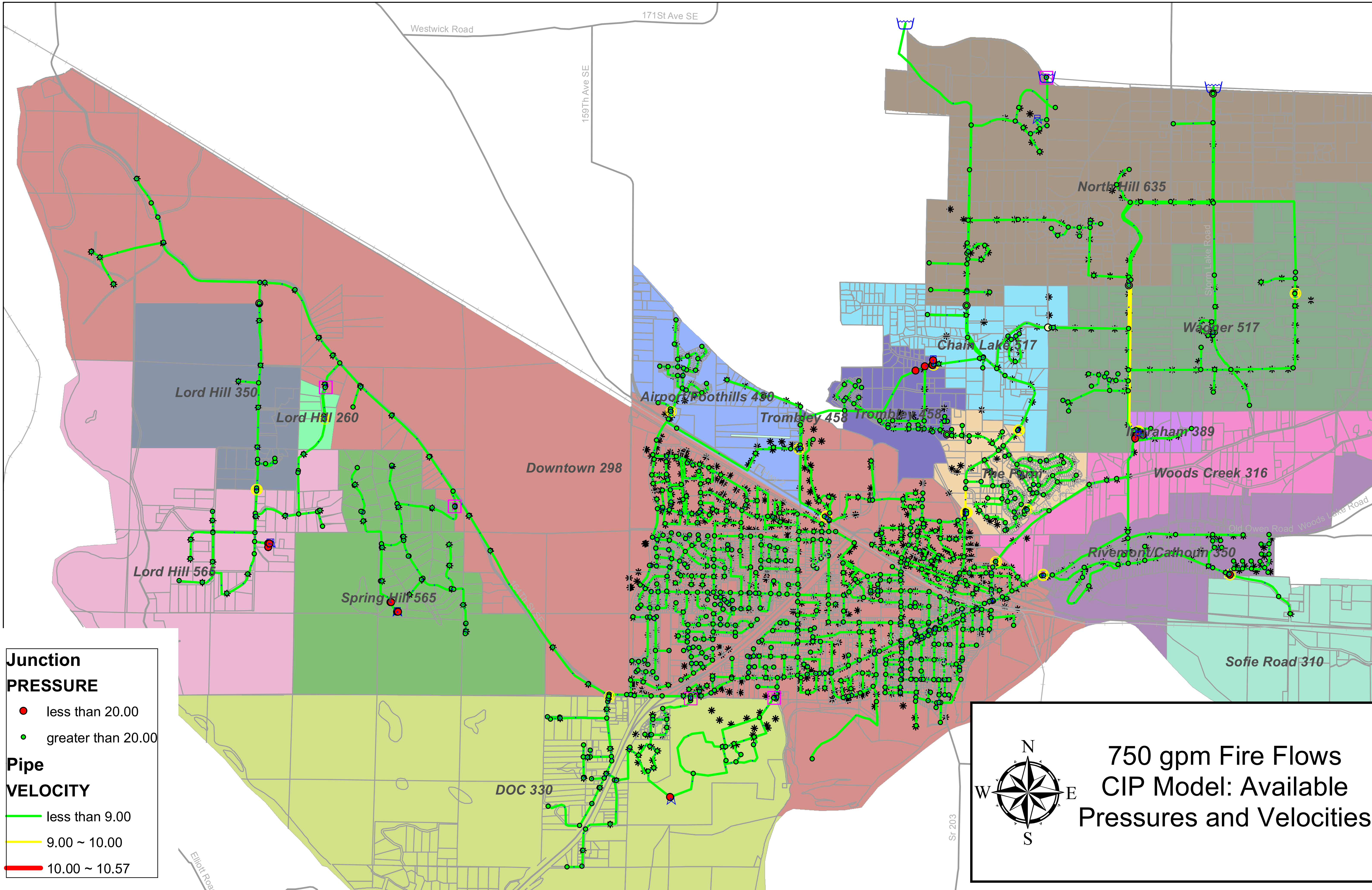
High velocity in transmission main
Low pressure throughout zone
Westwick Road
171St Ave SE
159Th Ave SE
North Hill 635
Wagner 517
Chain Lake 517
Lord Hill 350
Lord Hill 260
Airport Foothills 490
Tromley 458
Downtown 298
Graham 389
Woods Creek 316
The Farm
Rivmont/Cathoun 350
Lord Hill 565
Spring Hill 565
Sofie Road 310
DOC 330
Storm Lake Road
Old Owen Road
Woods Lake Road
Sr 203
Junction
PRESSURE
less than 20.00
greater than 20.00
Pipe
VELOCITY
less than 9.00
9.00 ~ 10.00
10.00 and above
N
W
E
S
5000 gpm Fire Flow
Airport 430 Zone
Pressures and Velocities



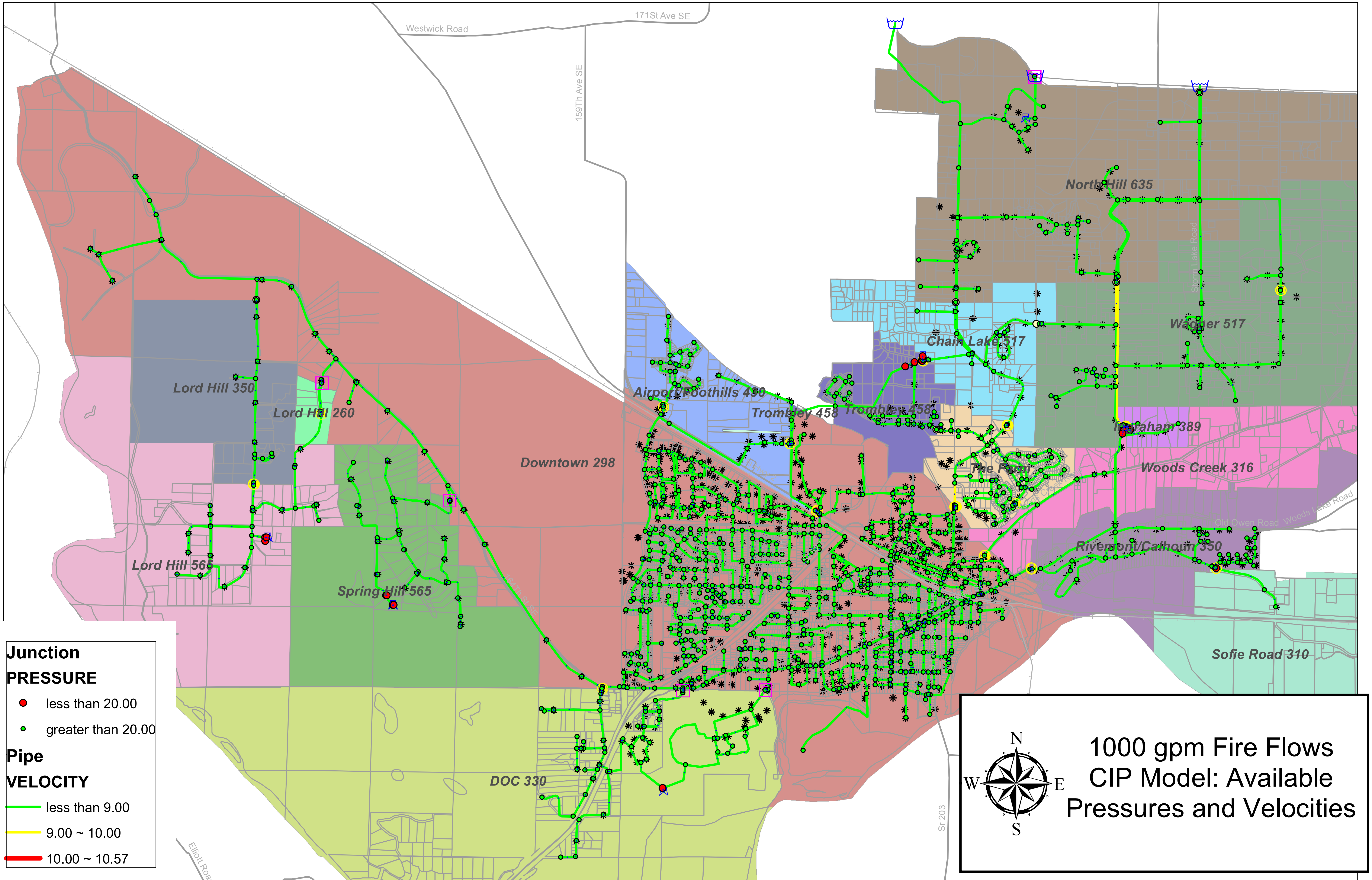
Westwick Road
171St Ave SE
System can deliver only 2500 of 5000 gpm fire flow demand here
Low service pressure
Old Owen Road
Woods Lake Road
Sr 203
Junction
PRESSURE
less than 20.00
greater than 20.00
Pipe
VELOCITY
less than 9.00
9.00 ~ 10.00
10.00 and above
N
S
E
W
5000 gpm Fire Flow
Downtown 298 Zone
Pressures and Velocities



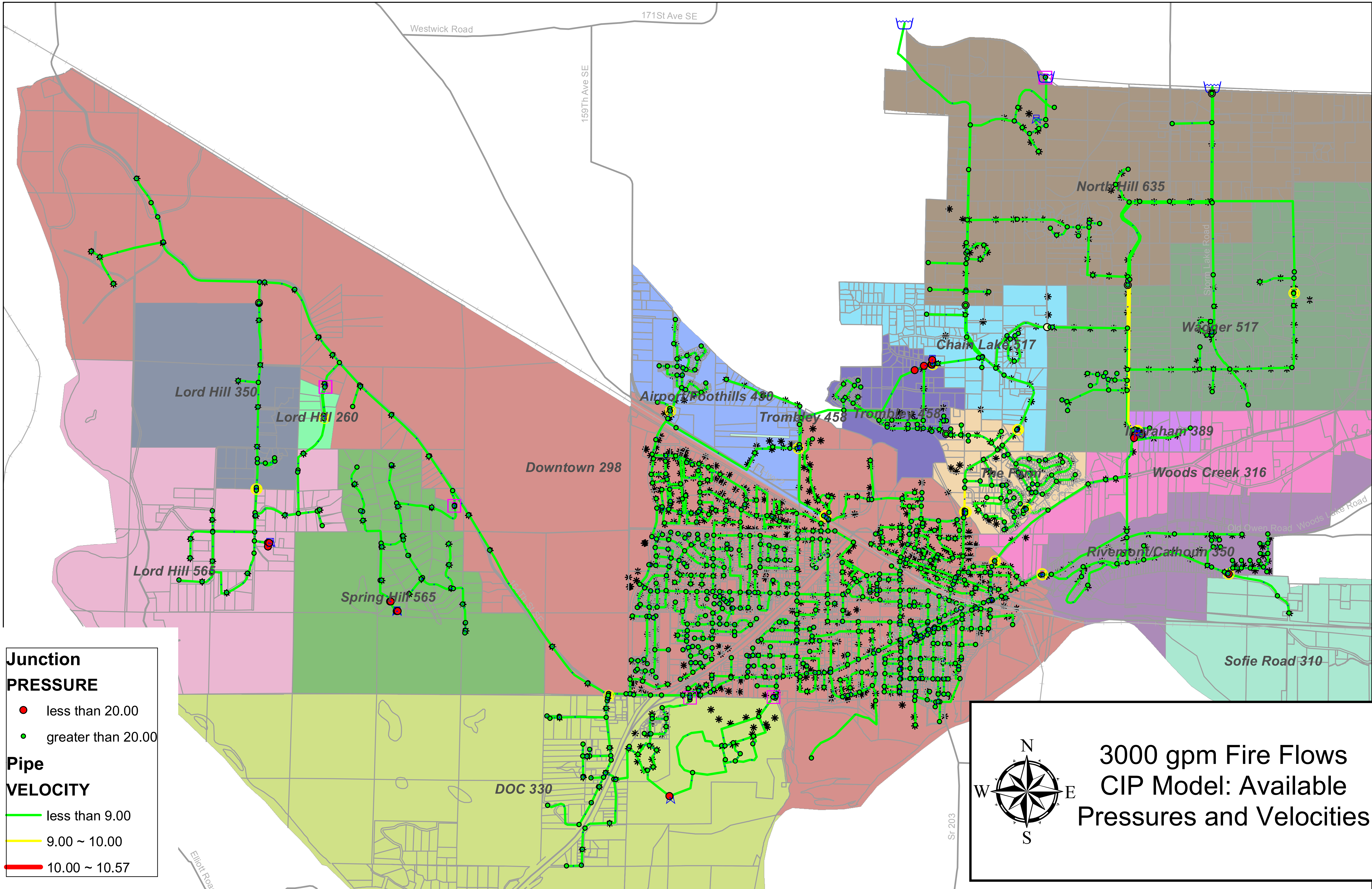
Westwick Road
171St Ave SE
159Th Ave SE
North Hill 635
Wagner 517
Chain Lake 517
Airport/Foothills 490
Trombley 458
Lord Hill 350
Lord Hill 260
Downtown 298
Tjerne Place 389
Woods Creek 316
The Farm
Lord Hill 565
Spring Hill 565
Rivermont/Calhoun 350
Old Owen Road
Sofie Road 310
DOC 330
Elliott Road
Sr 203
Junction
PRESSURE
less than 20.00
greater than 20.00
Pipe
VELOCITY
less than 9.00
9.00 ~ 10.00
10.00 and above
N
W
E
S
500 gpm Fire Flows
CIP Model: Available
Pressures and Velocities

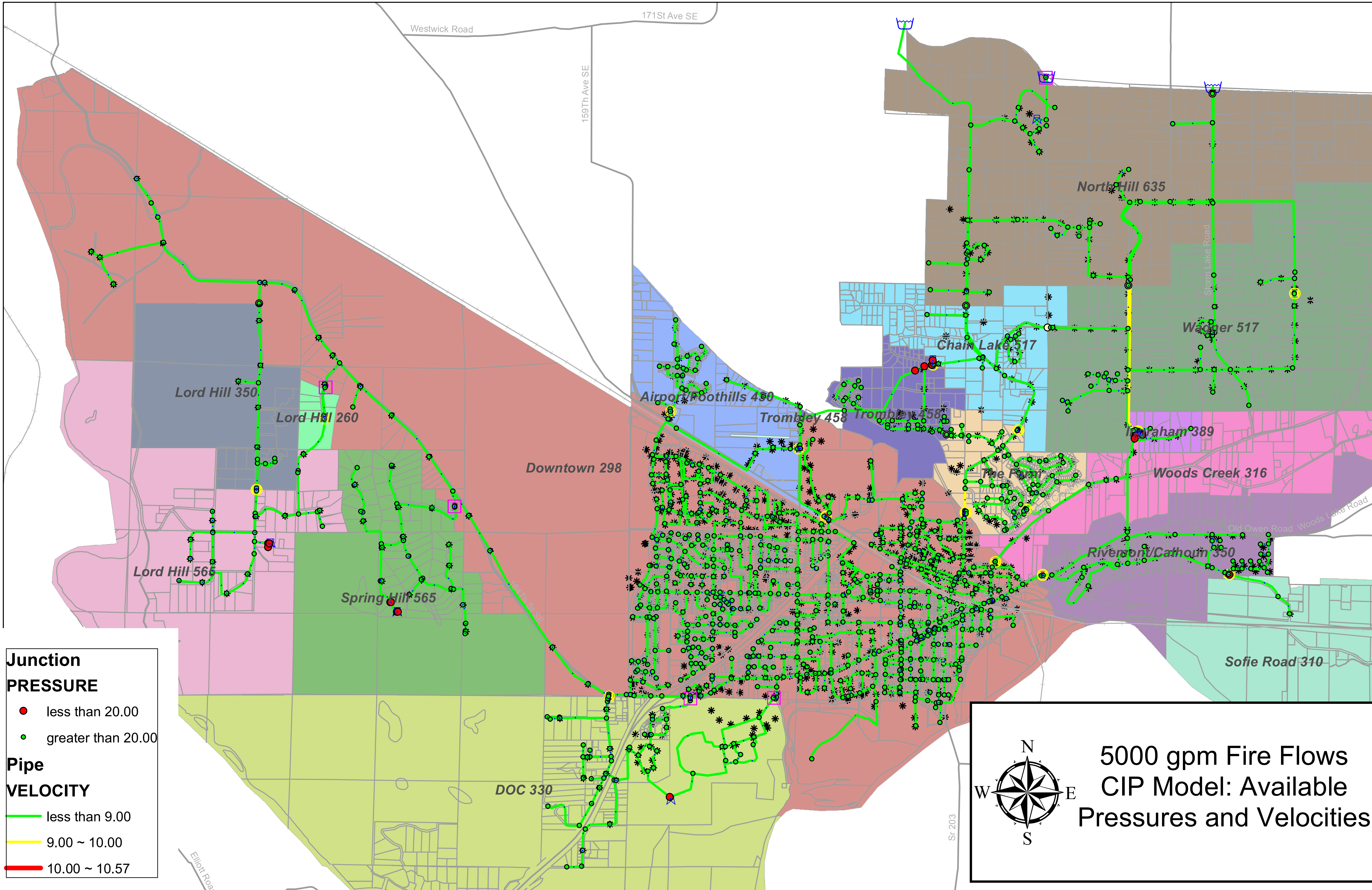


750 gpm Fire Flows
CIP Model: Available
Pressures and Velocities
Junction
PRESSURE
less than 20.00
greater than 20.00
Pipe
VELOCITY
less than 9.00
9.00 ~ 10.00
10.00 ~ 10.57
N
S
E
W
North Hill 635
Wagner 517
Chain Lake 517
Airport/Foothills 430
Trombley 458
Trombley 458
Ingraham 389
Woods Creek 316
The Farm
Riverpoint/Calhoun 350
Sofie Road 310
Downtown 298
Lord Hill 350
Lord Hill 260
Lord Hill 565
Spring Hill 565
DOC 330
Westwick Road
171St Ave SE
159Th Ave SE
Storm Lake Road
Old Owen Road
Woods Lake Road
Sr 203
Elliott Road



1000 gpm Fire Flows
CIP Model: Available
Pressures and Velocities
Junction
PRESSURE
less than 20.00
greater than 20.00
Pipe
VELOCITY
less than 9.00
9.00 ~ 10.00
10.00 ~ 10.57
N
S
E
W
Westwick Road
171St Ave SE
159Th Ave SE
North Hill 635
Wagner 517
Chain Lake 517
Airport/Foothills 450
Trombley 458
Lord Hill 350
Lord Hill 260
Downtown 298
Ingraham 389
Woods Creek 316
The Farm
Lord Hill 565
Spring Hill 565
Rivermont/Calhoun 350
Sofie Road 310
DOC 330
Old Owen Road
Woods Lake Road
Storm Lake Road
Sr 203
Elliott Road


Westwick Road
171St Ave SE
159Th Ave SE
North Hill 635
Wagner 517
Chain Lake 517
Airport/Foothills 430
Trombley 458
Trombley 458
Ingraham 389
Lord Hill 350
Lord Hill 260
Downtown 298
The Farm
Woods Creek 316
Old Owen Road
Woods Lake Road
Rivermont/Calhoun 350
Lord Hill 565
Spring Hill 565
Sofie Road 310
DOC 330
Elliott Road
Sr 203
Storm Lake Road
Junction
PRESSURE
less than 20.00
greater than 20.00
Pipe
VELOCITY
less than 9.00
9.00 ~ 10.00
10.00 ~ 10.57
N
S
E
W
3000 gpm Fire Flows
CIP Model: Available
Pressures and Velocities



5000 gpm Fire Flows
CIP Model: Available
Pressures and Velocities
N
S
E
W
Junction
PRESSURE
less than 20.00
greater than 20.00
Pipe
VELOCITY
less than 9.00
9.00 ~ 10.00
10.00 ~ 10.57
Westwick Road
171St Ave SE
159Th Ave SE
North Hill 635
Wagner 517
Chain Lake 517
Airport/Foothills 430
Trombley 458
Lord Hill 350
Lord Hill 260
Lord Hill 565
Spring Hill 565
Downtown 298
Ingraham 389
The Farm
Woods Creek 316
Rivermont/Calhoun 350
Sofie Road 310
DOC 330
Old Owen Road
Woods Lake Road
Storm Lake Road
Elliott Road
Sr 203

Appendix W-M

Laboratory Certification

The State of Washington
Department of Ecology

Monroe Water Quality Laboratory
Monroe, WA

has complied with provisions set forth in Chapter 173-50 WAC and is hereby recognized by the Department of Ecology as an ACCREDITED LABORATORY for the analytical parameters listed on the accompanying Scope of Accreditation. This certificate is effective March 1, 2014 and shall expire February 28, 2015.

Witnessed under my hand on March 4, 2014

Alan D. Rue
Lab Accreditation Unit Supervisor

Laboratory ID
W749

<u>Appendix W-N</u>

Opinions of Probable Project Costs

CIP Project No. W-1
DOC Tank
750,000 gallons

Construction Cost	$	1,853,000
Project Cost Markup:		
30% Design & SDC	$	555,900
30% Contingency	$	555,900
Total Project Cost	$	2,964,800
USE	$	3,000,000

ITEM NO.	BID ITEM	APPROX. QUANTITY	UNITS	Planning Estimate Covington 2011 UNIT PRICE	Planning Estimate TOTAL AMOUNT
1	Minor Change	1	EST	$ 15,000.00	$ 15,000
2	Final Cleanup and Restoration	1	LUMP SUM	$ 5,000.00	$ 5,000
3	SPCC Plan	1	LUMP SUM	$ 1,000.00	$ 1,000
4	Type B Progress Schedule	1	LUMP SUM	$ 1,500.00	$ 1,500
5	Mobilization	0	LUMP SUM	$ 5,000.00	$ -
6	Project Temporary Traffic Control	1	LUMP SUM	$ 4,000.00	$ 4,000
7	Clearing, Grubbing, and Grading	1	LUMP SUM	$ 82,500.00	$ 82,500
8	Tank 2A Removal of Structure	0	LUMP SUM	$ 35,000.00	$ -
9	Pipe Abandonment	0	LUMP SUM	$ 4,000.00	$ -
10	Controlled Density Fill		CY	$ 400.00	$ -
11	Conc. Class 2500		CY	$ 400.00	$ -
12	St. Reinf. Bar	0	POUND	$ 1.00	$ -
13	Cleaning and Painting, Tank 2B	0	LUMP SUM	$ 585,000.00	$ -
14	Flow Meter Valve Vault	1	LUMP SUM	$ 15,000.00	$ 15,000
15	Altitude Valve Vault	1	LUMP SUM	$ 60,000.00	$ 60,000
16	Dechlorination Facility	1	LUMP SUM	$ 20,000.00	$ 20,000
17	High Security Access Enclosure	1	LUMP SUM	$ 15,000.00	$ 15,000
18	Sedimentation Pond	0	LUMP SUM	$ 65,000.00	$ -
19	Plug Existing Pipe	0	EACH	$ 500.00	$ -
20	Trench Safety System	1	LUMP SUM	$ 500.00	$ 500
21	Ductile Iron Pipe for Water Main 6 In. Diam.	12	LINEAR FOOT	$ 375.00	$ 4,500
22	Ductile Iron Pipe for Water Main 8 In. Diam.[1]	20	LINEAR FOOT	$ 225.00	$ 4,500
23	Ductile Iron Pipe for Water Main 12 In. Diam.	110	LINEAR FOOT	$ 265.00	$ 29,150
24	6-inch Gate Valve	2	EACH	$ 1,300.00	$ 2,600
25	8-inch Gate Valve	1	EACH	$ 1,200.00	$ 1,200
26	12-inch Gate Valve[2]	7	EACH	$ 2,400.00	$ 16,800
27	Altitude Valve 12-In.	1	EACH	$ 13,000.00	$ 13,000
28	Double-Ball Coupling – 12-In.	1	EACH	$ 8,000.00	$ 8,000
29	Stabilized Construction Entrance and Access Road	1	LUMP SUM	$ 60,000.00	$ 60,000
30	Street Cleaning	1	LUMP SUM	$ 2,500.00	$ 2,500
31	High Visibility Fence	575	LINEAR FOOT	$ 4.50	$ 2,588
32	Seeding, Fertilizing, and Mulching	1.8	ACRE	$ 1,200.00	$ 2,160
33	Temporary Fencing	1	LUMP SUM	$ 20,000.00	$ 20,000
34	Chain Link Security Perimeter Fence and Gate	1	LUMP SUM	$ 32,000.00	$ 32,000
35	Cathodic Protection System	0	LUMP SUM	$ 16,000.00	$ -
36	Electrical Improvements	1	LUMP SUM	$ 80,000.00	$ 80,000
37	Instrumentation and Control Improvements for Water Utilities	1	LUMP SUM	$ 80,000.00	$ 80,000
38	24-inch Shell Manway	1	EACH	$ 35,000.00	$ 35,000
39	42-inch Shell Manway	1	EACH	$ 50,000.00	$ 50,000
40	Reservoir Mixing System	1	LUMP SUM	$ 45,000.00	$ 45,000
41	Tank 2B Structure Changes	0	LUMP SUM	$ 970,000.00	$ -
	Subtotal applicable items from 2011 bid tab				$ 708,498
	Escalation @ 4 years at 1.5%				$ 43,218
	Latest estimate by T. Bailey for Monroe				$ 950,000

Subtotal	$ 1,701,715.85
Washington State Sales Tax (8.90%)	$ 151,452.71
Total Estimate	$ 1,853,168.56

Cost per gallon at 750,000 gal $ 2.47

City of Monroe Water Comp Plan Update CIP
CIP W-47
New 8" North Hill service line and PRV station

Engineer's Opinion of Probable Project Cost
Date **February 2015**

Item No.	Description	Quantity	Unit	Unit Price	Cost
1	8-In, DI Water Main, Valves, & Appurtenances	4,830	LF	$80.00	$386,400.00
2	10-In, DI Water Main, Valves, & Appurtenances	0	LF	$95.00	$0.00
3	12-In, DI Water Main, Valves, & Appurtenances	0	LF	$90.00	$0.00
4	14-In, DI Water Main, Valves, & Appurtenances	0	LF	$112.00	$0.00
5	16-In, DI Water Main, Valves, & Appurtenances	0	LF	$116.00	$0.00
6	Tie-In(s) to Existing System/Tapping Sleeve and Valve Assembly	2	EA	$4,000.00	$8,000.00
7	Combination Air Release/Air Vacuum Valve Assembly, 1-In.	1	EA	$3,000.00	$3,000.00
8	Blow Off Assembly	1	EA	$2,500.00	$2,500.00
9	Hydrant Assembly	6	EA	$5,000.00	$30,000.00
10	Replace/Reconnect Ex Water Service	15	EA	$2,500.00	$37,500.00
11	Import Trench Backfill (CSTC)	920	TN	$24.00	$22,080.00
12	Controlled Density Fill	0	CY	$125.00	$0.00
13	Trench Safety System	4,830	LF	$3.00	$14,490.00
14	Removal and Replacement of Unsuitable Foundation Mtl	30	TN	$40.00	$1,200.00
15	Sawcutting Pavement	9,660	LF	$2.00	$19,320.00
16	Remove AC Pavement	1,970	SY	$20.00	$39,400.00
18	HMA for Pavement Repair	1,570	TN	$130.00	$204,100.00
19	Existing Side Sewer Relocation	15	EA	$1,500.00	$22,500.00
20	Ex Monument Removal & Restoration	5	EA	$800.00	$4,000.00
21	Pavement Markings	4,830	LF	$3.00	$14,490.00
22	Pavement Grinding	9,839	SY	$2.00	$19,677.78
	Subtotal				$828,657.78
	Mobilization (10%)				$82,870.00
	Removal of Structures & Obstructions (1%)				$8,290.00
	Temporary Erosion & Sediment Control (2%)				$16,570.00
	Utility Relocation (2%)				$16,570.00
	Traffic Control (2%)				$16,570.00
	Cleanup/General Restoration (2%)				$16,570.00
	Subtotal				$986,097.78
	Contingency (30%)				$295,829.33
	Subtotal				$1,281,927.11
	State Sales Tax (9.5%)				$114,092.00
	Construction Total				**$1,396,019.11**
	Easements				$0.00
	Permitting				$8,000.00
	Survey (4%)				$55,800.00
	Engineering - Design & Construction (30% of Construction)				$418,800.00
	Subtotal				**$482,600.00**
	Estimated Project Cost				$1,878,619.11
	Rounded Total				**$1,879,000.00**

City of Monroe Water Comp Plan Update CIP
CIP W-5
Transmission Main Replacement along Chain Lake Rd

Engineer's Opinion of Probable Project Cost
Date **February 2015**

Item No.	Description	Quantity	Unit	Unit Price	Cost
1	8-In, DI Water Main, Valves, & Appurtenances	0	LF	$88.00	$0.00
2	10-In, DI Water Main, Valves, & Appurtenances	0	LF	$105.00	$0.00
3	12-In, DI Water Main, Valves, & Appurtenances	3,972	LF	$99.00	$393,228.00
4	14-In, DI Water Main, Valves, & Appurtenances	0	LF	$123.00	$0.00
5	16-In, DI Water Main, Valves, & Appurtenances	0	LF	$128.00	$0.00
6	Tie-In(s) to Existing System/Tapping Sleeve and Valve Assembly	2	EA	$4,000.00	$8,000.00
7	Combination Air Release/Air Vacuum Valve Assembly, 1-In.	1	EA	$3,000.00	$3,000.00
8	Blow Off Assembly	1	EA	$2,500.00	$2,500.00
9	Hydrant Assembly	0	EA	$5,000.00	$0.00
10	Replace/Reconnect Ex Water Service	15	EA	$2,500.00	$37,500.00
11	Import Trench Backfill (CSTC)	1,130	TN	$24.00	$27,120.00
12	Controlled Density Fill	0	CY	$125.00	$0.00
13	Trench Safety System	3,970	LF	$3.00	$11,910.00
14	Removal and Replacement of Unsuitable Foundation Mtl	30	TN	$40.00	$1,200.00
15	Sawcutting Pavement	7,940	LF	$2.00	$15,880.00
16	Remove AC Pavement	1,990	SY	$20.00	$39,800.00
18	HMA for Pavement Repair	1,330	TN	$130.00	$172,900.00
19	Existing Side Sewer Relocation	15	EA	$1,500.00	$22,500.00
20	Ex Monument Removal & Restoration	4	EA	$800.00	$3,200.00
21	Pavement Markings	3,972	LF	$3.00	$11,916.00
22	Pavement Grinding	7,723	SY	$2.00	$15,446.67
	Subtotal				$766,100.67
	Mobilization (10%)				$76,610.00
	Removal of Structures & Obstructions (1%)				$7,660.00
	Temporary Erosion & Sediment Control (2%)				$15,320.00
	Utility Relocation (2%)				$15,320.00
	Traffic Control (2%)				$15,320.00
	Cleanup/General Restoration (2%)				$15,320.00
	Subtotal				$911,650.67
	Contingency (30%)				$273,495.20
	Subtotal				$1,185,145.87
	State Sales Tax (8.9%)				$105,478.00
	Construction Total				**$1,290,623.87**
	Easements				$0.00
	Permitting				$8,000.00
	Survey (4%)				$51,600.00
	Engineering - Design & Construction (30% of Construction)				$387,200.00
	Subtotal				**$446,800.00**
	Estimated Project Cost				$1,737,423.87
	Rounded Total				**$1,737,000.00**

City of Monroe Water Comp Plan Update CIP
CIP W-6
Existing 6" Pipe Replacement Along Tester Rd/Crossing HWY 522

Engineer's Opinion of Probable Project Cost
Date **February 2015**

Item No.	Description	Quantity	Unit	Unit Price	Cost
1	8-In, DI Water Main, Valves, & Appurtenances	0	LF	$80.00	$0.00
2	10-In, DI Water Main, Valves, & Appurtenances	1,820	LF	$95.00	$172,900.00
3	12-In, DI Water Main, Valves, & Appurtenances	0	LF	$90.00	$0.00
4	14-In, DI Water Main, Valves, & Appurtenances	0	LF	$112.00	$0.00
5	16-In, DI Water Main, Valves, & Appurtenances	0	LF	$116.00	$0.00
6	10-In, Ductile Iron Jack and Bore	370	LF	$500.00	$185,000.00
7	Tie-In(s) to Existing System/Tapping Sleeve and Valve Assembly	2	EA	$4,000.00	$8,000.00
8	Combination Air Release/Air Vacuum Valve Assembly, 1-In.	0	EA	$3,000.00	$0.00
9	Blow Off Assembly	0	EA	$2,500.00	$0.00
10	Hydrant Assembly	0	EA	$5,000.00	$0.00
11	Replace/Reconnect Ex Water Service	5	EA	$2,500.00	$12,500.00
12	Import Trench Backfill (CSTC)	550	TN	$24.00	$13,200.00
13	Controlled Density Fill	0	CY	$125.00	$0.00
14	Trench Safety System	1,820	LF	$3.00	$5,460.00
15	Removal and Replacement of Unsuitable Foundation Mtl	20	TN	$40.00	$800.00
16	Sawcutting Pavement	2,890	LF	$2.00	$5,780.00
17	Remove AC Pavement	860	SY	$20.00	$17,200.00
18	HMA for Pavement Repair	500	TN	$130.00	$65,000.00
19	Existing Side Sewer Relocation	5	EA	$1,500.00	$7,500.00
20	Ex Monument Removal & Restoration	0	EA	$800.00	$0.00
21	Pavement Markings	1,815	LF	$3.00	$5,445.00
22	Pavement Grinding	2,676	SY	$2.00	$5,351.85
	Subtotal				$504,136.85
	Mobilization (10%)				$50,410.00
	Removal of Structures & Obstructions (1%)				$5,040.00
	Temporary Erosion & Sediment Control (2%)				$10,080.00
	Utility Relocation (2%)				$10,080.00
	Traffic Control (2%)				$10,080.00
	Cleanup/General Restoration (2%)				$10,080.00
	Subtotal				$599,906.85
	Contingency (30%)				$179,972.06
	Subtotal				$779,878.91
	State Sales Tax (8.9%)				$69,409.00
	Construction Total				**$849,287.91**
	Easements				$0.00
	Permitting				$8,000.00
	Survey (4%)				$34,000.00
	Engineering - Design & Construction (30% of Construction)				$254,800.00
	Subtotal				**$296,800.00**
	Estimated Project Cost				$1,146,087.91
	Rounded Total				**$1,146,000.00**

City of Monroe Water Comp Plan Update CIP
CIP W-7
12" Pipe Replacement from Trombley Reservoirs to 191st Ave

Engineer's Opinion of Probable Project Cost
Date **February 2015**

Item No.	Description	Quantity	Unit	Unit Price	Cost
1	8-In, DI Water Main, Valves, & Appurtenances	0	LF	$80.00	$0.00
2	10-In, DI Water Main, Valves, & Appurtenances	0	LF	$95.00	$0.00
3	12-In, DI Water Main, Valves, & Appurtenances	0	LF	$90.00	$0.00
4	14-In, DI Water Main, Valves, & Appurtenances	0	LF	$112.00	$0.00
5	16-In, DI Water Main, Valves, & Appurtenances	260	LF	$116.00	$30,160.00
6	Tie-In(s) to Existing System/Tapping Sleeve and Valve Assembly	2	EA	$4,000.00	$8,000.00
7	Combination Air Release/Air Vacuum Valve Assembly, 1-In.	0	EA	$3,000.00	$0.00
8	Blow Off Assembly	0	EA	$2,500.00	$0.00
9	Hydrant Assembly	0	EA	$5,000.00	$0.00
10	Replace/Reconnect Ex Water Service	10	EA	$2,500.00	$25,000.00
11	Import Trench Backfill (CSTC)	120	TN	$24.00	$2,880.00
12	Controlled Density Fill	0	CY	$125.00	$0.00
13	Trench Safety System	260	LF	$3.00	$780.00
14	Removal and Replacement of Unsuitable Foundation Mtl	0	TN	$40.00	$0.00
15	Sawcutting Pavement	520	LF	$2.00	$1,040.00
16	Remove AC Pavement	0	SY	$20.00	$0.00
17	HMA for Pavement Repair	0	TN	$130.00	$0.00
18	Existing Side Sewer Relocation	10	EA	$1,500.00	$15,000.00
19	Ex Monument Removal & Restoration	1	EA	$800.00	$800.00
20	Pavement Markings	260	LF	$3.00	$780.00
21	Pavement Grinding	0	SY	$2.00	$0.00
	Subtotal				$84,440.00
	Mobilization (10%)				$8,440.00
	Removal of Structures & Obstructions (1%)				$840.00
	Temporary Erosion & Sediment Control (2%)				$1,690.00
	Utility Relocation (2%)				$1,690.00
	Traffic Control (2%)				$1,690.00
	Cleanup/General Restoration (2%)				$1,690.00
	Subtotal				$100,480.00
	Contingency (30%)				$30,144.00
	Subtotal				$130,624.00
	State Sales Tax (8.9%)				$11,626.00
	Construction Total				**$142,250.00**
	Easements				$0.00
	Permitting				$8,000.00
	Survey (4%)				$5,700.00
	Engineering - Design & Construction (30% of Construction)				$42,700.00
	Subtotal				**$56,400.00**
	Estimated Project Cost				$198,650.00
	Rounded Total				**$199,000.00**

City of Monroe Water Comp Plan Update CIP
CIP W-8
12" Pipe Replacement from Fairgrounds PRVs Adjacent to Airport

Engineer's Opinion of Probable Project Cost
Date **February 2015**

Item No.	Description	Quantity	Unit	Unit Price	Cost
1	8-In, DI Water Main, Valves, & Appurtenances	0	LF	$80.00	$0.00
2	10-In, DI Water Main, Valves, & Appurtenances	0	LF	$95.00	$0.00
3	12-In, DI Water Main, Valves, & Appurtenances	0	LF	$90.00	$0.00
4	14-In, DI Water Main, Valves, & Appurtenances	0	LF	$112.00	$0.00
5	16-In, DI Water Main, Valves, & Appurtenances	770	LF	$116.00	$89,320.00
6	Tie-In(s) to Existing System/Tapping Sleeve and Valve Assembly	2	EA	$4,000.00	$8,000.00
7	Combination Air Release/Air Vacuum Valve Assembly, 1-In.	1	EA	$3,000.00	$3,000.00
8	Blow Off Assembly	1	EA	$2,500.00	$2,500.00
9	Hydrant Assembly	1	EA	$5,000.00	$5,000.00
10	Replace/Reconnect Ex Water Service	4	EA	$2,500.00	$10,000.00
11	Import Trench Backfill (CSTC)	290	TN	$24.00	$6,960.00
12	Controlled Density Fill	0	CY	$125.00	$0.00
13	Trench Safety System	770	LF	$3.00	$2,310.00
14	Removal and Replacement of Unsuitable Foundation Mtl	10	TN	$40.00	$400.00
15	Sawcutting Pavement	1,550	LF	$2.00	$3,100.00
16	Remove AC Pavement	460	SY	$20.00	$9,200.00
17	HMA for Pavement Repair	270	TN	$130.00	$35,100.00
18	Existing Side Sewer Relocation	4	EA	$1,500.00	$6,000.00
19	Ex Monument Removal & Restoration	1	EA	$800.00	$800.00
20	Pavement Markings	773	LF	$3.00	$2,319.00
21	Pavement Grinding	1,431	SY	$2.00	$2,862.96
	Subtotal				$186,871.96
	Mobilization (10%)				$18,690.00
	Removal of Structures & Obstructions (1%)				$1,870.00
	Temporary Erosion & Sediment Control (2%)				$3,740.00
	Utility Relocation (2%)				$3,740.00
	Traffic Control (2%)				$3,740.00
	Cleanup/General Restoration (2%)				$3,740.00
	Subtotal				$222,391.96
	Contingency (30%)				$66,717.59
	Subtotal				$289,109.55
	State Sales Tax (8.9%)				$25,731.00
	Construction Total				**$314,840.55**
	Easements				$0.00
	Permitting				$8,000.00
	Survey (4%)				$12,600.00
	Engineering - Design & Construction (30% of Construction)				$94,500.00
	Subtotal				**$115,100.00**
	Estimated Project Cost				$429,940.55
	Rounded Total				**$430,000.00**

City of Monroe Water Comp Plan Update CIP
CIP W-9
10" Pipe/PRV Replacement at Fairgrounds PRV Station

Engineer's Opinion of Probable Project Cost
Date **February 2015**

Item No.	Description	Quantity	Unit	Unit Price	Cost
1	8-In, DI Water Main, Valves, & Appurtenances	0	LF	$88.00	$0.00
2	10-In, DI Water Main, Valves, & Appurtenances	0	LF	$105.00	$0.00
3	12-In, DI Water Main, Valves, & Appurtenances	340	LF	$99.00	$33,660.00
4	14-In, DI Water Main, Valves, & Appurtenances	0	LF	$123.00	$0.00
5	16-In, DI Water Main, Valves, & Appurtenances	0	LF	$128.00	$0.00
6	Tie-In(s) to Existing System/Tapping Sleeve and Valve Assembly	2	EA	$4,000.00	$8,000.00
7	Combination Air Release/Air Vacuum Valve Assembly, 1-In.	0	EA	$3,000.00	$0.00
8	Blow Off Assembly	0	EA	$2,500.00	$0.00
9	Hydrant Assembly	0	EA	$5,000.00	$0.00
10	Replace/Reconnect Ex Water Service	0	EA	$2,500.00	$0.00
11	Import Trench Backfill (CSTC)	0	TN	$24.00	$0.00
12	Controlled Density Fill	0	CY	$125.00	$0.00
13	Trench Safety System	340	LF	$3.00	$1,020.00
14	Removal and Replacement of Unsuitable Foundation Mtl	0	TN	$40.00	$0.00
15	Sawcutting Pavement	0	LF	$2.00	$0.00
16	Remove AC Pavement	0	SY	$20.00	$0.00
18	HMA for Pavement Repair	0	TN	$130.00	$0.00
19	Existing Side Sewer Relocation	0	EA	$1,500.00	$0.00
20	Ex Monument Removal & Restoration	2	EA	$800.00	$1,600.00
21	Pavement Markings	335	LF	$3.00	$1,005.00
22	Pavement Grinding	0	SY	$2.00	$0.00
	Subtotal				$45,285.00
	Mobilization (10%)				$4,530.00
	Removal of Structures & Obstructions (1%)				$450.00
	Temporary Erosion & Sediment Control (2%)				$910.00
	Utility Relocation (2%)				$910.00
	Traffic Control (2%)				$910.00
	Cleanup/General Restoration (2%)				$910.00
	Subtotal				$53,905.00
	Contingency (30%)				$16,171.50
	Subtotal				$70,076.50
	State Sales Tax (8.9%)				$6,237.00
	Construction Total				**$76,313.50**
	Easements				$0.00
	Permitting				$8,000.00
	Survey (4%)				$3,100.00
	Engineering - Design & Construction (30% of Construction)				$22,900.00
	Subtotal				**$34,000.00**
	Estimated Project Cost				$110,313.50
	Rounded Total				**$110,000.00**

City of Monroe Water Comp Plan Update CIP
CIP W-10
8" Pipe Replacement from HWY 2 to Cascade View Dr

Engineer's Opinion of Probable Project Cost
Date February 2015

Item No.	Description	Quantity	Unit	Unit Price	Cost
1	8-In, DI Water Main, Valves, & Appurtenances	0	LF	$88.00	$0.00
2	10-In, DI Water Main, Valves, & Appurtenances	0	LF	$105.00	$0.00
3	12-In, DI Water Main, Valves, & Appurtenances	1,985	LF	$99.00	$196,515.00
4	14-In, DI Water Main, Valves, & Appurtenances	0	LF	$123.00	$0.00
5	16-In, DI Water Main, Valves, & Appurtenances	0	LF	$128.00	$0.00
6	Tie-In(s) to Existing System/Tapping Sleeve and Valve Assembly	2	EA	$4,000.00	$8,000.00
7	Combination Air Release/Air Vacuum Valve Assembly, 1-In.	0	EA	$3,000.00	$0.00
8	Blow Off Assembly	0	EA	$2,500.00	$0.00
9	Hydrant Assembly	1	EA	$5,000.00	$5,000.00
10	Replace/Reconnect Ex Water Service	2	EA	$2,500.00	$5,000.00
11	Import Trench Backfill (CSTC)	570	TN	$24.00	$13,680.00
12	Controlled Density Fill	0	CY	$125.00	$0.00
13	Trench Safety System	1,990	LF	$3.00	$5,970.00
14	Removal and Replacement of Unsuitable Foundation Mtl	20	TN	$40.00	$800.00
15	Sawcutting Pavement	3,970	LF	$2.00	$7,940.00
16	Remove AC Pavement	990	SY	$20.00	$19,800.00
18	HMA for Pavement Repair	670	TN	$130.00	$87,100.00
19	Existing Side Sewer Relocation	2	EA	$1,500.00	$3,000.00
20	Ex Monument Removal & Restoration	2	EA	$800.00	$1,600.00
21	Pavement Markings	1,985	LF	$3.00	$5,955.00
22	Pavement Grinding	3,860	SY	$2.00	$7,719.44
23	Gate Valves	0	EA	$1,500.00	$0.00
	Subtotal				$368,079.44
	Mobilization (10%)				$36,810.00
	Removal of Structures & Obstructions (1%)				$3,680.00
	Temporary Erosion & Sediment Control (2%)				$7,360.00
	Utility Relocation (2%)				$7,360.00
	Traffic Control (2%)				$7,360.00
	Cleanup/General Restoration (2%)				$7,360.00
	Subtotal				$438,009.44
	Contingency (30%)				$131,402.83
	Subtotal				$569,412.28
	State Sales Tax (8.9%)				$50,678.00
	Construction Total				**$620,090.28**
	Easements				$0.00
	Permitting				$8,000.00
	Survey (4%)				$24,800.00
	Engineering - Design & Construction (30% of Construction)				$186,000.00
	Subtotal				**$218,800.00**
	Estimated Project Cost				$838,890.28
	Rounded Total				**$839,000.00**

City of Monroe Water Comp Plan Update CIP
CIP W-11
New 12" Pipe Installation from Cascade View Dr to Galaxy Theaters

Engineer's Opinion of Probable Project Cost
Date **February 2015**

Item No.	Description	Quantity	Unit	Unit Price	Cost
1	8-In, DI Water Main, Valves, & Appurtenances	0	LF	$88.00	$0.00
2	10-In, DI Water Main, Valves, & Appurtenances	0	LF	$105.00	$0.00
3	12-In, DI Water Main, Valves, & Appurtenances	970	LF	$99.00	$96,030.00
4	14-In, DI Water Main, Valves, & Appurtenances	0	LF	$123.00	$0.00
5	16-In, DI Water Main, Valves, & Appurtenances	0	LF	$128.00	$0.00
6	Tie-In(s) to Existing System/Tapping Sleeve and Valve Assembly	2	EA	$4,000.00	$8,000.00
7	Combination Air Release/Air Vacuum Valve Assembly, 1-In.	1	EA	$3,000.00	$3,000.00
8	Blow Off Assembly	1	EA	$2,500.00	$2,500.00
9	Hydrant Assembly	0	EA	$5,000.00	$0.00
10	Replace/Reconnect Ex Water Service	0	EA	$2,500.00	$0.00
11	Import Trench Backfill (CSTC)	330	TN	$24.00	$7,920.00
12	Controlled Density Fill	0	CY	$125.00	$0.00
13	Trench Safety System	970	LF	$3.00	$2,910.00
14	Removal and Replacement of Unsuitable Foundation Mtl	10	TN	$40.00	$400.00
15	Sawcutting Pavement	1,940	LF	$2.00	$3,880.00
16	Remove AC Pavement	0	SY	$20.00	$0.00
18	HMA for Pavement Repair	0	TN	$130.00	$0.00
19	Existing Side Sewer Relocation	0	EA	$1,500.00	$0.00
20	Ex Monument Removal & Restoration	15	EA	$800.00	$12,000.00
21	Pavement Markings	970	LF	$3.00	$2,910.00
22	Pavement Grinding	0	SY	$2.00	$0.00
	Subtotal				$139,550.00
	Mobilization (10%)				$13,960.00
	Removal of Structures & Obstructions (1%)				$1,400.00
	Temporary Erosion & Sediment Control (2%)				$2,790.00
	Utility Relocation (2%)				$2,790.00
	Traffic Control (2%)				$2,790.00
	Cleanup/General Restoration (10%)				$13,960.00
	Subtotal				$177,240.00
	Contingency (30%)				$53,172.00
	Subtotal				$230,412.00
	State Sales Tax (8.9%)				$20,507.00
	Construction Total				**$250,919.00**
	Easements				$56,250.00
	Permitting				$15,000.00
	Survey (4%)				$10,000.00
	Engineering - Design & Construction (30% of Construction)				$75,300.00
	Subtotal				**$156,550.00**
	Estimated Project Cost				$407,469.00
	Rounded Total				**$407,000.00**

City of Monroe Water Comp Plan Update CIP
CIP W-12
8" Pipe Replacement Along Wagner Rd by Salem Woods

Engineer's Opinion of Probable Project Cost
Date **February 2015**

Item No.	Description	Quantity	Unit	Unit Price	Cost
1	8-In, DI Water Main, Valves, & Appurtenances	0	LF	$88.00	$0.00
2	10-In, DI Water Main, Valves, & Appurtenances	0	LF	$105.00	$0.00
3	12-In, DI Water Main, Valves, & Appurtenances	1,887	LF	$99.00	$186,813.00
4	14-In, DI Water Main, Valves, & Appurtenances	0	LF	$123.00	$0.00
5	16-In, DI Water Main, Valves, & Appurtenances	0	LF	$128.00	$0.00
6	Tie-In(s) to Existing System/Tapping Sleeve and Valve Assembly	2	EA	$4,000.00	$8,000.00
7	Combination Air Release/Air Vacuum Valve Assembly, 1-In.	1	EA	$3,000.00	$3,000.00
8	Blow Off Assembly	1	EA	$2,500.00	$2,500.00
9	Hydrant Assembly	2	EA	$5,000.00	$10,000.00
10	Replace/Reconnect Ex Water Service	15	EA	$2,500.00	$37,500.00
11	Import Trench Backfill (CSTC)	540	TN	$24.00	$12,960.00
12	Controlled Density Fill	0	CY	$125.00	$0.00
13	Trench Safety System	1,890	LF	$3.00	$5,670.00
14	Removal and Replacement of Unsuitable Foundation Mtl	20	TN	$40.00	$800.00
15	Sawcutting Pavement	3,770	LF	$2.00	$7,540.00
16	Remove AC Pavement	940	SY	$20.00	$18,800.00
18	HMA for Pavement Repair	630	TN	$130.00	$81,900.00
19	Existing Side Sewer Relocation	15	EA	$1,500.00	$22,500.00
20	Ex Monument Removal & Restoration	2	EA	$800.00	$1,600.00
21	Pavement Markings	1,887	LF	$3.00	$5,661.00
22	Pavement Grinding	3,669	SY	$2.00	$7,338.33
	Subtotal				$412,582.33
	Mobilization (10%)				$41,260.00
	Removal of Structures & Obstructions (1%)				$4,130.00
	Temporary Erosion & Sediment Control (2%)				$8,250.00
	Utility Relocation (2%)				$8,250.00
	Traffic Control (2%)				$8,250.00
	Cleanup/General Restoration (2%)				$8,250.00
	Subtotal				$490,972.33
	Contingency (30%)				$147,291.70
	Subtotal				$638,264.03
	State Sales Tax (8.9%)				$56,805.00
	Construction Total				**$695,069.03**
	Easements				$0.00
	Permitting				$8,000.00
	Survey (4%)				$27,800.00
	Engineering - Design & Construction (30% of Construction)				$208,500.00
	Subtotal				**$244,300.00**
	Estimated Project Cost				$939,369.03
	Rounded Total				**$939,000.00**

City of Monroe Water Comp Plan Update CIP
CIP W-13
New 12" Pipe along Wagner Rd

Engineer's Opinion of Probable Project Cost
Date **February 2015**

Item No.	Description	Quantity	Unit	Unit Price	Cost
1	8-In, DI Water Main, Valves, & Appurtenances	0	LF	$88.00	$0.00
2	10-In, DI Water Main, Valves, & Appurtenances	0	LF	$105.00	$0.00
3	12-In, DI Water Main, Valves, & Appurtenances	2,285	LF	$99.00	$226,215.00
4	14-In, DI Water Main, Valves, & Appurtenances	0	LF	$123.00	$0.00
5	16-In, DI Water Main, Valves, & Appurtenances	0	LF	$128.00	$0.00
6	Tie-In(s) to Existing System/Tapping Sleeve and Valve Assembly	2	EA	$4,000.00	$8,000.00
7	Combination Air Release/Air Vacuum Valve Assembly, 1-In.	1	EA	$3,000.00	$3,000.00
8	Blow Off Assembly	1	EA	$2,500.00	$2,500.00
9	Hydrant Assembly	4	EA	$5,000.00	$20,000.00
10	Replace/Reconnect Ex Water Service	15	EA	$2,500.00	$37,500.00
11	Import Trench Backfill (CSTC)	650	TN	$24.00	$15,600.00
12	Controlled Density Fill	0	CY	$125.00	$0.00
13	Trench Safety System	2,290	LF	$3.00	$6,870.00
14	Removal and Replacement of Unsuitable Foundation Mtl	20	TN	$40.00	$800.00
15	Sawcutting Pavement	4,570	LF	$2.00	$9,140.00
16	Remove AC Pavement	1,140	SY	$20.00	$22,800.00
18	HMA for Pavement Repair	770	TN	$130.00	$100,100.00
19	Existing Side Sewer Relocation	15	EA	$1,500.00	$22,500.00
20	Ex Monument Removal & Restoration	2	EA	$800.00	$1,600.00
21	Pavement Markings	2,285	LF	$3.00	$6,855.00
22	Pavement Grinding	4,443	SY	$2.00	$8,886.11
	Subtotal				$492,366.11
	Mobilization (10%)				$49,240.00
	Removal of Structures & Obstructions (1%)				$4,920.00
	Temporary Erosion & Sediment Control (2%)				$9,850.00
	Utility Relocation (2%)				$9,850.00
	Traffic Control (2%)				$9,850.00
	Cleanup/General Restoration (2%)				$9,850.00
	Subtotal				$585,926.11
	Contingency (30%)				$175,777.83
	Subtotal				$761,703.94
	State Sales Tax (8.9%)				$67,792.00
	Construction Total				**$829,495.94**
	Easements				$0.00
	Permitting				$8,000.00
	Survey (4%)				$33,200.00
	Engineering - Design & Construction (30% of Construction)				$248,800.00
	Subtotal				**$290,000.00**
	Estimated Project Cost				$1,119,495.94
	Rounded Total				**$1,119,000.00**

City of Monroe Water Comp Plan Update CIP
CIP W-14
New 8" Pipe Along 127th Ave SE to close Pipe Loop

Engineer's Opinion of Probable Project Cost
Date **February 2015**

Item No.	Description	Quantity	Unit	Unit Price	Cost
1	8-In, DI Water Main, Valves, & Appurtenances	290	LF	$80.00	$23,200.00
2	10-In, DI Water Main, Valves, & Appurtenances	0	LF	$95.00	$0.00
3	12-In, DI Water Main, Valves, & Appurtenances	0	LF	$90.00	$0.00
4	14-In, DI Water Main, Valves, & Appurtenances	0	LF	$112.00	$0.00
5	16-In, DI Water Main, Valves, & Appurtenances	0	LF	$116.00	$0.00
6	Tie-In(s) to Existing System/Tapping Sleeve and Valve Assembly	2	EA	$4,000.00	$8,000.00
7	Combination Air Release/Air Vacuum Valve Assembly, 1-In.	0	EA	$3,000.00	$0.00
8	Blow Off Assembly	0	EA	$2,500.00	$0.00
9	Hydrant Assembly	1	EA	$5,000.00	$5,000.00
10	Replace/Reconnect Ex Water Service	3	EA	$2,500.00	$7,500.00
11	Import Trench Backfill (CSTC)	50	TN	$24.00	$1,200.00
12	Controlled Density Fill	0	CY	$125.00	$0.00
13	Trench Safety System	290	LF	$3.00	$870.00
14	Removal and Replacement of Unsuitable Foundation Mtl	0	TN	$40.00	$0.00
15	Sawcutting Pavement	570	LF	$2.00	$1,140.00
16	Remove AC Pavement	120	SY	$20.00	$2,400.00
18	HMA for Pavement Repair	90	TN	$130.00	$11,700.00
19	Existing Side Sewer Relocation	3	EA	$1,500.00	$4,500.00
20	Ex Monument Removal & Restoration	0	EA	$800.00	$0.00
21	Pavement Markings	286	LF	$3.00	$858.00
22	Pavement Grinding	583	SY	$2.00	$1,165.19
	Subtotal				$67,533.19
	Mobilization (10%)				$6,750.00
	Removal of Structures & Obstructions (1%)				$680.00
	Temporary Erosion & Sediment Control (2%)				$1,350.00
	Utility Relocation (2%)				$1,350.00
	Traffic Control (2%)				$1,350.00
	Cleanup/General Restoration (2%)				$1,350.00
	Subtotal				$80,363.19
	Contingency (30%)				$24,108.96
	Subtotal				$104,472.14
	State Sales Tax (8.9%)				$9,298.00
	Construction Total				**$113,770.14**
	Easements				$0.00
	Permitting				$8,000.00
	Survey (4%)				$4,600.00
	Engineering - Design & Construction (30% of Construction)				$34,100.00
	Subtotal				**$46,700.00**
	Estimated Project Cost				$160,470.14
	Rounded Total				**$160,000.00**

City of Monroe Water Comp Plan Update CIP
CIP W-15
Existing 6" Pipe Replacement on 141st Dr SE

Engineer's Opinion of Probable Project Cost
Date **February 2015**

Item No.	Description	Quantity	Unit	Unit Price	Cost
1	8-In, DI Water Main, Valves, & Appurtenances	0	LF	$80.00	$0.00
2	10-In, DI Water Main, Valves, & Appurtenances	3,880	LF	$95.00	$368,600.00
3	12-In, DI Water Main, Valves, & Appurtenances	0	LF	$90.00	$0.00
4	14-In, DI Water Main, Valves, & Appurtenances	0	LF	$112.00	$0.00
5	16-In, DI Water Main, Valves, & Appurtenances	0	LF	$116.00	$0.00
6	Tie-In(s) to Existing System/Tapping Sleeve and Valve Assembly	2	EA	$4,000.00	$8,000.00
7	Combination Air Release/Air Vacuum Valve Assembly, 1-In.	2	EA	$3,000.00	$6,000.00
8	Blow Off Assembly	2	EA	$2,500.00	$5,000.00
9	Hydrant Assembly	4	EA	$5,000.00	$20,000.00
10	Replace/Reconnect Ex Water Service	10	EA	$2,500.00	$25,000.00
11	Import Trench Backfill (CSTC)	1,470	TN	$24.00	$35,280.00
12	Controlled Density Fill	0	CY	$125.00	$0.00
13	Trench Safety System	3,880	LF	$3.00	$11,640.00
14	Removal and Replacement of Unsuitable Foundation Mtl	40	TN	$40.00	$1,600.00
15	Sawcutting Pavement	7,750	LF	$2.00	$15,500.00
16	Remove AC Pavement	2,300	SY	$20.00	$46,000.00
18	HMA for Pavement Repair	1,340	TN	$130.00	$174,200.00
19	Existing Side Sewer Relocation	10	EA	$1,500.00	$15,000.00
20	Ex Monument Removal & Restoration	4	EA	$800.00	$3,200.00
21	Pavement Markings	3,875	LF	$3.00	$11,625.00
22	Pavement Grinding	7,176	SY	$2.00	$14,351.85
23	Gate Valves	0	EA	$1,500.00	$0.00
	Subtotal				$760,996.85
	Mobilization (10%)				$76,100.00
	Removal of Structures & Obstructions (1%)				$7,610.00
	Temporary Erosion & Sediment Control (2%)				$15,220.00
	Utility Relocation (2%)				$15,220.00
	Traffic Control (2%)				$15,220.00
	Cleanup/General Restoration (2%)				$15,220.00
	Subtotal				$905,586.85
	Contingency (30%)				$271,676.06
	Subtotal				$1,177,262.91
	State Sales Tax (8.9%)				$104,776.00
	Construction Total				**$1,282,038.91**
	Easements				$0.00
	Permitting				$8,000.00
	Survey (4%)				$51,300.00
	Engineering - Design & Construction (30% of Construction)				$384,600.00
	Subtotal				**$443,900.00**
	Estimated Project Cost				$1,725,938.91
	Rounded Total				**$1,726,000.00**

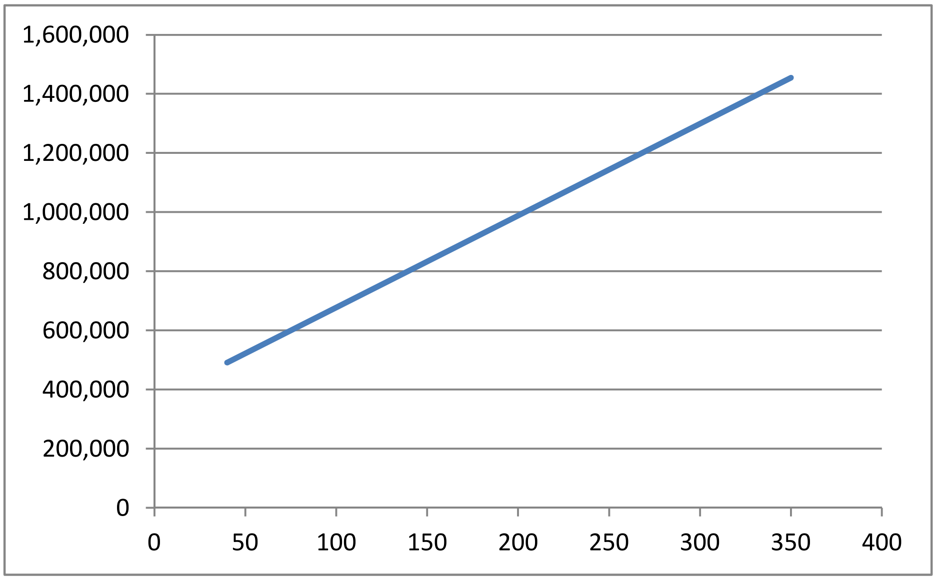
City of Monroe Water Comp Plan Update CIP
CIP W-53
Replace 6" Service Line Along Old Owen Rd

Engineer's Opinion of Probable Project Cost
Date **February 2015**

Item No.	Description	Quantity	Unit	Unit Price	Cost
1	8-In, DI Water Main, Valves, & Appurtenances	970	LF	$80.00	$77,600.00
2	10-In, DI Water Main, Valves, & Appurtenances	0	LF	$95.00	$0.00
3	12-In, DI Water Main, Valves, & Appurtenances	0	LF	$90.00	$0.00
4	14-In, DI Water Main, Valves, & Appurtenances	0	LF	$112.00	$0.00
5	16-In, DI Water Main, Valves, & Appurtenances	0	LF	$116.00	$0.00
6	Tie-In(s) to Existing System/Tapping Sleeve and Valve Assembly	2	EA	$4,000.00	$8,000.00
7	Combination Air Release/Air Vacuum Valve Assembly, 1-In.	0	EA	$3,000.00	$0.00
8	Blow Off Assembly	0	EA	$2,500.00	$0.00
9	Hydrant Assembly	0	EA	$5,000.00	$0.00
10	Replace/Reconnect Ex Water Service	10	EA	$2,500.00	$25,000.00
11	Import Trench Backfill (CSTC)	180	TN	$24.00	$4,320.00
12	Controlled Density Fill	0	CY	$125.00	$0.00
13	Trench Safety System	970	LF	$3.00	$2,910.00
14	Removal and Replacement of Unsuitable Foundation Mtl	10	TN	$40.00	$400.00
15	Sawcutting Pavement	1,930	LF	$2.00	$3,860.00
16	Remove AC Pavement	390	SY	$20.00	$7,800.00
18	HMA for Pavement Repair	310	TN	$130.00	$40,300.00
19	Existing Side Sewer Relocation	10	EA	$1,500.00	$15,000.00
20	Ex Monument Removal & Restoration	1	EA	$800.00	$800.00
21	Pavement Markings	966	LF	$3.00	$2,898.00
22	Pavement Grinding	1,968	SY	$2.00	$3,935.56
	Subtotal				$192,823.56
	Mobilization (10%)				$19,280.00
	Removal of Structures & Obstructions (1%)				$1,930.00
	Temporary Erosion & Sediment Control (2%)				$3,860.00
	Utility Relocation (2%)				$3,860.00
	Traffic Control (2%)				$3,860.00
	Cleanup/General Restoration (2%)				$3,860.00
	Subtotal				$229,473.56
	Contingency (30%)				$68,842.07
	Subtotal				$298,315.62
	State Sales Tax (8.9%)				$26,550.00
	Construction Total				**$324,865.62**
	Easements				$0.00
	Permitting				$8,000.00
	Survey (4%)				$13,000.00
	Engineering - Design & Construction (30% of Construction)				$97,500.00
	Subtotal				**$118,500.00**
	Estimated Project Cost				$443,365.62
	Rounded Total				**$443,000.00**

Pump Station Mechanical & Electrical Costs

Description	Total HP	Total Mech/Electr Costs	With 40% Markup
North City PS - Full	350	1,039,000	1,454,600
North City PS - Medium Only	40	351,000	491,400



Station	CIP No.	HP	Project Cost
177th	W-20	100	680,000
Spring Hill	W-21	50	520,000
Lord Hill	W-22	70	580,000
Tester Rd	W-23	80	620,000
North Hill	W-24	140	800,000
Trombley	W-25	155	850,000

North City Water District
North City Pump Station
Final Engineer's Estimate of Probable Construction Cost - Pump Station
Prepared by: V. Tokumoto/J. Zier/T. Whitehouse
Updated by: P. Cunningham
Reviewed by: A. Schuyler/J. Kreshel
1/22/2015

Item No.	Description	Quantity	Unit	Unit Price	Cost
1	Mobilization (10%)	1	LS	$85,160	$85,160
2	Minor Change	0	LS	$30,000	$0
3	Cleanup/General Restoration (2%)	1	LS	$17,030	$17,030
4	4-In, DI Water Main	15	LF	$48	$720
5	6-In, DI Water Main	35	LF	$54	$1,890
6	8-In. DI Water Main	10	LF	$55	$550
7	12-In, DI Water Main	65	LF	$120	$7,800
8	16-In, DI Water Main	190	LF	$174	$33,060
9	2-in. Gate Valve	2	EA	$1,075	$2,150
10	4-In, Gate Valve	4	EA	$969	$3,876
11	6-In, Gate Valve	2	EA	$1,238	$2,475
12	8-in. Gate Valve	3	EA	$3,600	$10,800
13	12-In, Gate Valve	3	EA	$3,888	$11,664
14	16-In, Butterfly Valve	7	EA	$6,200	$43,400
15	3-in. Pressure Reducing Valve	1	EA	$2,400	$2,400
16	3-in. Piping and Appurtenances	1	EA	$2,000	$2,000
17	8-in. Pressure Reducing Valve w/ Check Feature	2	EA	$9,000	$18,000
18	6-in. Pressure reducing valve w/ Check Feature (Angle Pattern)	2	EA	$5,250	$10,500
19	6-in. Pressure Relief valve with Rapid Opening	2	EA	$4,800	$9,600
20	16-in Pressure Relief Valve w/ Rapid Opening	1	EA	$36,000	$36,000
21	6-in. Excess Pressure Safety Shut-Off Valve	1	EA	$6,000	$6,000
22	615 Surge Tank	0	EA	$25,000	$0
23	502 Surge Tank	0	EA	$15,000	$0
24	4-In, Check Valve	2	EA	$1,751	$3,501
25	6-In, Check Valve	2	EA	$2,355	$4,710
26	16-In, Check Valve	1	EA	$15,000	$15,000
27	16-In, Silent Check Valve	2	EA	$8,400	$16,800
28	16-in Seismic Valve (16-in BV, Seismic Sensor & Actuator)	0	EA	$47,000	$0
29	12-in Magnetic Flow Meter	1	EA	$10,100	$10,100
30	14-in Rubber Joint	2	EA	$3,000	$6,000
31	16-in Tee	13	EA	$1,511	$19,637
32	16-in x 12-in Tee	1	EA	$1,511	$1,511
33	16-in Elbow	9	EA	$1,025	$9,221
34	16-in Restrained Flange Coupling Adaptor	10	EA	$2,550	$25,500
35	16-in x 12-in Reducer	4	EA	$782	$3,126
36	16-in x 8-in Reducer	1	EA	$1,040	$1,040
37	12-in x 8-in Reducer	2	EA	$1,040	$2,080
38	12-in Restrained Flange Coupling Adaptor	1	EA	$1,365	$1,365
39	12-in 90 Degree Elbow	6	EA	$632	$3,789
40	12-in 22.5 Degree Elbow	1	EA	$632	$632
41	12-in Tee	3	EA	$1,008	$3,024
42	12-in x 6-in Wye	1	EA	$1,000	$1,000
43	6-in 90 Degree Elbow	2	EA	$186	$372
44	6-in 45 Degree Elbow	2	EA	$270	$540
45	6-in Restrained Flange Coupling Adaptor	4	EA	$528	$2,112
46	8-in Restrained Flange Coupling Adaptor	1	EA	$683	$683
47	8-in 90 Degree Elbow	1	EA	$525	$525
48	4-in Elbow	1	EA	$119	$119
49	4-in Restrained Flange Coupling Adaptor	3	EA	$404	$1,211
50	Dissimilar Metal Isolation	2	EA	$250	$500
51	Pressure Gage	11	EA	$240	$2,640
52	Combo Air/Vac Valve	5	EA	$2,400	$12,000
53	Chlorine Residual Analyzer	0	EA	$6,000	$0
54	75 Degree Pitch Ships Ladder	0	EA	$2,400	$0
55	Davit Sleeve	0	EA	$3,600	$0
56	Pumps (P1 & P2)	2	EA	$4,250	$8,500
57	Pumps (P3 & P4)	2	EA	$9,625	$19,250
58	Pumps (P5 & P6)	2	EA	$88,063	$176,125
59	Building	0	LS	$677,811	$0
60	Crane Rail/Hoist	0	LS	$54,106	$0
61	HVAC	0	LS	$53,536	$0
62	E&IC	1	LS	$296,125	$296,125
63	Noise Attenuation	0	LS	$40,000	$0
64	Plumbing (floor drains, sinks, bathroom, etc)	0	LS	$69,016	$0
65	Furniture (cabinets, desks, chairs, etc)	0	LS	$8,000	$0
	Subtotal				$954,000
	Sales Tax @ 8.9%				$85,000
	TOTAL ESTIMATED CONSTRUCTION COST				$1,039,000

North City Water District
North City Pump Station
Final Engineer's Estimate of Probable Construction Cost - Pump Station
Prepared by: V. Tokumoto/J. Zier/T. Whitehouse
Updated by: P. Cunningham
Reviewed by: A. Schuyler/J. Kreshel
1/22/2015

Item No.	Description	Quantity	Unit	Unit Price	Cost
1	Mobilization (10%)	1	LS	$28,790	$28,790
2	Minor Change	0	LS	$30,000	$0
3	Cleanup/General Restoration (2%)	1	LS	$5,760	$5,760
4	4-In, DI Water Main	15	LF	$48	$720
5	6-In, DI Water Main	35	LF	$54	$1,890
6	8-In. DI Water Main	10	LF	$55	$550
7	12-In, DI Water Main	0	LF	$120	$0
8	16-In, DI Water Main	0	LF	$174	$0
9	2-in. Gate Valve	2	EA	$1,075	$2,150
10	4-In, Gate Valve	4	EA	$969	$3,876
11	6-In, Gate Valve	2	EA	$1,238	$2,475
12	8-in. Gate Valve	3	EA	$3,600	$10,800
13	12-In, Gate Valve	0	EA	$3,888	$0
14	16-In, Butterfly Valve	0	EA	$6,200	$0
15	3-in. Pressure Reducing Valve	1	EA	$2,400	$2,400
16	3-in. Piping and Appurtenances	1	EA	$2,000	$2,000
17	8-in. Pressure Reducing Valve w/ Check Feature	2	EA	$9,000	$18,000
18	6-in. Pressure reducing valve w/ Check Feature (Angle Pattern)	0	EA	$5,250	$0
19	6-in. Pressure Relief valve with Rapid Opening	0	EA	$4,800	$0
20	16-in Pressure Relief Valve w/ Rapid Opening	0	EA	$36,000	$0
21	6-in. Excess Pressure Safety Shut-Off Valve	1	EA	$6,000	$6,000
22	615 Surge Tank	0	EA	$25,000	$0
23	502 Surge Tank	0	EA	$15,000	$0
24	4-In, Check Valve	0	EA	$1,751	$0
25	6-In, Check Valve	2	EA	$2,355	$4,710
26	16-In, Check Valve	0	EA	$15,000	$0
27	16-In, Silent Check Valve	0	EA	$8,400	$0
28	16-in Seismic Valve (16-in BV, Seismic Sensor & Actuator)	0	EA	$47,000	$0
29	12-in Magnetic Flow Meter	1	EA	$10,100	$10,100
30	14-in Rubber Joint	0	EA	$3,000	$0
31	16-in Tee	0	EA	$1,511	$0
32	16-in x 12-in Tee	0	EA	$1,511	$0
33	16-in Elbow	0	EA	$1,025	$0
34	16-in Restrained Flange Coupling Adaptor	0	EA	$2,550	$0
35	16-in x 12-in Reducer	0	EA	$782	$0
36	16-in x 8-in Reducer	0	EA	$1,040	$0
37	12-in x 8-in Reducer	0	EA	$1,040	$0
38	12-in Restrained Flange Coupling Adaptor	0	EA	$1,365	$0
39	12-in 90 Degree Elbow	0	EA	$632	$0
40	12-in 22.5 Degree Elbow	0	EA	$632	$0
41	12-in Tee	0	EA	$1,008	$0
42	12-in x 6-in Wye	0	EA	$1,000	$0
43	6-in 90 Degree Elbow	0	EA	$186	$0
44	6-in 45 Degree Elbow	0	EA	$270	$0
45	6-in Restrained Flange Coupling Adaptor	0	EA	$528	$0
46	8-in Restrained Flange Coupling Adaptor	1	EA	$683	$683
47	8-in 90 Degree Elbow	1	EA	$525	$525
48	4-in Elbow	0	EA	$119	$0
49	4-in Restrained Flange Coupling Adaptor	0	EA	$404	$0
50	Dissimilar Metal Isolation	2	EA	$250	$500
51	Pressure Gage	2	EA	$240	$480
52	Combo Air/Vac Valve	1	EA	$2,400	$2,400
53	Chlorine Residual Analyzer	0	EA	$6,000	$0
54	75 Degree Pitch Ships Ladder	0	EA	$2,400	$0
55	Davit Sleeve	0	EA	$3,600	$0
56	Pumps (P1 & P2)	0	EA	$4,250	$0
57	Pumps (P3 & P4)	2	EA	$9,625	$19,250
58	Pumps (P5 & P6)	0	EA	$88,063	$0
59	Building	0	LS	$677,811	$0
60	Crane Rail/Hoist	0	LS	$54,106	$0
61	HVAC	0	LS	$53,536	$0
62	E&IC	1	LS	$296,125	$198,404
63	Noise Attenuation	0	LS	$40,000	$0
64	Plumbing (floor drains, sinks, bathroom, etc)	0	LS	$69,016	$0
65	Furniture (cabinets, desks, chairs, etc)	0	LS	$8,000	$0
	Subtotal				$322,000
	Sales Tax @ 8.9%				$29,000
	TOTAL ESTIMATED CONSTRUCTION COST				$351,000

Stormwater System Appendices

Appendix SW-A

Water Quality Measurements

07R050_2012French Cr nr Mouth

date	time	COND (umhos/cm)	FC (#/100ml)	FLOW (CFS)	NH3_N (mg/L)	NO2_NO3 (mg/L)	OP_DIS (mg/L)	OXYGEN (mg/L)	PH (pH)	PRESS (mm/Hg)	SUSSOL (mg/L)	TEMP (deg C)	TP_P (mg/L)	TPN (mg/L)	TURB (NTU)
10/19/2011	14:10	211	300	0.7 J	0.065	0.71	0.011	6.71	7.17	759.46	3	10.2	0.0576	0.945	12
11/30/2011	14:40	157	34	21.6 J	0.117	2.44	0.0149	8.4	6.66	777.24	3	7	0.0518	3	5.4
12/14/2011	13:10	195	28	7.2 J	0.216	1.26	0.0152	7.9	6.69	762	3	4.2	0.0622	1.82	7.3
1/25/2012	13:15	133	23	45 J	0.075	2.24		9.6	6.69	765.81	5	5.1		2.66	6.1
2/15/2012	13:15	164	3	7.2 J	0.162	1.04	0.0157	8.1	6.65	768.35	3	6.5	0.0633	1.49	5.7
3/7/2012	13:15	126	7	28.5 J	0.116	1.18	0.0151	9.8	6.67	770.89	4	4.9	0.056	1.56	5.1
4/17/2012	13:10	144	32		0.165	0.624	0.0124		6.72	762	4	10.9	0.0715	1.17	6.5
5/16/2012	12:45	172	44		0.147	0.582	0.0098	4.95	6.72 J	762	5	14.2	0.0731	1.14	8.2
6/20/2012	10:50	140	100		0.169	0.405	0.0187	5.6	6.59	763.27	6	13.8	0.085	0.718	6.3
7/18/2012	11:30	192	48		0.066	0.579	0.0081	5.4	6.9	762	7	16.9 J	0.0676	0.88	11
8/22/2012	12:00	204	48		0.034	0.38	0.0078	6.2	7.13	764.54	18	16.6	0.105	0.729	24
9/19/2012	12:17	209	17		0.01 U	0.455	0.0067	9.3	7.26	764.54	5	13.4	0.05	0.681	7.6

Common data qualifiers: U - not detected at the reported level, J - estimated value

Times are local (Pacific Standard or Pacific Daylight Savings).

Colored background

indicates that result exceeded water quality standards -OR- contrasted strongly with historical results. The November 2006 amendment to the water quality standards was incorporated beginning in January 2009.

http://www.ecy.wa.gov/apps/watersheds/riv/station.asp?theyear=&tab=final_data&scrolly=159&wria=07&sta=07A090&docextension=.xls&docextension=.xls

07A090_2013Snohomish R

date	time	COND (umhos/cm)	FC (#/100ml)	FLOW (CFS)	NH3_N (mg/L)	NO2_NO3 (mg/L)	OP_DIS (mg/L)	OXYGEN (mg/L)	PH (pH)	PRESS (mm/Hg)	SUSSOL (mg/L)	TEMP (deg C)	TP_P (mg/L)	TPN (mg/L)	TURB (NTU)
10/24/2012	11:12	39	21	5875	0.01 U	0.218	0.0045	11.2	6.84	759.46	5	7.72	0.0102	0.273	2.9
11/28/2012	11:25	38	20	11025	0.013	0.287	0.0051	11.7	6.93	751.84	7	5.61	0.0133	0.355	3.9
12/19/2012	11:20	45	52 J	10034	0.022	0.481	0.0105	12.1	7	753.11	8	4.6	0.0275	0.583	5.8
1/16/2013	10:52	46	6	6475	0.013	0.374	0.0048	12.7	7.01	778.51	4	3.4	0.0137	0.428	3.1
2/13/2013	11:00	48	6	6615	0.01	0.32	0.0056	11.3	7.07	773.43	3	5.91	0.0141	0.365	2.8
3/20/2013	11:10	38	35 J	14432	0.024	0.217	0.0055	11.7	7.05	749.3	11	5.61	0.0225	0.284	6.6
4/17/2013	10:47	40	1 U	12432	0.01	0.205	0.0036	11.8		773.43	8	6.91	0.0154	0.25	4.5
5/22/2013	10:55	28	23	14832	0.01 U	0.084	0.003 U	11.3	7.07	759.46	11	8.32	0.0211	0.112	4.7
6/19/2013	10:50	28	12	10014	0.01 U	0.062	0.0033	10.3	7.1	760.73	7	12.04	0.0119	0.1	3.4
7/24/2013	11:20	46	31	3557	0.01 U	0.102	0.0042	9	7.18	763.27	3	18.07	0.009	0.145	1.6
8/21/2013	11:10	53	20	2389	0.015	0.11	0.0047	8.9	7.2	763.27	3	18.07	0.0148	0.178	1.5
9/25/2013	13:15	36	100	6075	0.036	0.213	0.0067	9.3	7.1	760.73	9	12.34	0.0168	0.329	4.8

Common data qualifiers: U - not detected at the reported level, J - estimated value

Times are local (Pacific Standard or Pacific Daylight Savings).

Colored background indicates that result exceeded water quality standards -OR- contrasted strongly with historical results. The November 2006 amendment to the water quality standards was incorporated beginning in January 2009.

http://www.ecy.wa.gov/apps/watersheds/riv/station.asp?theyear=&tab=final_data&scrolly=159&wria=07&sta=07A090&docextension=.xls&docextension=.xls

07D050_2013Snoqualmie R nr Monr

date	time	COND (umhos/cm)	FC (#/100ml)	FLOW (CFS)	NH3_N (mg/L)	NO2_NO3 (mg/L)	OP_DIS (mg/L)	OXYGEN (mg/L)	PH (pH)	PRESS (mm/Hg)	SUSSOL (mg/L)	TEMP (deg C)	TP_P (mg/L)	TPN (mg/L)	TURB (NTU)
10/22/2012	11:30	33	9	2507 J	0.01 U	0.228	0.0035	11.3	6.84	749.3	8	8.02	0.0149	0.297	5
11/26/2012	12:40	36	17		0.016	0.36	0.0075	11.5	6.85	763.27	14 J	6.41	0.0107	0.475	6.5
12/17/2012	11:30	48	34	4382 J	0.014	0.414	0.0106	11.8	6.94	750.57	11 J	5.21	0.0305	0.49	5.7
1/14/2013	11:35	45	6	2995 J	0.014	0.385	0.0056	12.9	6.99	774.7	9	2.49	0.0188	0.435	4.2
2/11/2013	10:55	50	13	2692 J	0.013	0.333	0.0059	11.7	6.95	770.89	4	5.51	0.0142	0.392	3
3/18/2013	11:40	31	20	6932 J	0.016	0.186	0.0058	12.2	7.01	767.08	25 J	5.31	0.0292	0.242	11
4/15/2013	11:00	40	12 J	6210 J	0.011	0.247	0.0048	11.6		762	18	6.61	0.0219	0.253	8.1
5/20/2013	11:20	31	8	4370 J	0.01 U	0.12	0.0034	11.2		765.81	11	9.23	0.0135	0.168	1.9
6/17/2013	12:20	33	23	4555 J	0.01 U	0.057	0.0033	10.2	7.07	760.73	8	13.85	0.0127	0.125	2.9
7/22/2013	11:30	58	17	1266 J	0.013	0.152	0.006	8.9	7.11	763.27	3	18.17	0.0118	0.203	1.6
8/19/2013	11:30	72	26	455 J	0.015	0.175	0.0049	8.7	7.16	763.27	2	19.88	0.0202	0.251	1.1
9/23/2013	14:20	64	44	3180 J	0.01 U	0.154	0.0046	9.2	7.33	758.19	4	14.85	0.0137	0.207	1.6

Common data qualifiers: U - not detected at the reported level, J - estimated value

Times are local (Pacific Standard or Pacific Daylight Savings).

Colored background indicates that result exceeded water quality standards -OR- contrasted strongly with historical results. The November 2006 amendment to the water quality standards was incorporated beginning in January 2009.

Water Quality Parameters 2013

French Creek Watershed

French Creek at 167th Avenue SE (French Creek)												
Sample Date		Feb	March	April	May	June	July	Aug	Sept	Oct	Nov	Dec
Time		8:00	8:00	10:45	9:45	8:30	9:30	10:00	8:45	8:45	8:15	8:30
Dissolved Oxygen	mg/L	12.44	11.87	11.78	10.71	10.36	9.98	9.71	9.88	11.28	13.42	13.39
Temperature, water	deg C	5.97	8.13	8.36	11.33	12.26	13.86	15.22	13.27	9.69	3.68	3.33
Fecal Coliform	cfu/100mL	300	28	46	10	100	130	150	430	260	10	24

Woods Creek Watershed

Woods Creek at Florence Acres Road (Al Borlan)												
Sample Date		Feb	March	April	May	June	July	Aug	Sept	Oct	Nov	Dec
Time		13:10	13:20	13:25	13:35	13:15	13:30	12:45	13:45	13:15	10:30	11:55
Dissolved Oxygen	mg/L	12.42	12.15	12	10.69	10.49	10.07	10.41	10.64	11.5	13.03	13.13
Temperature, water	deg C	6.03	7.67	7.88	13.06	13.6	16.04	15.78	13.06	9.94	4.4	4.14
Fecal Coliform	cfu/100mL		18	120	40	52	14	66	140	64	16	8

Woods Creek at Old Owen Road (Albertsons)												
Sample Date		Feb	March	April	May	June	July	Aug	Sept	Oct	Nov	Dec
Time		12:40	12:50	13:00	13:15	12:50	13:00	12:05	13:20	12:50	10:05	11:20
Dissolved Oxygen	mg/L	12.25	12.06	11.85	11.57	11.74	10.45	10.65	10.76	10.72	12.99	13
Temperature, water	deg C	6.23	7.93	8.05	13.26	13.87	17.12	17.06	13.46	9.89	3.98	4.17
Fecal Coliform	cfu/100mL	82	20	60	110	52	26	72	120	130	14	12

Woods Creek at Bridge 229 Yeager Road (Eagles Park)												
Sample Date		Feb	March	April	May	June	July	Aug	Sept	Oct	Nov	Dec
Time		12:05	12:25	12:35	12:55	12:20	12:40	11:35	12:50	12:20	9:45	10:55
Dissolved Oxygen	mg/L	12.04	11.75	11.69	11.51	11.13	10.17	10.02	10.21	10.28	12.8	12.9
Temperature, water	deg C	6.16	7.94	8.01	10.99	13.21	15.47	15.68	12.94	9.85	3.77	4.05
Fecal Coliform	cfu/100mL	70	48	130	30	82	48	60	96	30	10	6

Appendix SW-B

Policy Issue Papers

Memorandum

DATE:	December 8, 2014
TO:	Jake Roberts, O&M Division Manager, City of Monroe Dave Harms, Stormwater Master Plan Update Project Manager
FROM:	Mike Giseburt, P.E.
SUBJECT:	**Pervious Pavement Issue Paper**

Introduction

As a part of the 2014 Stormwater System Plan update, the City requested that the consultant team address certain stormwater management policy issues through the development of brief issue papers. This issue paper is intended to provide guidance on when/where to consider pervious pavement. To provide guidance on this question, the consulting team (1) summarized background information from available technical resources, (2) used SCS soils maps in GIS to characterize the existing soils and substrata in Monroe with respect to permeability, which may provide an indicator of suitability for pervious pavement installations, and (3) conducted a brief informal inquiry to a number of jurisdictions to obtain input on their policies regulating the use of pervious pavement.

Background

The following background is largely excerpted and summarized from the 2012 Low Impact Development – Technical Guidance Manual for Puget Sound (Puget Sound Partnership (PSP), 2012), and from the 2012 Stormwater Management Manual for Western Washington (Manual), Volume V Section BMP T5.15 (Department of Ecology, 2012).

Pavement for vehicular and pedestrian travel occupies roughly twice the space of buildings. While essential for the movement of people, goods and services, vehicular pavement generates significant levels of heavy metals and most hydrocarbon pollutants in stormwater. The concentration of pollutants (specifically metals and hydrocarbons) in surface flow along pavements, in general, increases with traffic intensity.

Impervious pavements also contribute to increased peak flow, extended high-flow flow durations, and associated physical habitat degradation of streams and wetlands due to increased erosion and pollutant levels. Effective management of stormwater quality and quantity from paved surfaces is, therefore, critical for supporting fresh water conditions in Puget Sound.

Permeable paving surfaces are an important integrated management practice within the low impact development (LID) approach and can be designed to accommodate pedestrian, bicycle, and auto traffic while allowing infiltration, treatment, and storage of stormwater. The general categories of permeable paving systems include:

- Porous asphalt pavement, a flexible pavement similar to standard asphalt that uses a bituminous binder to adhere aggregate together. However, the fine material (sand and finer) is reduced or eliminated and, as a result, voids form between the aggregate in the pavement surface and allow water to infiltrate.
- Pervious Portland cement concrete, a rigid pavement similar to conventional concrete that uses a cementitious material to bind aggregate together. However, the fine aggregate (sand) component is reduced or eliminated in the gradation and, as a result, voids form between the aggregate in the pavement surface and allow water to infiltrate.
- Permeable interlocking concrete pavements (PICP) and aggregate pavers. PICPs are solid, precast, manufactured modular units. The solid pavers are (impervious) and pavements constructed with these units create joints that are filled with permeable aggregates and installed on an open-graded aggregate bedding course. Aggregate pavers (sometime called pervious pavers) are a different class of pavers from PICP. Aggregate pavers are intended for pedestrian use only.
- Grid systems made of concrete or plastic. Concrete units are precast in a manufacturing facility, packaged and shipped to the site for installation. Plastic grids typically are delivered to the site in rolls or sections. The openings in both grid types are filled with topsoil and grass or permeable aggregate.

Typical applications for permeable paving include industrial and commercial parking lots, sidewalks, pedestrian and bike trails, driveways, residential access and collector roads, and emergency and facility maintenance roads. Grid pavers are not intended for streets but are often used for emergency access lanes and intermittently used (overflow) parking areas. All other types of permeable paving can withstand loads from the number of trucks associated with residential collector roads. Specialized engineering expertise is required for designs for heavy loads.   The following table shows the typical permeable pavement applications (PSP, 2012).

Application	Residential walk/patio	Residential driveway	Commercial pedestrian plaza	Emergency access lane or overflow parking lot	Parking lot or travel lanes	Residential street or collector	High speed highway (>35mph)
Porous Asphalt	Yes	Yes	Yes	Yes	Yes	Yes	Limited to-date
Pervious Concrete	Yes	Yes	Yes	Yes	Yes	Yes	No
PICP	Yes	Yes	Yes	Yes	Yes	Yes	No
Grid Pavements	Yes	Yes	Yes	Yes	No	No	No

According to the Low Impact Development Technical Guidance Manual, permeable pavement should not be used (unless additional engineering analysis and design is conducted) where:

- Excessive sediment is deposited on the surface (e.g., construction and landscaping material yards).
- Steep erosion prone areas are upslope of the permeable surface and will likely deliver sediment and clog pavement on a regular basis, and where maintenance is not conducted regularly.
- Concentrated pollutant spills are possible, such as gas stations, truck stops and industrial chemical storage sites, and where infiltration will result in transport of pollutants to deeper soil or groundwater.
- Seasonally high groundwater is within 1 foot of the bottom of the aggregate base (interface of the subgrade and aggregate base).
- Fill soils, when saturated, cannot be adequately stabilized.
- Sites receive regular, heavy applications of sand (such as weekly) for maintaining traction during winter.
- Steep slopes where water within the aggregate base layer or at the subgrade surface cannot be controlled by detention structures (e.g., check dams) and may cause erosion and structural failure, or where surface runoff velocities may preclude adequate infiltration at the pavement surface. Note that permeable pavement has been used successfully on slopes up to 10 percent with subsurface detention structures and at 8 percent slopes without subsurface detention.

Ecology (acting as the NPDES permit authority) requires LID to be used unless deemed infeasible. Ecology has identified "Infeasibility Criteria" that can be used to limit the use of permeable pavement (as well as other LID BMPs). That is, Infeasibility Criteria are conditions that make permeable pavement not required as an LID tool. For project proponents to use any of the infeasibility criteria, conclusions must be based on an evaluation of site-specific conditions and a written recommendation from an appropriate licensed professional (e.g. Engineer, Geologist, Hydrogeologist). Many of the conditions listed above from the Low Impact Development Technical Guidance Manual qualify as infeasibility criteria. The following are additional criteria identified in the Ecology Manual that are applicable to Monroe:

- Where geotechnical evaluation recommends infiltration not be used due to reasonable concerns about erosion, slope failure or down gradient flooding.
- An area whose ground water drains into an erosion hazard, or landslide hazard area.
- Where infiltrating and ponded water below new permeable pavement area would compromise adjacent impervious pavements
- Where infiltrating water below a new permeable pavement area would threaten existing below grade basements.
- Where permeable pavements cannot provide sufficient strength to support heavy loads at industrial facilities.
- Where the installation of permeable pavement would threaten the safety or reliability of pre-existing underground storage tanks, or pre-existing road subgrades.
- Within 50 feet from the top of slopes that are greater than 20%.
- For properties with known soil or ground water contamination (typically federal Superfund sites or state cleanup sites under the Model Toxics Control Act (MTCA)).
- Within 100 feet of a drinking water well, or a spring used for drinking water supply, if the pavement is a pollutant-generating surface.
- Where the native soils below a pollution-generating permeable pavement (e.g. road or parking lot) do not meet the Ecology soil suitability criteria for providing treatment (These criteria are listed in Section 3.3.7 of Volume III).
- At sites defined as "high use sites" in Volume V of the Manual.
- In areas with "industrial activity" as defined in 40 CFR 122.26(b)(14).

In terms of slope restrictions for the pavement itself, detention structures (such as impermeable berms) should be placed on the subgrade and below the pavement on slopes 3 percent or greater. All permeable pavement surfaces should have a minimum slope of 1-2 percent to allow for surface overflow in extreme rainfall. General recommendations for maximum slopes for permeable pavement: Porous asphalt: 5 percent; Pervious concrete: 12 percent; permeable interlocking concrete pavement: 12 percent; and the maximum slope for concrete and plastic grid systems vary by manufacturer and generally range from 6-12 percent.

The Manual suggests that for successful application of any permeable paving system, four general guidelines must be followed:

- Conduct adequate site analysis so that the permeable pavement can be appropriate to site application. Important considerations include: vehicle use; soil type and permeability; groundwater; topography and the potential for sediment inputs to the permeable pavement; surrounding pollution generating land uses; surrounding vegetation; and maintenance needs.
- Follow correct design specifications.
- Use qualified contractors or preferably certified contractors where certification programs exist.
- Control erosion and sediment during construction and throughout service life.

Erosion and introduction of sediment from surrounding land uses should be strictly controlled during and after construction to reduce clogging of the void spaces in the subgrade, base material, and permeable surface.

Pending Changes to Ecology's Stormwater Management Manual for Western Washington

As a result of the NPDES Phase II appeals process, Ecology is considering updates to the 2012 Manual. Ecology has published draft modifications to the Manual. Some of the modifications could affect the use of pervious pavement. Some of the key changes under consideration applicable to the City of Monroe's consideration of pervious pavement are noted below.

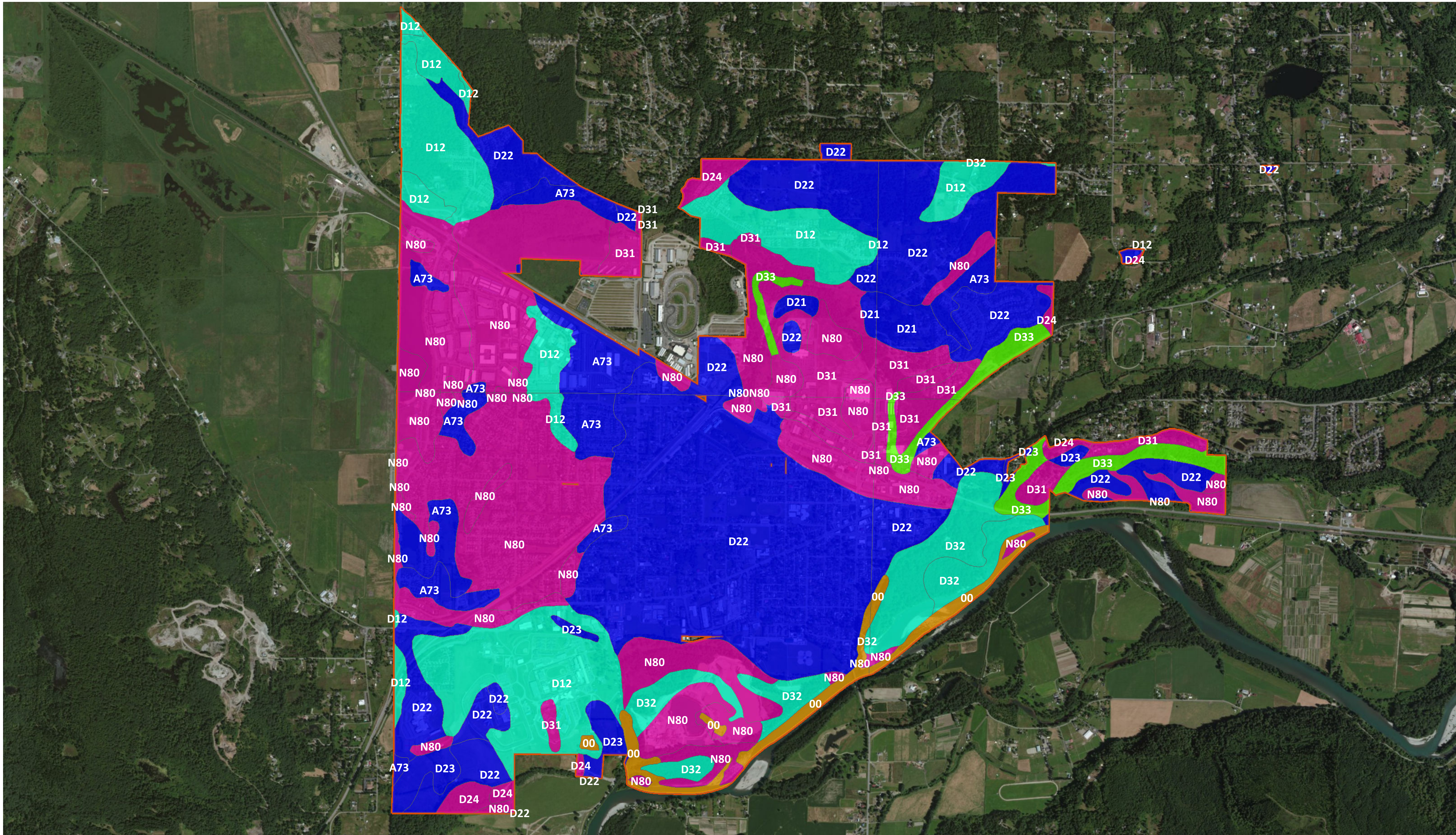
- The Manual will discourage impervious pavement draining to pervious pavement via sheet flow unless the area of the pervious pavement is greater than the impervious pavement. For example they would discourage a 12-ft impervious travel lane sheet flowing to an 8-ft pervious shoulder (unless the pavement, base course, and subgrade have been designed to accept runoff from adjacent impervious surfaces).

- The additional infeasibility criteria such that … "Roads and areas that bear more than very low traffic volumes or very low truck traffic" (e.g. where the roads type is classified as arterial or collector rather than access). The Manual revision considers residential access roads to receive only very low traffic volume and very low truck traffic. It also references RCW 35.78.010, RCW 36.86.070, and RCW 47.05.021, and the WSDOT Functional Classification Map for definition of road use.
- A local government may designate geographic areas within which permeable pavement, or certain permeable pavement applications, may be designated as infeasible due to year-round, seasonal or periodic high groundwater conditions, or due to inadequate infiltration rates. Designations must be based upon a preponderance of field data, collected within the area of concern, that indicate a high likelihood of failure to achieve the minimum groundwater clearance or infiltration rates identified in the above infeasibility criteria. The local government must develop a technical report, and make it available upon request by the Dept. of Ecology.

SCS Soils/GIS Analysis

Due to the importance of adequate subsoil conditions for the suitability of pervious pavement, and to provide some additional information regarding the locations within the City that may be either more or less favorable, Soil Conservation Service (SCS) Soils mapping was reviewed and characterized. In 1983, Snohomish County soils were classified according to SCS soil survey maps units. Generally, there are 82 different map units consisting of various combinations of soils and slope conditions. Within the City of Monroe, 10 out the 82 map units are present. These map units are shown on Figure 1 and are listed in Table 1. This table also shows the hydrologic soil group of each map unit, as well as some information about the composition of the soil, the permeability of the substratum and the approximate depth to the hard pan. This information can be used to help assess whether the subsoils create favorable, less favorable or unfavorable conditions for the installation of permeable pavement (or other LID infiltration techniques). Note this analysis is strictly based on the SCS soil survey and does not categorically rule out the feasibility of installing permeable pavement in areas designated as unfavorable.

Geotechnical studies of the soils at specific sites being considered would provide more exact and reliable information. Generally though, Figure 1 shows that much of the soils within the City fall into maps units and hydrologic soil groups A and B that would provide favorable conditions allowing the installation of permeable pavements. These areas have permeable substrate made of glacial outwash or sand and typically have at least 5 feet deep permeable subsurface conditions (to glacial till substratum). Hydrologic soil group C is listed as less favorable conditions. These soils typically have a depth to hard pan on the order of 20 to 40 inches, which may not be sufficient for permeable pavement. Unfavorable conditions also include areas with hydrologic soil group D where the soils are organic, the substratum has low permeability or a seasonal water table is perched at shallow depths.



N

1 inch = 2,000 feet

Feet

0 1,000 2,000 4,000

Hydrologic Soil Group

A B C D Not Specificied

Figure 1

City of Monroe Soils Map

Louis Berger

Table 1
Summary of City Area Soils and Preliminary Suitability for Pervious Pavement
City of Monroe - Stormwater Master Plan Update

Soil Group	Name	Info from SCS Soil Survey (SCS, 1983)	Potential for Permeable Pavement
A	Winston Gravelly Loam, 0 to 3% slope	Deep, somewhat excessively drained soil formed in glacial outwash and volcanic ash Permeability is moderate to the lower part of the substratum (at least 60 inches) and very rapid through it Effective rooting depth is 60 inches or more Low potential for heavy runoff and erosion	Favorable
C	Tokul Gravelly Loam, 8 to 15% slope	Moderately deep, moderately well drained soil formed in glacial till and volcanic ash Permeability is moderate to the hardpan and very slow through it Effective rooting depth is limited by a seasonal perched water table that is at a depth of 18 to 36" from November to May Average hard pan depth = 31 inches (depth to hardpan varies from 20 to 40 inches) Low erosion potential	Less Favorable
D	Cryohemists, nearly level	Deep very poorly drained soils usually in depressional areas on high ridgetops Made from layers of organic materials, thickness varies from 16 to 60" Permeability is moderately slow and available water content is high Effective rooting depth is limited by a seasonal water table a depth of 0 to 10"	Unfavorable
C	Getchell Silt Loam, 3 to 30% slope	Moderately deep, moderately well drained soil formed in glacial till and volcanic ash Permeability is moderate to the dense glacial till and very slow through it Depth to glacial till varies from 20 to 40 inches and typically averages 36 inches Effective rooting depth is limited by a seasonal perched water table that is at a depth of 18 to 36" from November to May Low erosion potential	Less Favorable
C	Getchell Oso Complex, 15 to 30% slope	Intricately intermingled mix of Getchell Silt Loam (21) and Oso Gravelly Loam which is similar to the Getchell Silt Loam except that it could be underlain by andesite as well as glacial till. The andesite layer depth averages 29 inches and ranges from 20 to 40 inches.	Less Favorable
C	Getchell Oso Rock Outcrop Complex, 30 to 65% slope	55% Getchell Silt Loam (21) , 30% Oso Gravelly Loam and 10% Rock Outcrop Mainly woodland, watershed and wildlife habitat Seasonal perched water table	Unfavorable
A	Greenwater Loamy Sand	Very deep excessively drained soil on terraces Substratum is dark gray sand at a depth of 60 inches or more Effective rooting depth at 60 inches or more Permeability is rapid and water content is low and runoff potential is low	Favorable
A	Lynnwood Nagar Complex, 65 to 90% slope	Map unit is 60% Lynnwood Loamy Sand (30) and 25% Nagar Fine Sandy Loam Lynnwood soil is deep excessively drained soil formed in glacial outwash Lynnwood soil permeability is rapid, runoff potential is low and water content is low Lynnwood soil substratum to a depth of 60 inches or more is grayish brown sand Nagar soil is very deep and excessively drained and is formed in Sandy Alluvium and Volcanic Ash Nagar soil permeability is moderate, water capacity is moderate and any runoff would be rapid Nagar soil substratum to a depth of 60 inches or more is very gravelly loamy sand	Favorable

Soil Group	Name	Info from SCS Soil Survey (SCS, 1983)	Potential for Permeable Pavement
D	McKenna Gravelly Silt Loam, 0 to 8% slope	Moderately deep poorly drained soil in depressional areas formed in glacial till Glacial till is at an average depth of 33 inches, depth ranges from 20 to 40 inches Permeability is slow Effective rooting depth 20 to 40 inches Seasonal perched water table at a depth of zero to 6 inches Mainly used as woodland and for hay and pasture	Unfavorable
B	Menzel Silt Loam, 0 to 3% slope	Very deep well drained soil on terraces formed in alluvium and volcanic ash Substratum to a depth of 60 inches or more is fine sandy loam or sand mixed with gravelly sand Permeability is moderate, available water capacity is high, runoff is slow and flooding is rare Effective rooting depth is 60 inches or more	Favorable

Notes:
1. The effect of a layer of dense glacial till on soil use and management is similar to that of a hardpan

Informal Discussions with Other Agencies

As previously noted, the consultant team conducted a brief informal inquiry to a number of jurisdictions to obtain input on their policies regulating the use of pervious pavement.

<u>City of Olympia (phone with Eric Christianson)</u>

In terms of existing pervious pavement in use at the City includes:

- 5 mi. pervious concrete sidewalk
- 700 lf of permeable interlocking pavers
- 200 ft. (testing section) of porous asphalt along major collector (currently being monitored
- 600 ft. road section of impervious pavement with underdrain reservoir system (where road runoff is treated via bio retention or filter system before discharging to the underdrain system below the road). This was not a pervious pavement project, but was designed with an underdrain reservoir system under the impervious pavement such that it acts similar to a pervious pavement project.
- 3700 ft. pervious concrete bike path
- 1700 feet porous asphalt bike shoulders
- 2.5 acres of porous asphalt parking area around city-owned facilities
- 50 acres of various porous asphalt, pervious concrete with private held lands

Comments on their use of pervious pavement:

- City interprets LID manual as allowing for pervious pavement only on low loading roads (residential cul-de-sac). Although they are taking it a step further and discouraging its use on any public travel lane. They would likely look at other LID options to implement before using pervious pavement on public travel lanes, such as using the underdrains in a porous reservoir under an impervious road. In general, their Transportation Department would prefer not to deal with it.

- The use of porous pavement for a bike lane on the road should has had mixed results. The adjacent impervious travel lanes wash the sediment to the bike lane to reduce effectiveness. Thus, it takes lots of maintenance.
- The test case for the major collector has not gone particularly well. The perviousness has diminished but is still ok, but the wearing surface has suffered extreme wear. The adjacent parallel parking lane is worn, particularly, where cars turn their wheels when standing still (using power steering). The wheel rotation action degrades the wearing course.

City of Puyallup (Discussion with Steve Carsten's)

The City is pursuing pervious pavement at any location that is deemed suitable (has the correct soils for infiltration and separation from groundwater). The City Engineer, Mark Palmer, P.E., is one of the area's leading experts on porous asphalt. Through his experience and knowledge, the City tries to look at permeable pavements as a solution over traditional non-porous pavement in almost every instance.

Regarding the City's experience and when asked if they've found anything to help shape where the City will use it in the future (i.e., is the City applying any restrictions in its use considering any lessons learned on past projects), their response was:

For porous asphalt, we have found the following changes would be incorporated in the future:

1. Use a raised curb or raised curb/gutter (similar to a curb and gutter in lieu of a single 6"x18" deep restraining curb). The raised curb would have curb cuts which are depressed, not flush, to the adjacent asphalt. We are finding the road maintenance staff expects a curb to guide them as they sweep the roadway. Similarly, the motoring public use the curb edge to guide them when they park along the street.
2. Vibratory compaction is needed (at the proper temperature) despite any resistance you would/will get from the paving community. It helps with durability.
3. No crown or slopes are needed.
4. 1 ¼" minus – rock is sufficient to use as a permeable base choker course. This is opposed to a 1 ¼" clean rock. We have found suppliers around here do not supply heavy fines with the 1 ¼" minus around here. If they have to wash the rock to flush the fines out, the cost increases for little to no benefit.

Porous Concrete:

Give contractors room to work with on both sides of the project. They need this room to work with a screed. Also, staging is critical for instances where the road would be under traffic. For the 39th Ave SW project, the City is still analyzing how the roadway can be built with pervious concrete and keep traffic on it during the curing time.

Regarding the City's Technical Manual and pervious pavement, they are generally adhering to the requirements listed in the LID tech manual, and are not more restrictive.

The City was also asked about installed pervious pavement in an area with street trees, and whether there has been issues with performance or requirements for more frequent maintenance? The City responded that it had not currently installed permeable pavements with streets trees, but they are currently designing Shaw Road, (23rd to 39th) using TIB funds that would incorporate a center median containing street trees. This project would utilize a pervious concrete pavement cross section for the arterial lanes. It also has a dedicated bicycle path adjacent to the road section which will be porous asphalt pavement.

Subsequent to the telephone conversation with Steve Carsten's, a follow up call was made with Mark Palmer. Regarding the tree question Mark responded that pervious pavement may even hold up better than regular pavement because the pavement section is thicker and therefore less subject to tree root uplift.

Mark also suggested avoiding having a roadway section that is impervious for the travel lanes and then pervious for the shoulders/bike lanes. In their experience, it just creates clogging problems at the interface. It's better to have the whole road as pervious.

<u>Snohomish County (phone conversation with Bob McEwen)</u>
To date, Snohomish County has just used pervious pavement on pedestrian facilities and has not installed it on roads. At this same time, the County is in the process of updating their LID manual requirements which will allow pervious pavement for roads. The County's intent is to follow Ecology's guidance for pervious pavement and with very strict adherence to the Infeasibility criteria. That is, they plan to not allow it if the infeasibility criteria apply so as not to inherit a future problem as roads are dedicated to the County.

<u>Additional Miscellaneous Pervious Pavement Discussion from the November 5&6 Washington State Municipal Stormwater Conference. Staff from Louis Berger attended this conference which had individual conference program discussions on pervious pavement. Some of the applicable commentary regarding its use during these discussions are noted below.</u>

Michael O'Neil (King County)

- Typically permeable pavement needs to be installed in large batches (because production plant has to completely reset), so small projects are sometimes problematic.
- Pervious pavement wears more under traffic. His estimate was that pervious pavement could decrease life by one-half compared to impermeable pavement.

- The County has had significant problems with moss growth on porous concrete. Moss limits the porosity such that the pavement is much less or not permeable, and thus has required much more maintenance in attempts to keep it clean. It has almost reached a point, where they will not use porous concrete in the future.

Jessica Knickerbocker (City of Tacoma)

- In situations where the City had an impermeable pavement travel lane next to a pervious pavement shoulder, the City found that for the first 3 years, the impervious pavement released small particles, so that during this period the pervious pavement needed more maintenance.
- She also noted that when using curbing along permeable pavement, to make sure that the horizontal radius for the curbing is large enough for the street sweepers. Otherwise there is an area that doesn't get maintained and will pond.

Mark Palmer (City of Puyallup)

- Indicated that the cost for use of pervious pavement was less than regular pavement, when accounting for the reduction in stormwater infrastructure (and land acquisition for ponds/facilities).
- There is a draft specification in WSDOT format that is being developed that will be available soon.

Conclusions and Recommendations

The following conclusions and recommendations were developed based on the data gathering from pervious pavement guidance documents, input from other jurisdictions, considerations of the proposed pervious pavement standard changes being considered by Ecology as a part of the 2012 Manual update, and the GIS mapping exercise.

- The application and understanding of pervious pavement is still in its learning stage and there is a wide variety of perceptions from municipalities on its use and success. There have been failures and the industry is learning from past experience. Many jurisdictions are still hesitant in proposing wide application. Yet at the same time, some jurisdictions (e.g., Puyallup) are fully embracing pervious pavement and expanding its use.
- Because the perception is still mixed, and the industry is learning from experience at a relatively fast pace, it is recommended that the City pursue pervious pavement somewhat on the cautious side, so as not to create a non-significant increase in roadway maintenance demands.
- Should grant funding be available, the City should always consider capitalizing on maximizing surface water benefits when projects can be implemented at low costs.

- The City has already successfully applied for and received grant funding for pervious pavement projects.
- The City should consider the following recommendations:
- The City should use Figure 1 as a general guidance for initial consideration of where pervious pavement should be considered. Although there are certain to be exceptions due to the variability of soils, this map can be used as an initial indicator.
- Until more data is developed, the City should consider following the proposed changes to Ecology's Manual. These include;
    - Pervious pavement should be not be considered on non-residential roads (i.e., arterials and commercially used roadways) (note, this does not apply to sidewalks along these roadways), and
    - Avoid configurations where impervious pavement "runon" has a larger surface area than the adjacent pervious pavement (unless the pavement, base course, and subgrade have been designed to accept runoff from adjacent impervious surfaces).
- The City should generally employ the infeasibility criteria listed in the manual.
- The City should avoid porous concrete in shaded areas (due to potential of moss growth)
- The City should monitor the development of the WSDOT specification for pervious pavement, and use it when it becomes available.
- The City should continue to seek grant funding for pervious pavement opportunities.

Appendix SW-C

Detailed Cost Information

City of Monroe
2015 Stormwater Comprehensive Plan Update
Planning Level Opinion of Probable Project Costs - Blueberry Lane
Prepared by: T. McClaskey
Checked by:
1/30/2015

Item No.	Item Description	Unit	Quantity	Unit Price	Amount
1	Mobilization	LS	1	$ 77,297	$ 77,297
2	Traffic Control Labor and Equipment	LS	1	$ 825	$ 825
3	Erosion/Water Pollution Control	LS	1	$ 14,900	$ 14,900
4	Removal of Obstructions and Trees	LS	1	$ 5,000	$ 5,000
5	Utility Potholing	HR	8	$ 300	$ 2,400
6	18-inch PVC Sewer Pipe, SDR 35	LF	165	$ 128	$ 21,120
7	Trench Safety System	LS	1	$ 825	$ 825
8	Infiltration Vault Excav & Backfill	CY	6100	$ 30	$ 183,000
9	Infiltration Vault Excav & Haul/Dispose	CY	3400	$ 20	$ 68,000
10	Infiltration Vault	LS	1	$ 343,400	$ 343,400
11	Pre-Treatment	LS	1	$ 19,300	$ 19,300
12	54-inch Dia Manhole, 0' to 8' deep	EA	1	$ 6,400	$ 6,400
13	54-inch Dia Manhole, extra depth	VF	6	$ 300	$ 1,800
14	CDF/Drainage Rock	CY	370	$ 130	$ 48,100
15	Extruded Concrete Curb	LF	150	$ 100	$ 15,000
16	Sidewalk	SY	30	$ 100	$ 3,000
17	Restoration	SY	5000	$ 5	$ 25,000
18	Minor Change	MC	1	$ 14,900	$ 14,900

Subtotal	$850,267
30% Contingency	$ 255,080
Subtotal	$ 1,105,347
9.0% State Sales Tax	$ 99,481
Estimated Total Construction Costs	**$ 1,204,828**
PROJECT ALLIED COSTS	
Engineering Design, Survey, Geotechnical and Permits	$ 144,579
Construction Services	$ 84,338
District Project Administration	$ 24,097
Legal	$ 12,048
Subtotal Project Allied Costs	**$ 265,062**
Total Estimated Project Costs	**$ 1,469,891**

The opinion of probable cost herein is based on our perception of current conditions at the project location. This estimate reflects our professional opinion of accurate costs at this time and is subject to change as the project design matures. BHC Consultants has no control over variances in the cost of labor, materials, equipment; nor services provided by others, contractor’s means and methods of executing the work or of determining prices, competitive bidding or market conditions, practices or bidding strategies. BHC Consultants cannot and does not warrant or guarantee that proposals, bids, or actual construction costs will not vary from the costs presented as shown.

City of Monroe
2015 Stormwater Comprehensive Plan Update
Planning Level Opinion of Probable Project Costs - Intersection of Blueberry Ln and N Kelsey St
Prepared by: T. McClaskey
Checked by:
1/30/2015

Item No.	Item Description	Unit	Quantity	Unit Price	Amount
1	Mobilization	LS	1	$ 35,530	$ 35,530
2	Project Temporary Traffic Control	LS	1	$ 9,668	$ 9,668
3	Erosion/Water Pollution Control	LS	1	$ 6,445	$ 6,445
4	Utility Potholing	HR	8	$ 300	$ 2,400
5	Dewatering	LS	1	$ 750	$ 750
6	Sheeting, Shoring and Bracing	LS	1	$ 750	$ 750
7	Sawcutting Pavement	LF	476	$ 4	$ 1,904
8	Pavement Removal	SY	583	$ 20	$ 11,667
9	12-inch PVC Sewer Pipe, SDR 35	LF	150	$ 61	$ 9,150
10	Infiltration Vault Excav & Backfill	CY	400	$ 30	$ 12,000
11	Infiltration Vault Excav & Haul/Dispose	CY	700	$ 20	$ 14,000
12	Infiltration Vault Shoring	SF	1800	$ 30	$ 54,000
13	Infiltration Vault	LS	1	$ 139,000	$ 139,000
14	Pre-Treatment	LS	1	$ 12,500	$ 12,500
15	Type 2 Catch Basin 48"	LS	1	$ 3,000	$ 3,000
16	CDF/Drainage Rock	CY	150	$ 100	$ 15,000
17	Class B Asphalt	TN	70	$ 100	$ 7,000
18	Asphalt Treated Base (ATB)	TN	120	$ 100	$ 12,000
19	CSTC	TN	90	$ 35	$ 3,150
20	Extruded Concrete Curb	LF	200	$ 100	$ 20,000
21	Sidewalk	SY	40	$ 100	$ 4,000
22	Restoration	LS	1	$ 10,152	$ 10,152
23	Minor Change	MC	1	$ 6,768	$ 6,768

Subtotal		$336,040
30% Contingency	$	100,812
Subtotal	$	436,852
9.0% State Sales Tax	$	39,317
Estimated Total Construction Costs	**$**	**476,169**
PROJECT ALLIED COSTS		
Engineering Design, Survey, Geotechnical and Permits	$	57,140
Construction Services	$	33,332
District Project Administration	$	9,523
Legal	$	4,762
Subtotal Project Allied Costs	**$**	**104,757**
Total Estimated Project Costs	**$**	**580,926**

The opinion of probable cost herein is based on our perception of current conditions at the project location. This estimate reflects our professional opinion of accurate costs at this time and is subject to change as the project design matures. BHC Consultants has no control over variances in the cost of labor, materials, equipment; nor services provided by others, contractor's means and methods of executing the work or of determining prices, competitive bidding or market conditions, practices or bidding strategies. BHC Consultants cannot and does not warrant or guarantee that proposals, bids, or actual construction costs will not vary from the costs presented as shown.

City of Monroe
2015 Stormwater Comprehensive Plan Update
Planning Level Opinion of Probable Project Costs - Lake Tye
Prepared by: T. McClaskey
Checked by:
1/30/2015

Item No.	Item Description	Unit	Quantity	Unit Price	Amount
1	Mobilization	ls	1	$ 5,494	$ 5,494
2	Project Temporary Traffic Control	ls	1	$ 750	$ 750
3	Erosion/Water Pollution Control	ls	1	$ 1,011	$ 1,011
4	Utility Potholing	hr	8	$ 300	$ 2,400
5	Dewatering	LS	1	$ 750	$ 750
6	Sheeting, Shoring and Bracing	LS	1	$ 750	$ 750
7	Sawcutting Pavement	LF	300	$ 4	$ 1,200
8	Pavement Removal	SY	56	$ 20	$ 1,111
9	30-inch PVC Sewer Pipe, SDR 35	lf	150	$ 175	$ 26,250
10	Trench Safety System	ls	1	$ 750	$ 750
11	Class B Asphalt	TN	10	$ 100	$ 1,000
12	Asphalt Treated Base (ATB)	TN	20	$ 100	$ 2,000
13	CSTC	TN	10	$ 35	$ 350
14	Extruded Concrete Curb	lf	50	$ 100	$ 5,000
15	Sidewalk	sy	40	$ 100	$ 4,000
16	Maintenance: Bioswale Clearing and Grubbing	sy	1000	$ 1	$ 1,000
17	Maintenance: Bioswale Planting	sy	1000	$ 4	$ 4,000
18	Restoration	ls	1	$ 1,570	$ 1,570
19	Minor Change	mc	1	$ 1,046	$ 1,046

Subtotal		$54,938
30% Contingency	$	16,482
Subtotal	$	71,420
9.0% State Sales Tax	$	6,428
Estimated Total Construction Costs	**$**	**77,848**
PROJECT ALLIED COSTS		
Engineering Design, Survey, Geotechnical and Permits	$	9,342
Construction Services	$	5,449
District Project Administration	$	1,557
Legal	$	778
Subtotal Project Allied Costs	**$**	**17,127**
Total Estimated Project Costs	**$**	**94,974**

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City of Monroe
2015 Stormwater Comprehensive Plan Update
Planning Level Opinion of Probable Project Costs - Lords's Lake Option 1
Prepared by: T. McClaskey
Checked by:
1/30/2015

Item No.	Item Description	Unit	Quantity	Unit Price	Amount
1	Mobilization	LS	1	$ 23,784	$ 23,784
2	Project Temporary Traffic Control	LS	1	$ 675	$ 675
3	Erosion/Water Pollution Control	LS	1	$ 4,428	$ 4,428
4	Utility Potholing	HR	8	$ 300	$ 2,400
5	Cleaning out ditch (clearing and grubbing?)	SY	1500	$ 1	$ 1,500
6	Dewatering	LS	1	$ 500	$ 500
7	Sheeting, Shoring and Bracing	LS	1	$ 500	$ 500
8	Sawcutting Pavement	LF	270	$ 4	$ 1,080
9	Pavement Removal	SY	250	$ 20	$ 5,000
10	24-inch PVC Sewer Pipe, SDR 35	LF	100	$ 121	$ 12,100
11	Treatment Vault Excav & Backfill	CY	400	$ 30	$ 12,000
12	Treatment Vault Excav & Haul/Dispose	CY	700	$ 20	$ 14,000
13	Treatment Vault Shoring	SF	630	$ 30	$ 18,900
14	Treatment Vault and Cartridges	LS	1	$ 138,000	$ 138,000
15	CDF/Drainage Rock	CY	20	$ 100	$ 2,000
16	Class B Asphalt	TN	30	$ 100	$ 3,000
17	Asphalt Treated Base (ATB)	TN	50	$ 100	$ 5,000
18	CSTC	TN	40	$ 35	$ 1,400
19	Extruded Concrete Curb	LF	20	$ 100	$ 2,000
20	Sidewalk	SY	20	$ 100	$ 2,000
21	Restoration	LS	1	$ 6,794	$ 6,794
22	Minor Change	MC	1	$ 4,563	$ 4,563

Subtotal	$230,338
30% Contingency	$ 69,101
Subtotal	$ 299,439
9.0% State Sales Tax	$ 26,950
Estimated Total Construction Costs	**$ 326,389**
PROJECT ALLIED COSTS	
Engineering Design, Survey, Geotechnical and Permits	$ 39,167
Construction Services	$ 22,847
District Project Administration	$ 6,528
Legal	$ 3,264
Subtotal Project Allied Costs	**$ 71,806**
Total Estimated Project Costs	**$ 398,194**

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City of Monroe
2015 Stormwater Comprehensive Plan Update
Planning Level Opinion of Probable Project Costs - Lord's Lake Option 2
Prepared by: T. McClaskey
Checked by:
1/30/2015

Item No.	Item Description	Unit	Quantity	Unit Price	Amount
1	Mobilization	LS	1	$ 2,185	$ 2,185
2	Project Temporary Traffic Control	LS	1	$ 500	$ 500
3	Erosion/Water Pollution Control	LS	1	$ 1,000	$ 1,000
4	24" Flap Gate	EA	1	$ 5,000	$ 5,000
5	Rip Rap/ Quarry Spalls	TN	65	$ 100	$ 6,507
6	Maintenance: Bioswale Clearing and Grubbing	SY	1,700	$ 2	$ 3,400
7	Maintenance: Bioswale Planting	SY	1,100	$ 4	$ 4,400
8	Restoration	LS	1	$ 624	$ 624
9	Minor Change	MC	1	$ 416	$ 416

Subtotal		$21,847
30% Contingency	$	6,554
Subtotal	$	28,401
9.0% State Sales Tax	$	2,556
Estimated Total Construction Costs	**$**	**30,957**
PROJECT ALLIED COSTS		
Engineering Design, Survey, Geotechnical and Permits	$	3,715
Construction Services	$	2,167
District Project Administration	$	619
Legal	$	310
Subtotal Project Allied Costs	**$**	**6,811**
Total Estimated Project Costs	**$**	**37,768**

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Appendix SW-D

Documentation for Hydrologic Analysis

WWHM2012 Model Results

	Water Quanity	Blueberry Ln	Park+Blueberry Ln	Intersection	Lake Tye A+B	Lords Lake
On-line BMP	24 hr Volume (ac-ft)	1.70	1.74	0.49	7.56	1.61
On-line BMP	Standard Flow Rate (cfs)	2.46	2.46	0.76	12.68	2.40
Off-Line BMP	Standard Flow Rate (cfs)	1.39	1.39	0.43	6.92	1.35

Land Use Summary for WWHM2012 Hydrologic Input in acres

Sub-Basin	Impervious Area		Pervious Area		Impervious %	Total Acres
	Roads	Roof	Lawn	Ditch/Swale		
Blueberry Ln	4.9	8.2	5.4	0.0	71%	**18.5**
Intersection	3.4	0.6	0.4	0.0	91%	**4.4**
Lords Lake	6.3	8.0	2.7	0.0	84%	**17.0**
Lake Tye Total	35.0	72.9	61.7	2.8	63%	**172.5**
Lake Tye A	*11.6*	*22.6*	*17.9*	*0.0*	*66%*	*52.1*
Lake Tye B	*9.1*	*19.3*	*14.6*	*1.4*	*64%*	*44.4*
Lake Tye C	*14.3*	*31.1*	*29.2*	*1.4*	*60%*	*76.0*

Zoning Areas by Sub-Basin

Land Use Designations	**Impervious %**	**Area (ac)**			
		Blueberry Ln	Intersection	Lake Tye	Lords Lake
Urban Residential	75%	6.86		107.05	8.91
Multi-Family Res	75%	3.68			
Undeveloped (Vacant)	5%	1.29	0.22	1.09	0.33
Common Area	30%	0.46		3.68	
Warehousing	100%		0.52	0.37	
Retail	100%		0.05		
Hotel / Motel	100%		1.17		
Parks/ Recreation	30%			7.67	
School	100%			5.48	
Ditch/Swale	0%			5.98	
Motor Vehicles	95%				1.40
ROW	95%	5.21	3.57	24.36	6.61