Kitsap County Manchester Sewer Facilities Strategy Plan

October 2014

BHC CONSULTANTS

Acknowledgments

Manchester Sewer Facilities Strategy Plan

October 2014

Board of County Commissioners

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10/24/2014

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List of Abbreviations

AAF	Annual Average Flow
AC	Asbestos Cement
ADF	Average Design Flow
CIP	Capital Improvement Plan
County	Kitsap County
DHI	Danish Hydraulic Institute
DMR	Daily Monitoring Report
DOE	Department of Ecology
EPA	Environmental Protection Agency
ERU	Equivalent Residential Unit
FC	Fecal Coliform
FOG	Fats, Oils, and Grease
GIS	Graphical Information Systems
gpcd	Gallons per Capita Per Day
gpd	Gallons per Day
I/I	Infiltration and Inflow
IPS	Individual Pump Stations, Influent Pump Station
KPHD	Kitsap Public Health Department
LAMIRD	Limited Area of More Intense Rural Development
LID	Local Improvement District
mgd	Million Gallons per Day
MTP	Manchester Sewage Treatment Plant
MVC	Manchester Village Commercial
MVLR	Manchester Village Low Residential
MVR	Manchester Village Residential
O&M	Operation and Maintenance
PIC	Pollution Identification and Correction
Plan	Facilities Strategy Plan
PVC	Polyvinyl Chloride
RAS	Return Activated Sludge
RCW	Revised Code of Washington
RDII	Rain-Dependent Infiltration/Inflow
SAE	Small Area Estimates
SBR	Settling Batch Reactor
SCADA	Supervisory Control and Data Acquisition
SEPA	State Environmental Policy Act
SSM	Scum System
STEP	Septic Tank Effluent Pump
TDH	Total Dynamic Head
UGA	Urban Growth Area
ULCA	Updated Land Capacity Analysis
ULID	Utility Local Improvement District
UV	Ultraviolet
WAC	Washington Administrative Code
WAS	Waste Activated Sludge

Executive Summary

The Manchester area is classified as a Limited Area of More Intense Rural Development or LAMIRD. Manchester is located in Kitsap County approximately 6 miles east of Port Orchard and approximately 20 miles north of Gig Harbor, directly west of Puget Sound. A vicinity map is shown on Figure 1-1. According to the United States Census, the 2010 population of Manchester was 5,413 persons. 60 percent of the LAMIRD is unsewered. Manchester is primarily residential; an EPA lab and Naval Depot Station makeup of the large percentage of the commercial area.

The sewer system was first established in 1969 by Sewer District 3, and was financed and built by a Utility Local Improvement District (ULID). Ownership of the system was transferred to Kitsap County in 1976. Kitsap County continues to own, operate and maintain the sewer facilities in Manchester. The system consists of gravity pipe, force main piping, pump stations and a sewage treatment plant. The Manchester Sewage Treatment Plant (MTP) is permitted to treat up to 460,000 gallons per day (gpd) average flow for the maximum month.

Manchester's maximum population is expected to be just over 8,300 persons based on current zoning and the County's most recent Land Capacity Analysis. The LAMIRD's sewer service area is expected to grow from the current sewered area of approximately 460 acres to the total LAMIRD area of approximately 1,130 acres.

This Plan evaluates future facilities required to accommodate both existing and future sewage collection and conveyance needs for the next six years (2014 through 2019) and beyond through buildout. The proposed sewer service area within the Manchester LAMIRD is consistent with the County's Growth Management Plan (GMP). The County reviews population and flows annually to make sure proposed projects track with actual growth, such that the County customers needs are continually being met.

This Facilities Strategy Plan (Plan) complies with the Washington State Department of Ecology (DOE) regulations for facilities plan (Washington Administrative Code [WAC] 173-240-050). This Plan will be approved by DOE.

E.1 Projected Population

The projected populations for the Manchester area are presented in Table E-1.

Table E-1 Sewered Population Projections

Year	Population	Source
2009	2,335	Sewered Dwelling Units x 2.5 people per Dwelling Unit
2019	3,488	Projected
2030	4,757	Projected
Build-out	8,333	Sewered Population is assumed to equal Build-out Population

E.2 Existing Sewage Facilities

There are approximately 11 miles of pipe and 6 operating sewer pump stations within Manchester's sewage collection system. The MTP is a secondary treatment plant, currently (2009-2011) operating at 64 percent of design flow capacity. The effluent is discharged into the Puget Sound through an outfall pipe extending 600 feet offshore and discharging effluent at a depth of about 35 feet. The existing sewer system is presented in Figure 3-1. Figure 3-2 highlights the septic system age of the existing Manchester septic tanks. The Kitsap Public Health Department (KPHD) is working closely with other County departments to improve public health by identifying septic risks and failures, as well as educating homeowners with septic systems on how to prevent septic failures and get the most life possible from their septic investment.

The MTP has received the DOE Outstanding Performance Award for 16 consecutive years, and is the only plant in the state to earn a perfect score (meet every condition of its permit, take every water sample, and pass every on-site inspection).

E.3 Sewage Flow Characteristics

Influent and effluent sewage flow data recorded at the MTP for the years of 2009 through 2011 were analyzed to develop the Manchester sewer flow characteristics summarized in Table E-2.

Table E-2 Projected Sewage Flows

Year	Population	Average Annual Flow (mgd)	Average Day of the Max Month		Peak Day		Peak Hour	
			Peaking Factor	Flow (mgd)	Peaking Factor	Flow (mgd)	Peaking Factor	Flow (mgd)
2009-2011	2,335	0.201	1.46	0.293	3.02	0.609	4.38	0.883
2019	3,448	0.284	1.46	0.413	3.02	0.857	4.21	1.193
2030	4,757	0.391	1.46	0.570	3.02	1.182	4.05	1.585
Build-Out	8,333	0.686	1.46	0.998	3.02	2.071	3.76	2.580

E.4 Sewage Treatment Plant Capacity Evaluation

The MTP is currently permitted to treat up to 460,000 gpd average day of the maximum month flow. The plant is not being analyzed as part of this Plan, but a brief description of the MTP is provided in the following paragraph.

The original MTP was installed in 1969 with primary treatment only. The plant was initially capable of treating up to 160,000 gpd of sewage. The plant was upgraded to secondary treatment in 1985 to comply with the Clean Water Act. Completed in 1991, Phase 1 of the upgrade provided secondary treatment for 230,000 gpd of sewage. Phase 2 of the upgrade, completed in 1998, increased the capacity to 460,000 gpd, which is the current permitted capacity. The permitted capacity of 460,000 gpd is sufficient for a population of 3,707, which is projected to occur near 2021-2022. Plans for expansion of the plant will be undertaken by the County when plant flows reach 85 percent of design capacity in compliance with the NDPES discharge permit issued by DOE.

E.5 Sewer Model

The existing sewage conveyance system was modeled using MIKE Urban software to analyze the existing facilities and evaluate their capacity and effectiveness to convey flows generated by the current and the projected future populations. The projected populations and their distributions are the basis for establishing future system requirements. The existing sewer system has sufficient hydraulic capacity to convey future flows through build-out.

E.6 Collection Facilities Improvements

The sewer piping system will be expanded primarily through developer extensions and the formation of Utility Local Improvement Districts (ULIDs). A ULID is one way to finance sewer projects that involve the affected property owners sharing in the cost of the sewer service extension. However, it is recommended to include portions of the collection and conveyance systems in conjunction with Road or Stormwater projects as funding and timing allows. Some sewers constructed as road or stormwater improvements may not actually get connected to the sewer system until a later date when the remainder of the piping system is constructed. Recommended sewer facility improvements are described below:

- Pump Stations 45, 46, and 47 will reach the end of their design lives and are projected for rehabilitation between 2014 and 2018.
- Pump Stations 48, 49, and 50 will reach the end of their design lives and are projected for rehabilitation between 2020 and 2033.
- Beach Line cured-in-place pipe repair in Basins 45, 46, and 47 should be completed by 2015.
- Alaska Avenue gravity sewer should be completed by 2019 in conjunction with road paving and stormwater improvements (Transportation Improvement Program #50).
- Beach Drive gravity sewer and force main should be completed by 2019 in conjuction with road paving and stormwater improvements (Transportation Improvement Program #49).
- Chester Road gravity sewer should be completed by 2017 in conjunction with the road paving and stormwater improvements (Transportation Improvement Program #45).
- Manchester Treatment Plant Influent Pump Station rehabilitation is recommended to minimize groundwater infiltration and address corrosion, and should be completed by 2017.
- Sewer extension projects will provide service into currently unsewered areas and will include gravity pipeline in Basins A, B, C, D, E, F, G, H, 50, and WWTP; two pump

stations PS-A1 and PS-F1; force main from PS-F1, and individual pump stations (IPS) in Basin F.
- Operations and Maintenance projects in Basins 49 and E by 2019 to replace gravity sewer pipe bellies and faulty tees.

A cost effectiveness analysis was performed for Pump Stations 45, 46, 47 and associated beachlines. The Cost Effectiveness Analysis is included as Appendix H, and complies with the requirements of WAC 173-98-730.

Several additional programs are recommended for review, but are not included in the capital improvement program at this time, to maintain the capacity of the existing sewer collection system. These are described below:

- As pipes continue to age, a regular program of pipe replacement would gradually bring these segments up to modern standards.
- Infiltration and inflow (I/I) is not believed to be a significant issue for the sewer system as discussed in Chapter 4. Local I/I problem areas may exist however, and so it is recommended that an I/I reduction program be instituted. Better flow monitoring at individual pump stations will facilitate this analysis.
- Television inspection of a portion the sewer system each year would allow maintenance concerns to be identified and direct maintenance funds to the most cost-effective locations.
- Fats, oils, and grease (FOG) accumulations are a concern with most sewer systems in that these deposits may plug pipes and cause sewer overflows. An active study to the effectiveness of the current County FOG program and development of improved practices will contribute to better operating efficiencies.
- Asset management will be enhanced when the above programs are in place. Once in place, an updated asset management program will aid the County to make the best use of available sewer utility funds.

Total annual 6-year CIP costs total approximately $7,109,000, are listed in Table E-3 and presented in Exhibit E-1. These components are identified only to a preliminary level of design that will need to be refined during final design. The 6-year CIP is a component of the County's "Capital Facilities Plan" that is available at www.kitsapgov.com/dcd/community_plan/comp_plan/capital_facilities.htm.

Table E-3 Capital Improvements - 2014 through 2019 Estimated Project Costs in 2013 Dollars

Capital Improvement	2014	2015	2016	2017	2018	2019	Total
Pump Station 45 Rehabilitation and Force Main	$240,800	$103,200		$876,000			$1,220,000
Pump Station 46 Rehabilitation	$217,000	$93,000	$714,000				$1,024,000
Pump Station 47 Rehabilitation	$217,000	$93,000			$714,000		$1,024,000
Beach Line CIPP Repair in Basins 45, 46 and 47	$130,200	$667,800					$798,000
Gravity Pipeline and Force Main from PS-A1 in Basin A (Beach Drive) – Joint Project with Trans/Storm						$731,000	$731,000
Gravity Pipeline in Basin B (Chester Road and Alaska Avenue) – Joint Project with Trans/Storm				$663,000			$663,000
Gravity Pipeline in Basin C (Alaska Avenue) – Joint Project with Trans/Storm						$111,000	$111,000
Gravity Pipeline in Basin G (Alaska Avenue) – Joint Project with Trans/Storm					$327,000		$327,000
Gravity Pipeline in Basin H (Alaska Avenue) – Joint Project with Trans/Storm			$544,000				$544,000
MTP Influent Pump Station Rehabilitation				$667,000			$667,000
6-Year CIP Subtotal	**$805,000**	**$957,000**	**$1,258,000**	**$2,206,000**	**$1,041,000**	**$842,000**	**$7,109,000**

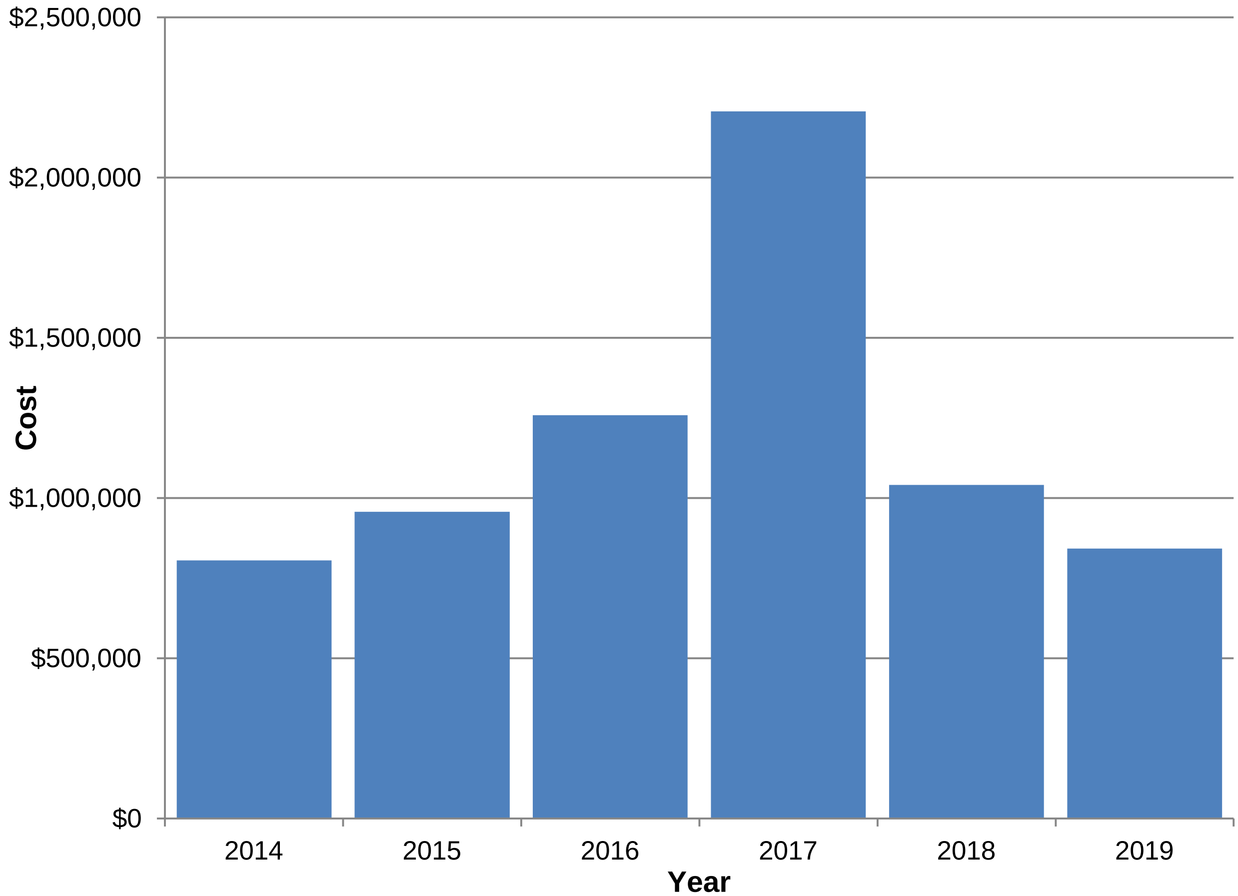


Exhibit E-1 Capital Improvements – 2014 through 2019

E.7 Sustainability

Kitsap County owns and operates the MTP. At this time, the MTP does not produce any reclaimed water; all effluent is discharged to the Puget Sound.

In other communities, potential reclaimed water customers include schools, parks, golf courses, and agriculture, where reclaimed water could be used for irrigation, dual-plumbed buildings, environmental enhancement projects, or other non-potable uses. The County will evaluate potential reuse opportunities if they become available for the MTP effluent.

Kitsap County recognizes that water should not be treated as a waste stream or wasted. In 2009, the Kitsap County adopted Resolution 109-2009 – “Water as a Resource” Policy, which applies to all departments within the Kitsap County Board of Commissioners jurisdiction to treat water as a resource.

E.8 Financial

Cost per service, in terms of debt service and operation and maintenance costs, for all facilities (existing and proposed) during the planning period can be found in Chapter 10 of the Central Kitsap County Wastewater Facility Plan, Brown and Caldwell, March 2011.

E.9 Public Participation

Three Manchester Citizens’ Advisory Committee (MCAC) meetings were held in 2012 and 2013 to involve the public with the Plan preparation.

The County has the MCAC presentations available for public review; public notices and agendas, as well as presentations, are included in Appendix G.

The Kitsap County Board of County Commissioners reviewed and accepted the draft Plan prior to submittal to DOE.

Chapter 1 Introduction

The Manchester area is classified as a Limited Area of More Intense Rural Development or LAMIRD. Manchester is located in Kitsap County approximately 6 miles east of Port Orchard and approximately 20 miles north of Gig Harbor, directly west of Puget Sound. A vicinity map is shown on Figure 1-1. According to the United States Census, the 2010 population of Manchester was 5,413 persons. 60 percent of the LAMIRD is unsewered. Manchester is primarily residential; an EPA lab and Naval Depot Station makeup of the large percentage of the commercial area.

The sewer system was first established in 1969 by Sewer District 3, and was financed and built by a Utility Local Improvement District (ULID). Ownership of the system was transferred to Kitsap County in 1976. Kitsap County continues to own, operate and maintain the sewer facilities in Manchester. The system consists of approximately 11 miles of gravity pipe, 3 miles of force main piping, 6 pump stations and a wastewater treatment plant. The Manchester Sewage Treatment Plant (MTP) is permitted to treat up to 460,000 gallons per day (gpd) average flow for the maximum month.

Manchester's maximum population is expected to be just over 8,300 persons based on current zoning and the County's most recent Land Capacity Analysis. The LAMIRD's sewer service area is expected to grow from the current sewered area of approximately 460 acres to the total LAMIRD area of approximately 1,130 acres, and is consistent with the County's Growth Management Plan (GMP). This Plan evaluates future facilities required to accommodate both existing and future sewer collection and conveyance needs. The County reviews actual population and flows on an annual basis to make sure that the evaluations in this Plan reflect actual customer needs.

1.1 Background

Recent documents reflecting planning efforts and projects related to the Manchester sewage collection and treatment system include:

- *Central Kitsap County Wastewater Plan, Brown and Caldwell and BHC Consultants, March 2011*
- *Manchester Subarea Plan,* Kitsap County, adopted December 17, 2007
- Kitsap County GMP Compliance documents, 2014.

1.2 Purpose and Scope

This Facilities Plan (Plan) is prepared for Kitsap County to fulfill the requirements of Chapter 173-240-050 of the Washington Administrative Code (WAC), Chapter 90.48 of the Revised Code of Washington (RCW), and RCW 36.70A (Growth Management Act). The Plan provides the County with a comprehensive guide for managing and operating the sewer system and coordinating expansions and upgrades to the infrastructure to build-out. The WAC requirements are outlined in Table 1-1.

Table 1-1 Comprehensive Sewer Plan Requirements per WAC 173-240-050

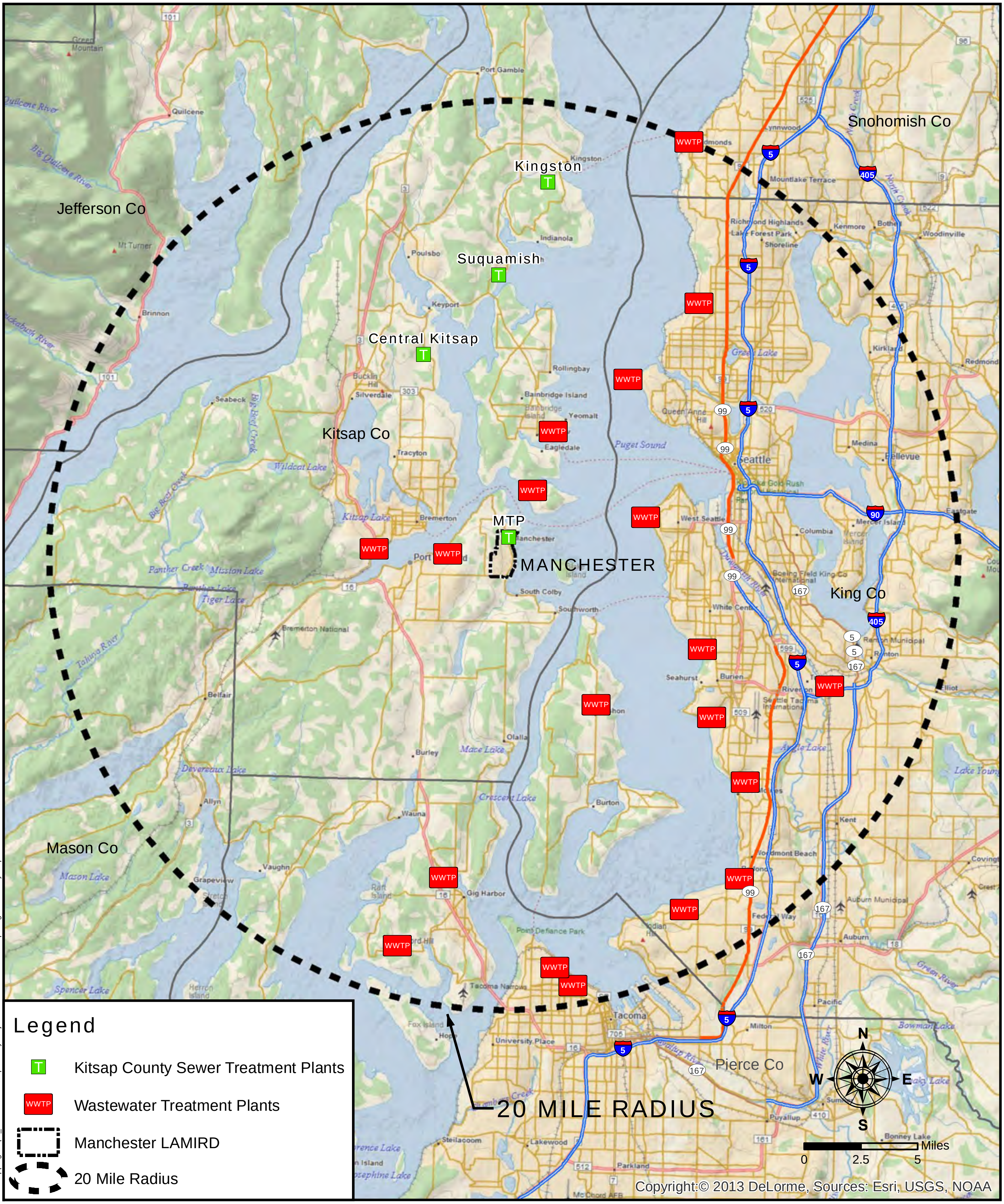
Reference Paragraph	Description of Requirement	Location in Document
3a	Purpose and need for proposed plan	Section 1.2
3b	Who will own, operate, and maintain system	Chapter 1
3c	Existing and proposed service boundaries	Figures 3-1 and 6-1
3d	Layout map showing boundaries; existing sewer facilities; proposed sewers; existing and proposed pump stations and force mains; topography and elevations; streams, lakes; and other water bodies; water systems	Figures 1-1, 2-1, 2-2, 2-3, 3-1
3e	Population trends	Chapter 2
3f	Existing domestic and/or industrial sewer facilities within 20 miles	Figure 1-1
3g	Infiltration and inflow problems	Chapter 4
3h	Treatment systems and adequacy of such treatment	Chapter 4
3i	Identify industrial wastewater sources	Chapter 4
3k	Discussion of collection alternatives	Chapter 6
3l	Define construction cost and O&M costs	Chapter 6
3m	Compliance with management plan	Section 2.8
3n	SEPA compliance	Appendix F
5	Public Participation	Chapter 9; Appendix G

The Plan also provides the public and regulatory agencies with information on the County's plan for the Manchester system upgrades and extensions to all of the designated service area.

The existing and future capacities of the sewer system were evaluated based on current and anticipated future wastewater flow rates. Future wastewater flow rates are estimated from existing flow data and population growth projected within the sewer service area.

A capital improvements plan is provided that prioritizes improvements, estimates project costs, and outlines a plan for financing the capital improvements, as well as reviewing the existing sewer service rates and connection fee structure.

An evaluation of the MTP is not included as part of this Plan.



P:\Mapping\Maps_Generated\KitsapCounty\Projects\12-10274.00\009\maps\Fig 1-1 Vicinity Map 8.5x11.mxd 10/2/2014 ctolentino

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VICINITY MAP

MANCHESTER SEWER FACILITIES STRATEGY PLAN

Kitsap County

October 2014

Figure

1-1

Chapter 2 Service Area Characteristics

The Plan has been developed based on the following characteristics:

- Existing sewer service area
- Planned service area expansions
- Land use assumptions
- Population projections for Manchester

These characteristics are used to assess existing sewer services as well as future service needs. The existing environment within the sewer service area is also discussed.

2.1 Study Area

The current sewer service area is limited to the Manchester Limited Area of More Intensive Rural Development (LAMIRD) boundaries. There is no urban growth area (UGA) immediately adjacent to the LAMIRD. The LAMIRD boundaries and topography are presented in Figure 2-1.

2.2 Surrounding Vicinity Characteristics

2.2.1 Topography

The topography of the Manchester generally slopes downhill from west to east approximately 5 to 10 percent. The eastern side of the LAMIRD is bounded by the Puget Sound, and the high point on the west side is approximately 350 feet.

2.2.2 Water Resources

Immediately west of Manchester, Beaver Creek flows north and discharges into Clam Bay. Beaver Creek appears on Washington Department of Ecology's Category 5 Water Quality Assessment list [303(d)] for impaired water bodies. Also, Puget Sound, immediately east of downtown Manchester, appears on the Category 5 DOE listing.

2.2.3 Critical Areas

Manchester has identified critical areas in several categories:

- Features sensitive to human activity (wetlands and streams)
- Land that can pose a hazard to the community (flood plains)
- Steep Slopes (areas above 40 percent slope)
- Shoreline of Puget Sound

Figure 2-2 shows the LAMIRD critical areas.

The County is working closely with the Kitsap Public Health District to address concerns over septic tank failures, especially in critical areas.

2.3 Water Supply System

Manchester is served by the Manchester Water District that receives water from 11 different deep-aquifer wells. A map of Manchester's water system including, pipes, pumps, and storage tanks is shown in Figure 2-3, as well as private water wells in the Manchester area. There is no impact to the public and private water systems from the Plan's proposed projects.

2.4 Land Use and Zoning

2.4.1 Growth Management Act

The State of Washington adopted the Growth Management Act with the intent of concentrating most new development and population growth within the urban areas of the more populous and rapidly growing counties. State and local governments are required to define an urban growth area (UGA) boundary within which urban services like sewers are provided. Outside the UGA, RCW 36.70A.070(5)(d) allows for the definition of LAMIRD, within which the development of necessary public facilities and public services, such as sewer, is allowed. Because these services and urban development are not otherwise allowed in rural areas, specific criteria must be met in order to establish the logical boundary of a LAMIRD and limit new patterns of low-density sprawl. Manchester is recognized as a Type 1 LAMIRD under these regulations. Therefore, it is highly unlikely that the boundary and the zoning within Manchester will change within the planning horizon for the sewer plan.

2.4.2 Land Use and Zoning

The Manchester boundary and zoning are established in the *Manchester Community Plan Update, December 31, 2007*. Manchester contains two residential zoning designations, and one commercial designation. The Manchester Village Residential (MVR) zone includes the densest parcel platting patterns. The Manchester Village Low Residential (MVLR) zone includes a variety of platting densities and incentivizes the use of clustering to encourage an increase in the establishment of open space. The Manchester Village Commercial (MVC) zone has been applied to areas where historic commercial development occurred and where future development is acceptable. The zoning in Manchester is shown in Figure 2-4.

2.5 Existing Population

2.5.1 Small Area Estimates (SAE)

Kitsap County (County) provided Small Area Estimates (SAE) for the Manchester LAMIRD from 2000-2009. SAE are calculated by the Office of Financial Management and report population and housing unit totals within the Manchester LAMIRD boundary. SAE were used as the census boundary does not match the LAMIRD boundary. Trend lines through the 2000 – 2009 SAE data points were examined to select a reasonable linear growth rate of 1.5 percent to assist in population projections.

2.5.2 Updated Land Capacity Analysis (ULCA)

The County provided the most recent Updated Land Capacity Analysis (ULCA), which was last run for Manchester in 2007. The ULCA is a parcel-based analysis of remaining dwelling unit capacity that also identifies vacant and underutilized parcels and provides tax ID numbers and property class codes for each parcel.

The property class codes in the ULCA were used to estimate the approximate number of dwelling units for each parcel in Manchester in 2007. The County provided a permit report for Manchester from 2007 to the present that allowed for the number of dwelling units for each parcel in 2009 to be estimated. The remaining dwelling unit capacity for Manchester was then estimated for 2009. Population was calculated by assigning 2.5 people per dwelling unit that was suggested by County staff and compares favorably to the 2010 Census.

2.6 Projected Populations

Populations are projected based on historical data, existing and future land use, and anticipated growth. A linear trend was utilized for predicting future populations for the Plan. Due to the inherent variability of population projections, the County reviews projections on an annual basis and adjusts projected populations and flows accordingly.

2.6.1 Total LAMIRD Population

The 1.5 percent projected growth rate coupled with the SAE and the ULCA were used to project the population in Manchester for 2019, 2030, and build-out (build-out is defined as the time when Manchester is fully developed based on current zoning). Build-out is projected well beyond the planning horizon. Table 2-1 summarizes the projected population in Manchester over the planning horizon and build-out.

Table 2-1 Population Projections

Year	Population	Source
2009	4,668	ULCA Analysis
2019	5,372	Projected 1.5 percent growth rate, from SAE
2030	6,148	Projected 1.5 percent growth rate, from SAE
Build-out	8,333	ULCA Analysis

2.6.2 Sewered Population – Existing and Projected

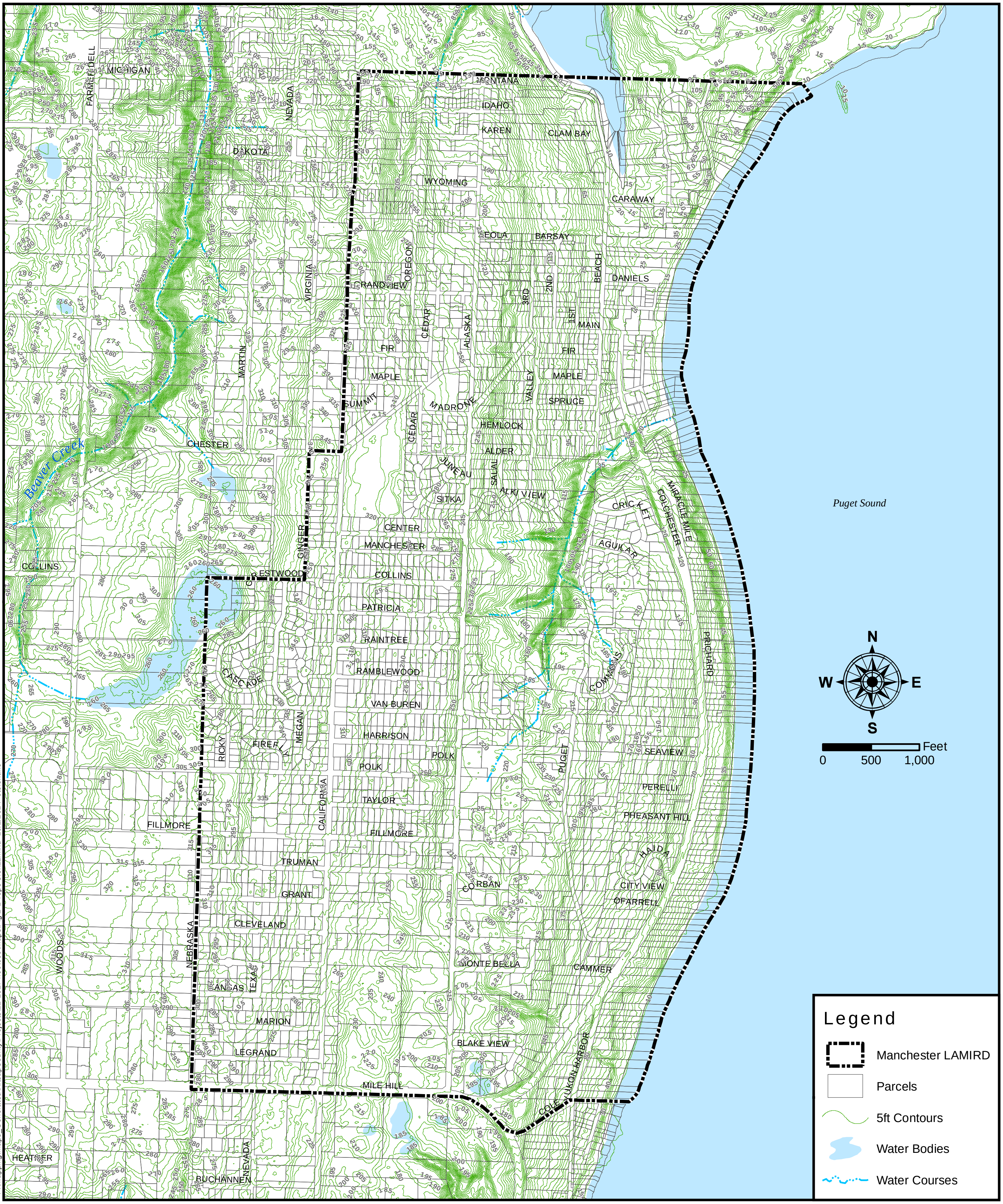
Basin boundaries were delineated with sewered and unsewered parcels identified within each mini-basin in the Manchester LAMIRD. To estimate Manchester's sewered population, existing and forecasted dwelling units on sewered parcels were totaled for each mini-basin. This was compared to the number of existing sewer accounts in the Manchester LAMIRD and seemed to match very well. Total sewered growth was estimated for 2019 and 2030 on the basis of remaining development capacity and the presence of existing sewer infrastructure in each basin. In other words, the sewered population will grow faster in areas adjacent to existing sewer infrastructure. For the hypothetical build-out scenario, it is assumed that 100 percent of the population will be sewered. Therefore, the estimated growth rate over the planning horizon for the sewered population is 4.9 percent per year. Table 2-2 provides a summary of the sewered population projected growth over the planning horizon.

Table 2-2 Sewered Population Projections

Year	Population	Source
2009	2,335	Sewered Dwelling Units x 2.5 people per Dwelling Unit
2019	3,488	Projected
2030	4,757	Projected
Build-out	8,333	Sewered Population is assumed to equal Build-out Population

2.7 Compliance with Kitsap County's Growth Management Plan

The proposed sewer service area is consistent with the County's Growth Management Plan (including the established LAMIRD development area). New sewer services are not being proposed outside of designated growth areas (UGA or LAMIRD boundaries). Appendix E includes a letter to the Department of Ecology regarding this consistency statement.



P:\Mapping\Maps_Generated\KitsapCounty\Projects\12-10274.00\009\maps\Fig 2-1 Topo 8.5x11.mxd 10/2/2014 ctolentino

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TOPOGRAPHY MAP

MANCHESTER SEWER
FACILITIES STRATEGY PLAN
Kitsap County
October 2014

Figure
2-1

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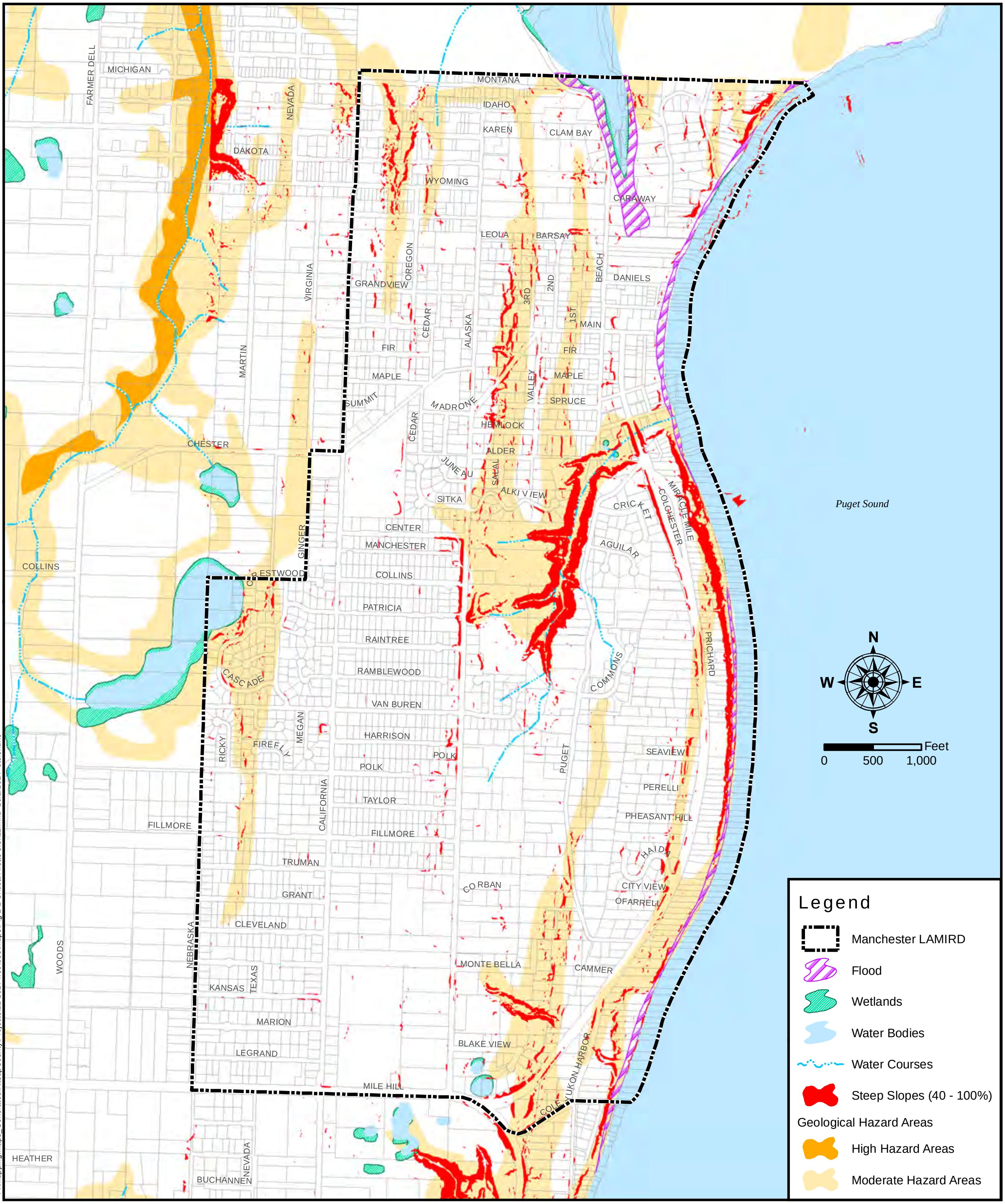

P:\Mapping\Maps_Generated\KitsapCounty\Projects\12-10274.00\009\maps\Fig 2-2 Critical Areas 8.5x11.mxd 10/2/2014 ctolentino

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CRITICAL AREAS
MANCHESTER SEWER FACILITIES STRATEGY PLAN
Kitsap County
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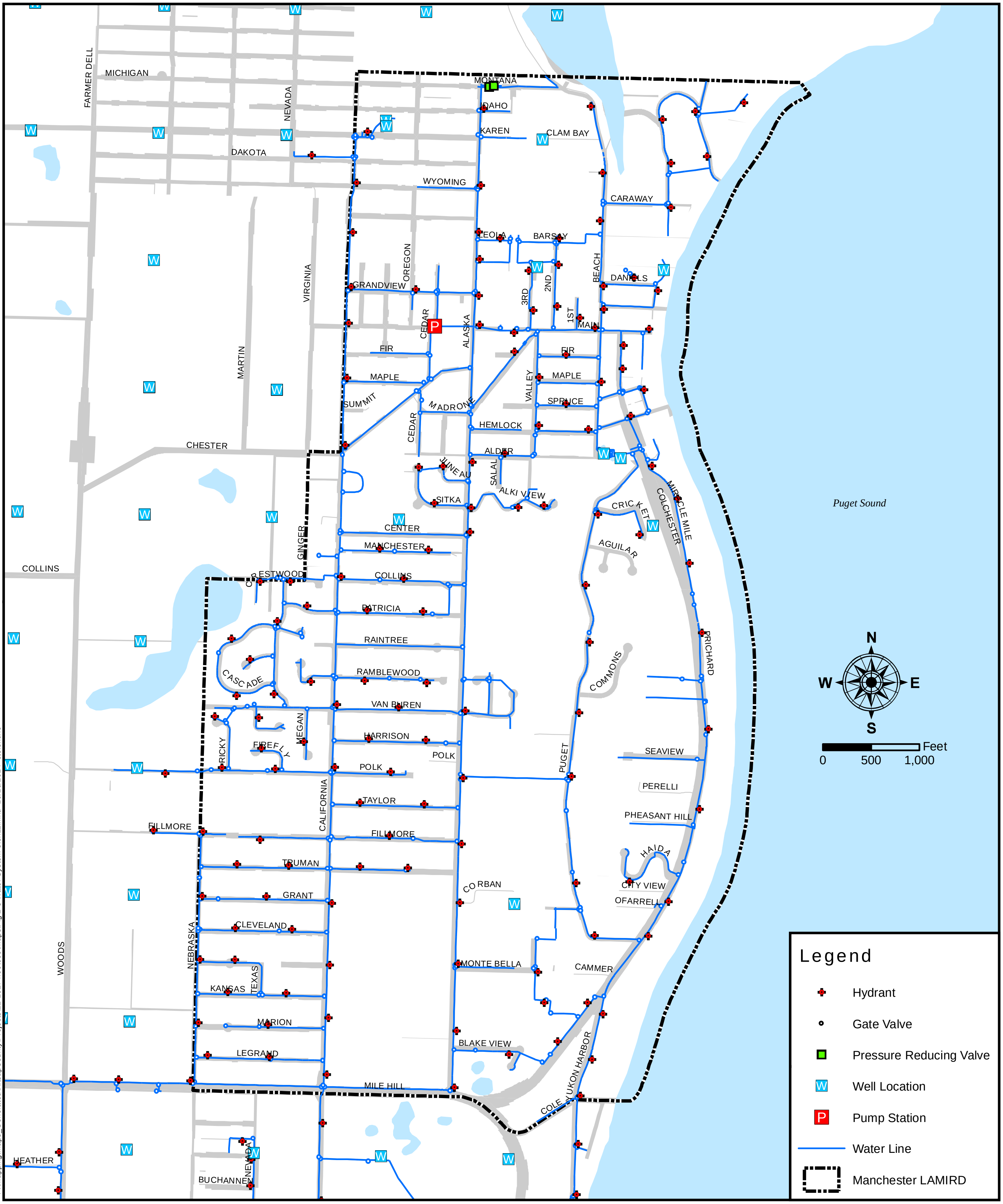
Figure
2-2



P:\Mapping\Maps_Generated\KitsapCounty\Projects\12-10274.00\009\maps\Fig 2-3 Water System 8.5x11.mxd 10/16/2014 ctolentino

Water System: Kitsap Public Utility District 2004; Base GIS Data: Kitsap County
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WATER SYSTEM

MANCHESTER SEWER
FACILITIES STRATEGY PLAN
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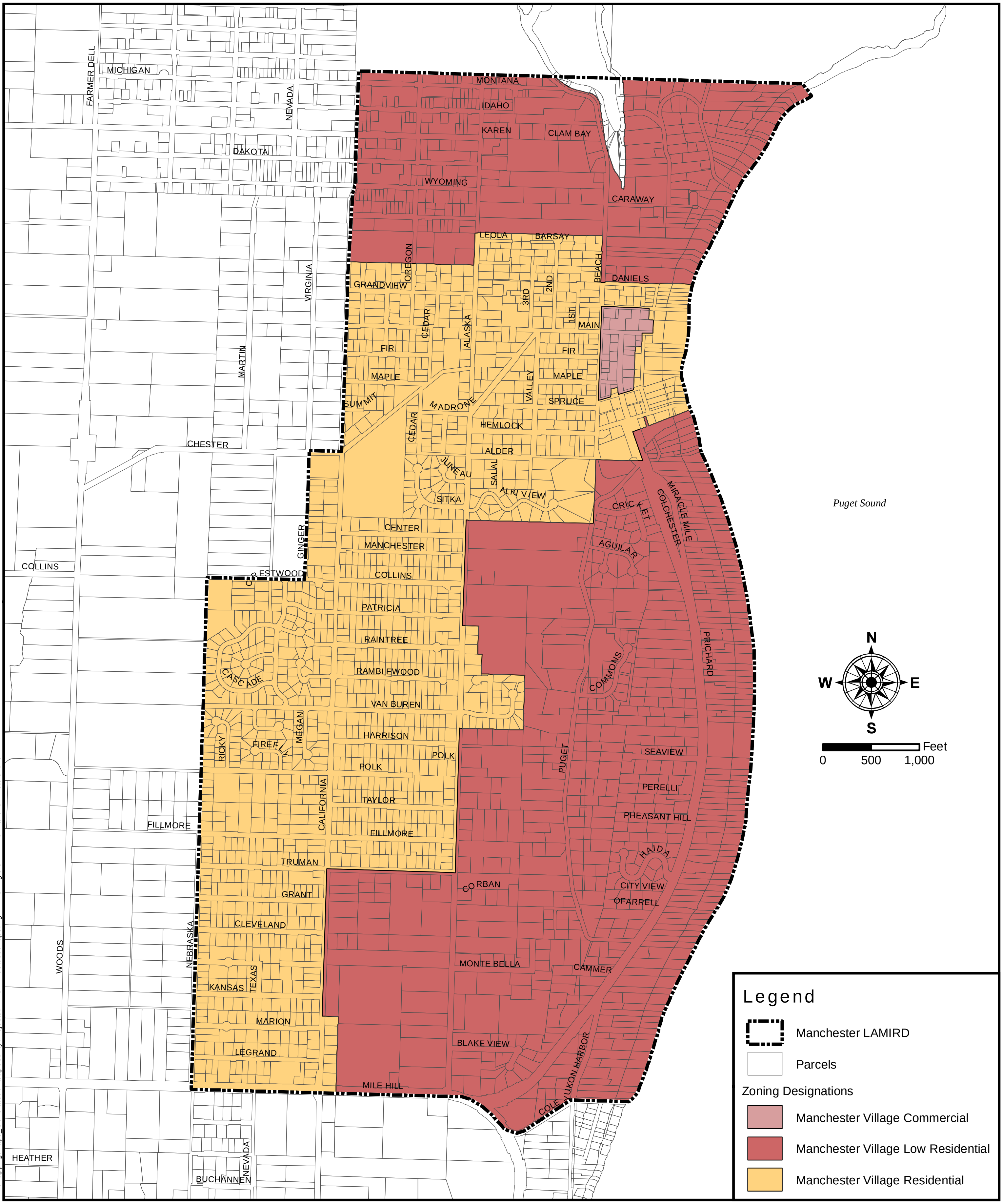
Figure
2-3



P:\Mapping\Maps_Generated\KitsapCounty\Projects\12-10274.00\009\maps\Fig 2-4 Zoning 8.5x11.mxd 10/2/2014 ctolentino

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ZONING MAP

MANCHESTER SEWER FACILITIES STRATEGY PLAN

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Figure

2-4

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Chapter 3 Existing Sewer Facilities

3.1 Collection and Conveyance Facilities

The existing sewer collection and conveyance system is comprised of gravity sewers, six pump stations and force mains, and a number of individual grinder pump stations. Sewage is treated at the Manchester Sewage Treatment Plant (MTP) and discharged into Puget Sound. Manchester's existing sewer system is shown in Figure 3-1.

3.1.1 Gravity Sewers

The Manchester sewer system was first constructed in 1969 to serve the Manchester area. The majority of the initial gravity system was constructed of asbestos cement piping (AC) but recent installations typically have been polyvinyl chloride (PVC). The County currently maintains approximately 11 miles of gravity pipe in the Manchester Sewer System summarized in Table 3-1. The north end of the system has approximately 4,000 lineal feet of sewer constructed along the beach. Beachline sewers can pose maintenance problems due to beach dynamics, may exhibit high infiltration and inflow (I/I) due to high groundwater and tidal influence, and typically have high replacement costs due to difficult construction and permitting.

Table 3-1 Gravity Pipe Inventory

Pipe Diameter (inches)	Total Length (feet)
8	47,492
10	3,567
12	1,548
14	154
15	3,100
18	2,377
Total Length	**58,238**

3.1.2 Pump Stations

The collection system includes 6 pump stations. Pump Stations 45, 46, and 47 (Daniels, Caraway and Hemlock, respectively) were constructed directly on the beach. These pump stations have been identified as aging and in need of complete replacement. Pump Station 48 (EPA lab) serves the Region 10 EPA lab, Department of Ecology and National Marine Fisheries, which are a few miles north of Manchester LAMIRD limits. Prior to the Growth Management Act (GMA), Pump Station 49 (Megan Heights Pump Station) serves a neighborhood at the central west side of Manchester. Pump Station 50 (Blackstone) was constructed to serve a new development in the central portion of the LAMIRD. However, the developer was unable to finish the development construction and the pump station only serves one household. There are also a number of individual pump stations (IPS) or grinder pumps that are operational within the system. A summary of each pump station follows, and Table 3-2 is a summary of the capacity and horsepower at each pump station. None of the pump stations have piped bypasses to the waters of the State.

- Pump Station 45 (Daniels) – Pump Station 45 is a beachline pump station at the east side of Daniels Street. The pump station pumps directly west approximately 250 lineal feet and discharges into a gravity manhole at the intersection of Daniels and Denniston. Pump Stations 46 and 47 are tributary to Pump Station 45. Pump Station 45 is equipped with dual Peabody Barnes submersible pumps.
- Pump Station 46 (Caraway) – Pump Station 46 is also a beachline pump station. The pump station pumps nearly vertical (approximately 20 feet) and discharges to an adjacent manhole. There are no other pump stations tributary to Pump Station 46. Pump Station 46 is equipped with dual Peabody Barnes submersible pumps.
- Pump Station 47 (Hemlock) – Pump Station 47 is also a beachline pump station. The pump station is at the east end of Hemlock Street and pumps directly west in to a gravity manhole at the intersection of Nubling Ave and Hemlock Street. Pump Station 47 is equipped with dual Peabody Barnes submersible pumps.
- Pump Station 48 (EPA Lab) – Pump Station 48 is located on the EPA Laboratory, Region 10 site. The lab is approximately a half mile north of Manchester LAMIRD limits, located on Puget Sound next to the Naval Depot Station. The pump station pumps south to a gravity discharge manhole near the MTP. The station is equipped with two Hydromatic pumps (one duty, one standby).
- Pump Station 49 (Megan Heights) – Pump Station 49 serves the Megan Heights neighborhood in the central western portion of Manchester. The pump station serves approximately 150 single family residences. The station is equipped with two submersible PACO pumps and an on-site emergency generator.
- Pump Station 50 (Blackstone) – Pump Station 50 is a newer pump station that was built to serve the Blackstone Development in central Manchester. However, the development was halted during the recent recession. Currently, only one household is served by the pump station. Approximately 25 single family residences could flow to the pump station at full development.
- Individual Pumping Stations (Grinder Pumps) – A number of houses in Manchester are also served by IPS, which pump only localized sewage (1-8 houses) into a common private force main.

Table 3-2 Manchester Pump Stations

Pump Station	Location	Capacity (gpm)	No. of Pumps	Pump HP
45 – Daniels	East Daniels Loop Road and beach	200	2	3.7
46 – Caraway	Caraway Street and beach	200	2	2.8
47 – Hemlock	East Hemlock Street and beach	200	2	2.8
48 – EPA	EPA Region 10 Site	669	2	10
49 – Megan Heights	6975 East Van Buren Street	200	2	10
50 – Blackstone	East Commons Court	150	2	5

The pumps are controlled via float switches located within the wet wells. The floats are located at elevations that minimize hydraulic detention time, prevent surcharging of the gravity sewers upstream of the pump stations, while keeping motor starts within acceptable ranges.

Each pump stations has two pumps to meet the Department of Ecology's requirement for redundancy and remote telemetry that monitors pump run time and links the data to the Central Kitsap Treatment Plant SCADA (Supervisory Control and Data Acquisition) system. All of the pump stations have float alarm signals which are connected to the telemetry system. The pump stations are all served with 3-phase power. Locations of the pump stations are shown on Figure 3-1.

3.1.3 Force Mains

The collection system in Manchester has approximately 12,000 feet of force mains. Pipe lengths are approximated from GIS data provided by the County. The force mains are summarized in Table 3-3 below, and are shown in Figure 3-1.

Table 3-3 Manchester Force Mains

Pump Station	Diameter (inches)	Length (ft)
45 – Daniels	4	257
46 – Caraway	4	12
47 – Hemlock	4	207
48 – EPA	6	6,970
49 – Megan Heights	6	820
50 – Blackstone	4	1,779
Colchester ULID 8 IPS	3	1,930
Total Length		**11,975**

3.2 Septic Age

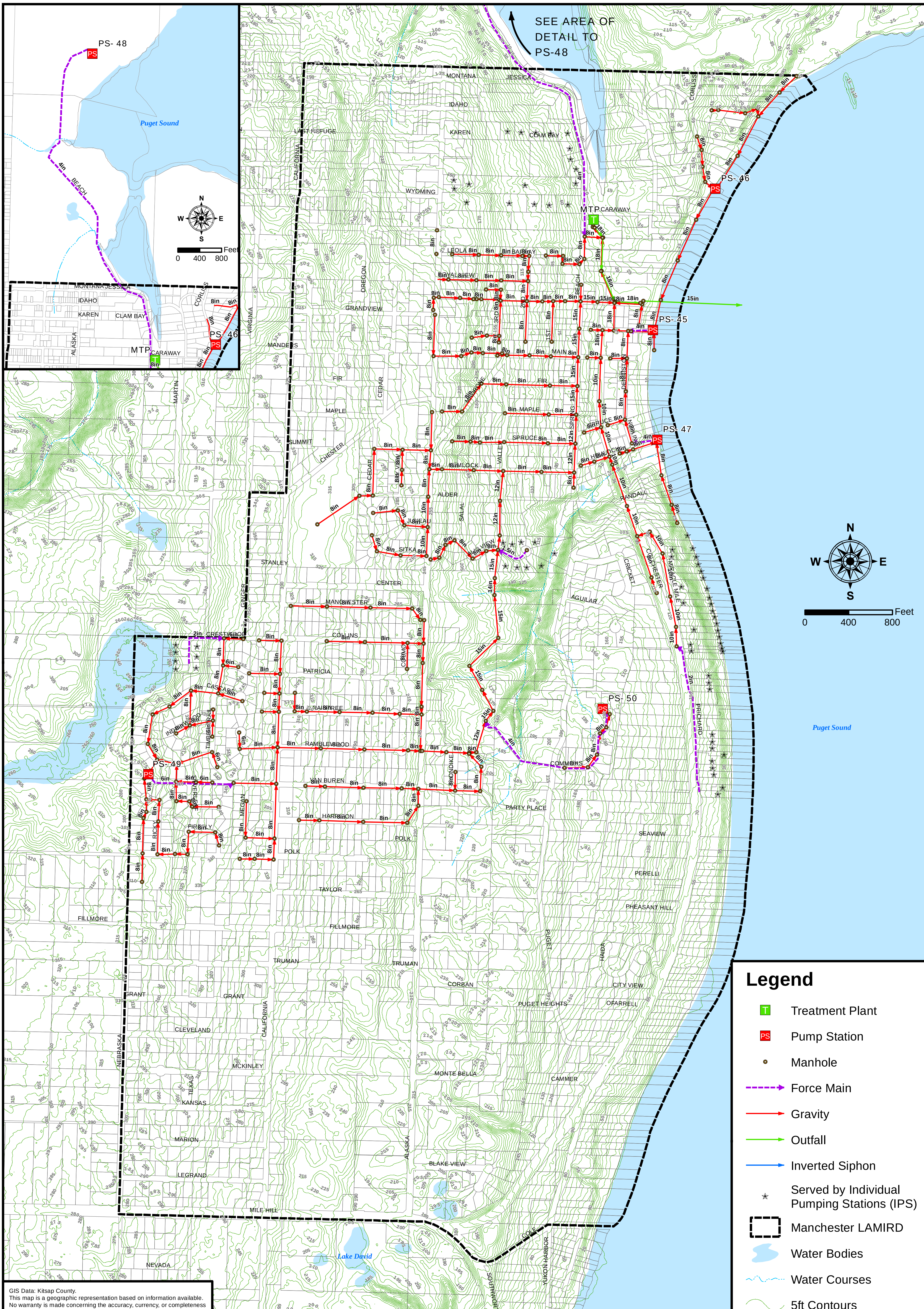
Kitsap Public Health Department (KPHD) and other County departments are working together to promote public health, specifically regarding aging septic systems in the Manchester LAMIRD.

Kitsap Public Health developed the Pollution Identification and Correction (PIC) program to prioritize and address fecal pollution problem areas in Kitsap County. Problem areas are thoroughly assessed for land uses and ranked by water quality data and public accessibility. Water quality monitoring and door-to-door PIC inspections are conducted in high priority areas, such as Yukon Harbor, to identify and correct fecal pollution sources. PIC inspectors provide free technical assistance to guide property owners through the process of correcting identified pollution sources. The inspection is designed to help property owners and residents prevent fecal pollution and get the most life possible from their septic investment. Since 2010, KPHD has made 333 site visits in the Yukon Shoreline and Upper Yukon Harbor area. We have identified 23 failing septic systems and repaired 22 of them. KPHD is currently wrapping up 2 major grants on Yukon Harbor.

Septic systems in Yukon Harbor have considerable challenges:

- Most of them are approaching or are past the average thirty year lifespan.
- Lots in the watershed are small, ranging from 0.25 to 1.25 acres and make it difficult to find adequate replacement areas.
- Soils in the project area are considered poor for onsite sewage treatment according to the Soil Survey of Kitsap County Area, Washington (SCS, 1980).
- Some of the parcels were platted and developed prior to development and sewage regulations.
- Many of the onsite septic systems are disposal systems designed by “perc test” and not engineered for sewage treatment.
- Average annual rainfall, collected by Kitsap County Public Utility District #1, is 46 inches per year, the majority of which falls between October and April. This causes high groundwater conditions and surface water intrusion, which reduces sewage treatment.

Figure 3-2 highlights the ages of the septic systems in the LAMIRD. Sewers are the preferred method of wastewater collection, as the risks of public health issues are minimized, especially considering the challenges listed above.



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EXISTING SEWER SYSTEM

MANCHESTER SEWER FACILITIES STRATEGY PLAN

Kitsap County
October 2014

Figure
3-1

P:\Mapping\Maps_Generated\KitsapCounty\Projects\12-10274.00\009\maps\Fig 3-2 Septic System Age Map 8.5x11.mxd 10/2/2014 ctolentino

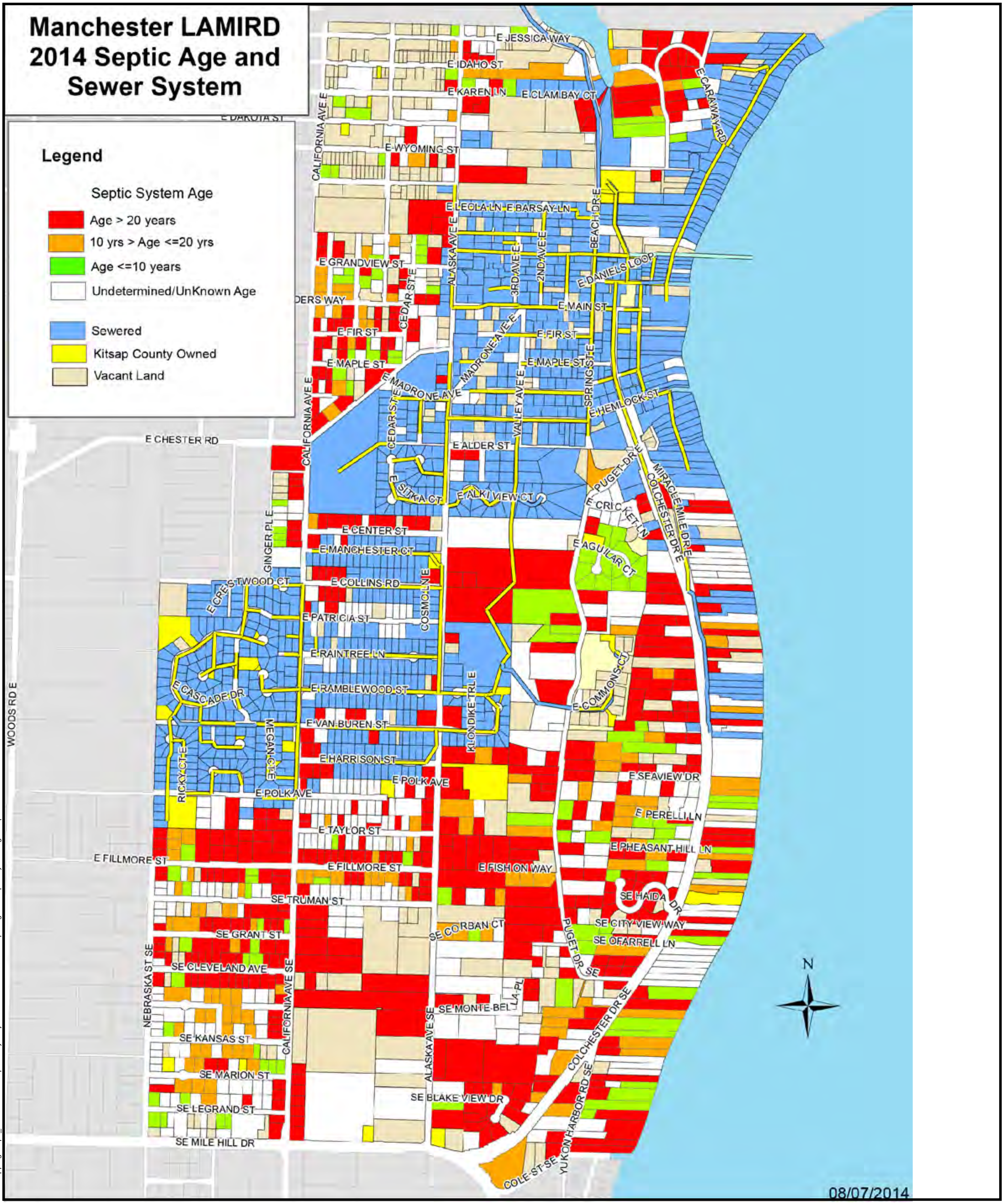

Image: Kitsap County 2014
This map is a geographic representation based on information available.
No warranty is made concerning the accuracy, currency, or completeness of data depicted on this map.

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SEPTIC SYSTEM AGE

MANCHESTER SEWER FACILITIES STRATEGY PLAN
Kitsap County
October 2014

Figure 3-2

Chapter 4 Sewage Characteristics

This section analyzes influent and effluent sewage flow data recorded at the Manchester Sewage Treatment Plant (MTP) for the years of 2009 through 2011. Daily monitoring reports (DMRs) provide daily flow and loading values for the MTP and resulting effluent. The DMRs are included as Appendix A. Current plant influent characteristics as well as current and future population projections are evaluated to project future treatment flows and loadings. Future sewage flow projections are directly related to the growth projections discussed in Chapter 2.

The sewage flow is primarily domestic. While there is industry in Manchester, there is no industrial sewage discharged into the sewer system. The Fuel Depot has a separate treatment plant for their industrial water and only sends domestic sewage from the land-based and ship facilities to the sewer system. The EPA lab does a pH adjustment on the laboratory water prior to discharge to the sewer system.

4.1 Existing Sewage Flows

Daily sewage flow through the MTP is measured by a magnetic flow meter. The measured effluent flow volume is approximately equal to the influent flow minus the volume of solids. Some flow attenuation occurs in the treatment process and in the collection system but this attenuation is considered minor and in any case will be normalized in the monthly flow averages.

4.1.1 Annual Average Day Flow

Table 4-1 presents annual average sewage flow characteristics recorded at the MTP during the years 2009 through 2011. Table 4-1 includes flow from residential, commercial, institutional, and inflow and infiltration. The sewered population was estimated for 2009 through 2011, and then carried forward at a 4.9 percent growth rate to the build-out population of 8,333.

Table 4-1 Annual Average Flow Characteristics

Year	Flow (MGD)	Sewered Population	Gallons Per Capita Per Day (gpcd)
2009	0.193	2,335	83
2010	0.213	2,370	90
2011	0.199	2,406	83
Average	**0.201**	**N/A**	**85**

4.1.2 Monthly Average Day Flow

Table 4-2 summarizes the monthly average flow measured at the MTP from 2009 through 2011.

Table 4-2 Monthly Average Daily Flow Summary (2009 - 2011)			
Month/Year	**Flow (mgd)**		
	2009	**2010**	**2011**
January	0.226	0.291	0.238
February	0.187	0.228	0.220
March	0.197	0.210	0.283
April	0.186	0.201	0.208
May	0.200	0.195	0.192
June	0.164	0.183	0.174
July	0.163	0.166	0.169
August	0.162	0.167	0.165
September	0.167	0.180	0.165
October	0.178	0.194	0.167
November	0.273	0.217	0.210
December	0.211	0.324	0.191
Average	**0.193**	**0.213**	**0.199**

4.1.3 Max Month and Max Day

Table 4-3 presents max month and max day flows recorded at the MTP from 2009 through 2011.

Table 4-3 Sewage Treatment Plant Peak Flows				
Year	**Max Month (MGD)**	**Month**	**Max Day (MGD)**	**Day**
2009	0.273	November	0.527	January 7, 2009
2010	0.324	December	0.773	December 12, 2010
2011	0.283	March	0.526	March 14, 2011
Average	**0.293**		**0.609**	

4.2 Existing Sewage Flow Peaking Factors

MTP flow records for the period from 2009 through 2011 were provided by the County and analyzed to determine the flow events summarized in Table 4-4. Average dry weather flow is defined as the average flow for dry weather months, July through September. The peak hour peaking factor is derived from yearly peak hour/wet weather events, using MTP circular flow charts.

Table 4-4 Flow Event Summaries

Year	Average Dry Weather Flow (MGD)	Annual Average Flow (MGD)	Max Month (MGD)	Max Day (MGD)	Peak Hour (MGD)
2009	0.164	0.193	0.273	0.527	0.908
2010	0.171	0.213	0.324	0.773	0.966
2011	0.166	0.199	0.283	0.526	0.775
Average	**0.167**	**0.201**	**0.293**	**0.609**	**0.883**

Peaking factors based on historic flow records are used to project future max month sewage flows. Peaking factors are calculated by taking the various flow events and dividing them by the annual average flow. Table 4-5 presents the derivation of the peaking factors for Manchester.

Table 4-5 Existing Peaking Factors

Year	Average Dry Weather Flow Factor	Annual Average Flow Factor	Max Month Factor	Max Day Factor	Peak Hour Factor
2009	0.85	1.00	1.42	2.73	4.71
2010	0.80	1.00	1.52	3.63	4.54
2011	0.84	1.00	1.43	2.65	3.90
Average	**0.83**	**1.00**	**1.45**	**3.00**	**4.38**

The peaking factors presented in Table 4-5 are typical of similar communities and are used as the basis for flow projections developed in subsequent sections.

4.3 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.

4.3.1 Previous Investigations

No previous investigations regarding I/I have been conducted for Manchester.

4.3.2 Infiltration

The EPA publication 'Infiltration/Inflow – I/I Analysis and Project Certification' dated May 1985 was reissued by the Department of Ecology as DOE Publication No. 97-03; this publication established that the following thresholds for possibly excessive dry weather infiltration and inflow:

- If average dry weather flow is less than 120 gpcd, infiltration is non-excessive.
- If average wet weather flow is less than 275 gpcd, inflow is non-excessive.

It should be noted that average wet weather flow in the publication is defined as "the average daily flow per capita...over a 7-14 day average measured during periods of seasonal high groundwater". This is a conservative estimate of what is normally considered average wet weather flow. Average dry weather flow is defined as the average flow for dry weather months, July through September. The results of the analysis are summarized in Table 4-6.

Table 4-6 Average Per Capita Flows for I/I Analysis

Flow Event	Flow (gpcd)	EPA/DOE Excessive I/I Criteria	Result
Dry Weather	70(1)	120	Infiltration is non-excessive
Average Annual	85	N/A	-----
Wet Weather	181(2)	275	Inflow is non-excessive

Notes:
(1) Determined by taking the average dry weather flow for July through September for the years 2008 through 2010.
(2) Determined by taking the average of the 7-day and 14-day periods in early December 2010.

4.3.3 Water Use Data

Water usage quantities were collected from Manchester Water District for the years 2009 to 2011. The Manchester Water District serves approximately 10,000 customers, some of which are outside of the Manchester LAMIRD boundaries. Water usage data is only available for the entire District and therefore does not directly represent usage within the LAMIRD boundaries. The per capita water use for the Manchester Water District from 2009 to 2011 is summarized in Table 4-7.

Table 4-7 Comparison of Annual Average Water Use and Sewage Flow (2009 – 2011)

Year	Water Use (gpcd)
2009	58
2010	51
2011	52
Average	**54**

The 54 gpcd water use compared to the 70 gpcd dry weather sewer flow is unusual in that the water use is typically slightly higher than the sewer flow. However, the 70 gpcd sewer flow is a reasonable number, representative of similar communities that practice water conservation and with sewers in relatively good condition. A detailed analysis of the deviation between the per capita water use and sewer flow is beyond the scope of this study.

4.4 MTP Unit Flows

Projected flows at the MTP are estimated for future dates based on projected population and developed service area and associated unit flows derived from historic records. Existing domestic sewage flow was derived from the 2009 through 2011 period of record at the MTP. The average domestic sewage flow per capita is not anticipated to change significantly over the planning period; therefore, the current average annual value of 85 gpcd derived in Table 4-1 is used for future projections.

The use of 85 gpcd in the future assumes that the existing combination of residential, commercial, and industrial sewage sources will remain essentially the same as currently exists within the sewer system. It is anticipated that some existing conveyance facilities, specifically those pump stations along the beach, will be rehabilitated during the study period, which may reduce infiltration rates. New sewer facilities will be constructed to modern standards which include materials that are more resistant to I/I than were used in past decades. Therefore, no I/I degradation factor is being used for the projections. The 85 gpcd is applied to all flow projection years.

4.5 Future Peaking Factors

A peaking factor method is commonly used to project peak sewage flows. Peak design flows are the key parameters for evaluating sewage facilities, as well as designing upgrades and improvements.

4.5.1 Peaking Factor for Domestic Sewage

The maximum month and maximum day peaking factors derived from the 2009 through 2011 period of record at the MTP are shown in Table 4-5, and discussed in Section 4.2. Table 4-8 shows existing peaking factors in relation to average day flow projected for future years.

Table 4-8 Future Peaking Factors				
Year	**Sewered Population**	**Peak Hour Factor**	**Max Month Factor**	**Max Day Factor**
2009	2,335	4.71	1.42	2.73
2009-2011$_{AVE}$	2,335	4.38	1.46	3.02
2019	3,448	4.21	1.46	3.02
2030	4,757	4.05	1.46	3.02
Build-Out	8,333	3.76	1.46	3.02

As presented in Table 4-8, the 2009 peak hour peaking factor is 4.71, and the 2009 to 2011 average peak hour peaking factor is 4.38 (Table 4-5). As the sewered population increases, it is expected that the peaking factor will reduce based on peaking factors reported for larger service areas. The projected peak hour peaking factor is reduced for years 2019, 2030, and build-out year by using Department of Ecology Figure C1-1 and the associated equation (provided as Appendix B). The DOE peaking factor equation is dependent on population; as the population increases, the peaking factor is expected to decrease.

The DOE peaking factor equation is for estimating future flows. When considering existing flows using the MTP DMRs, the actual peaking factor is higher than what the DOE peaking factor equation estimates for existing flows. Therefore, a ratio was determined to estimate closer-to-actual flows at the MTP. As population increases, the peaking factor is still expected to decrease but remain relatively higher than what is estimated by DOE.

To determine these estimated flows, the 2009-2011 average peak hour peaking factor of 4.38 was multiplied by the DOE Figure C1-1 peaking factor for years 2019, 2030, or buildout (3.39, 3.26, and 3.03, respectively) divided by the DOE Figure C1-1 peaking factor for year 2009 (3.53). These are the peak hour factors listed above in Table 4-8.

The Max Month and Max Day peaking factors were held constant at the 2009-2011 averages developed in Table 4-5. Keeping the factors the same over the future forecasts is a conservative approach in estimating these peaking factors.

4.6 Projected Flow

The total projected sewage flow for the year 2019 and 2030 will include all domestic flow, commercial flow, and infiltration and inflow. It is assumed that by using current per capita flows, the mix of commercial, residential and I/I 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 MTP facilities. Projected flows for the mini-basins comprising the Manchester sewer service area are developed in Chapter 5.

4.6.1 Annual Average Flow

Domestic flows are calculated as the product of the unit flows developed in Section 4.4 and the projected sewered population. The projected average annual sewage flows received at the MTP throughout the planning horizon are tabulated in Table 4-9.

4.6.2 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 4-9.

4.6.3 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 4-9. The projected flows are based on an 85 gpcd Annual Average Flow Rate combined with the peaking factors described in Section 4.5.1. The sewered population growth assumes a linear trend until build-out that equates to a sewering rate of approximately 115 persons per year.

Table 4-9 Projected Sewage Flows

Year	Population	Average Annual Flow (mgd)	Average Day of the Max Month		Peak Day		Peak Hour	
			Peaking Factor	Flow (mgd)	Peaking Factor	Flow (mgd)	Peaking Factor	Flow (mgd)
2009-2011	2,335	0.201	1.46	0.293	3.02	0.609	4.38	0.883
2019	3,448	0.284	1.46	0.413	3.02	0.857	4.21	1.193
2030	4,757	0.391	1.46	0.570	3.02	1.182	4.05	1.585
Build-Out	8,333	0.686	1.46	0.998	3.02	2.071	3.76	2.580

4.7 Sewage Treatment Plant Capacity Evaluation

The County operates a sewage treatment plant in Manchester. The plant is currently permitted to treat up to 460,000 gallons per day (gpd) average day of the maximum month flow through NPDES discharge permit WA-002370-1. The plant is not being analyzed as part of this Plan but a brief description is provided below:

The original MTP was installed in 1969 with primary treatment only. The plant was initially capable of treating up to 160,000 gpd of sewage. The plant was upgraded to secondary treatment in 1985 to comply with the Clean Water Act. Completed in 1991, Phase 1 of the upgrade provided secondary treatment for 230,000 gpd of sewage. Phase 2 of the upgrade, completed in 1998, increased the capacity to 460,000 gpd, which is the current permitted capacity. Exhibit 4-1 presents an approximate timeframe for when the facilities plan and upgrades will need to occur based on Department of Ecology requirements.

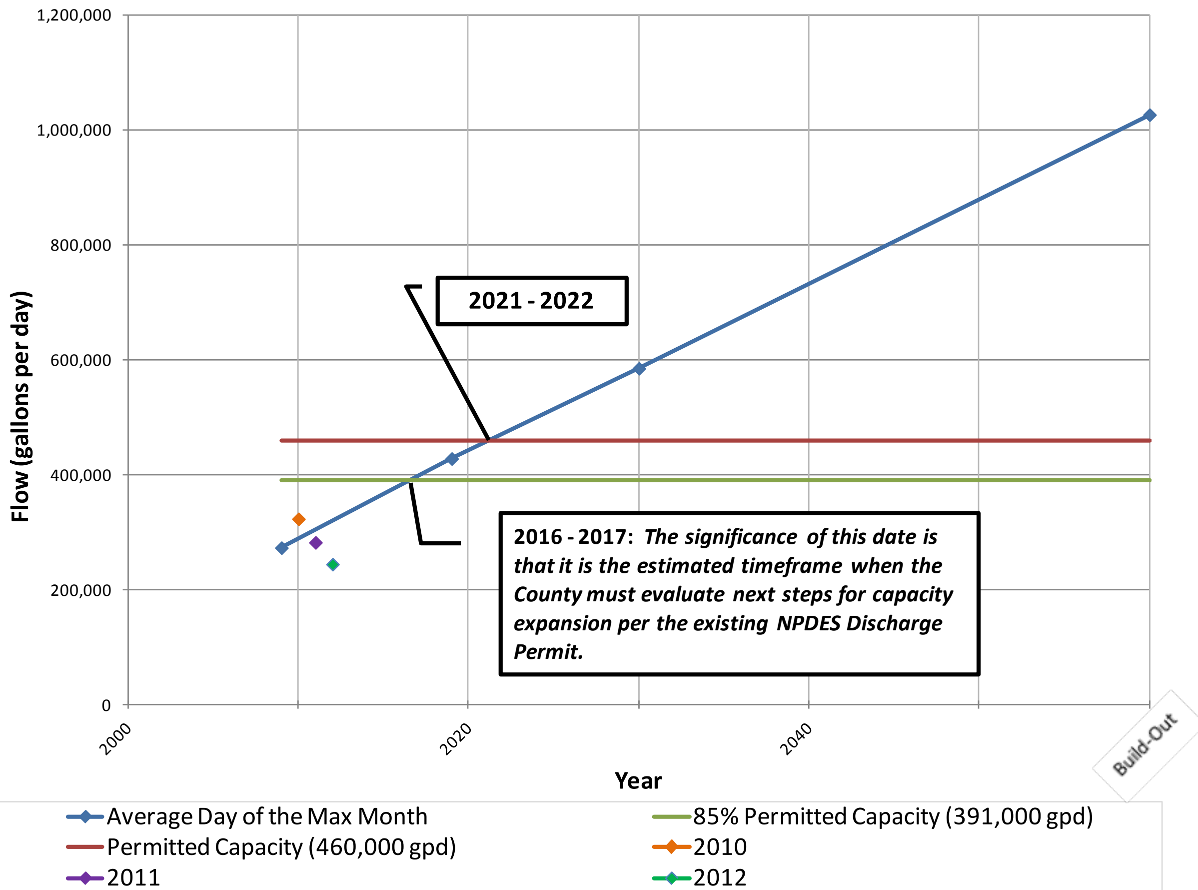


Exhibit 4-1 Projected Timeline for MTP Facilities Plan and Upgrades

Provisions for treatment of the permitted 460,000 gpd flow included the following Phase 2 improvements (1998):

- A new influent pump station.
- A new headworks facility downstream from the influent pumps. The facility consists of a rotary screen or mechanically cleaned bar screen and a grit removal system.
- A Parshall flume was integrated with the headworks facility to provide influent flow measurement.
- The existing primary clarifier was taken out of service and removed.
- The existing SBR tanks were converted to flow-through aeration basins.
- Two new secondary clarifiers.
- A new RAS/WAS/SSM pump station for the return, waste, and scum pumping systems necessary for the activated sludge process.
- A new UV system for effluent disinfection. The existing chlorine contact basins and related chlorine gas systems were taken out of service and removed.
- Removal of the existing Parshall flume structure. Constructed a new Parshall flume at a higher elevation, incorporated with the new UV structure.
- Installed a new diffuser on the existing outfall to improve dilution.
- A new sludge thickening facility, incorporating a gravity belt thickener.
- A new odor control system to treat odorous air from the headworks and sludge thickening facilities.
- A new standby power generator was provided. Removed the existing generator. Extended the maintenance garage to accommodate the new, larger generator unit.

The County is committed to make the improvements to adequately treat the 460,000 gpd flows. At 85% of permitted capacity, the County will develop a new improvement program to expand the plant to meet future flows in compliance with the discharge permit issued by DOE.

Chapter 5 Conveyance System Evaluation and Modeling

The existing sewage conveyance system of the Manchester Limited Area of More Intense Rural Development (LAMIRD) was modeled to identify potential future infrastructure needs. Conveyance system modeling was utilized to analyze the existing facilities and evaluate their capacity and effectiveness to convey flows generated by the current and the projected future population. The projected populations and their distributions were the basis for establishing future system requirements.

The following sections describe the hydraulic modeling approach used for the Plan.

5.1 Modeling and Analysis Approach

Modeling was performed to evaluate existing pump stations and conveyance facilities under the current and projected population and related flow scenarios. Recommended system improvements and sizing of future pump stations and force mains were based on system deficiencies found during the modeling analysis and also on system needs identified by Kitsap County staff.

The MIKE Urban hydraulic model developed by the Danish Hydraulic Institute (DHI) was selected for use in modeling the conveyance system. MIKE Urban release 2009 is a fully-dynamic model utilizing DHI's proprietary hydraulic engine and is designed specifically for modeling urban sanitary and combined sewers systems. The current version operates interactively with ArcGIS (ArcMap).

5.2 Model Input Parameters

The MIKE Urban model relies on user generated as well as automatically generated parameters to perform a range of calculations for various flow scenarios. Conveyance system details such as daily flow patterns, peaking factors, and infrastructure characteristics are input by the user and used by the model in conjunction with sewage flow information to provide simulation of the system under existing and future conditions. Infrastructure characteristics include pipe diameters and inverts, manhole locations and rim elevations, and pump station parameters. Automatically generated data, such as pipe slope, friction losses, and pump head-discharge relationships rely on user input along with model-based algorithms.

5.2.1 Daily Flow Pattern

A diurnal curve represents the variation in flow over time as a fraction of the average daily flow. A diurnal curve factors the average 24-hour flow, typically on an hourly basis, providing a multiplier for each time component of the analysis. The average of all the multipliers must equal 1.0, so that the model produces the correct amount of flow. A diurnal curve, based on measured hourly flow rates was developed to represent a typical daily flow rate pattern for the LAMIRD. A second diurnal curve was developed to vary peak day flow over the 24-hours simulation. The diurnal curves are included in Appendix C.

5.2.2 Existing Facilities

Existing facilities must be modeled and evaluated as a basis for development of future system needs. As part of this process, the existing collection and conveyance system is inventoried; physical properties of the infrastructure are tabulated; parcel-based flow projections are generated; sewerage basins are defined; and the sewered properties are identified and input into the hydraulic model. Kitsap county staff provided maintenance information that was used as a condition assessment for the existing collection and conveyance system. After a model run is initiated, flows are generated and loaded into manholes throughout the model and sewage is “conveyed” through the modeled collection system. Flow patterns and results are calibrated against known flow data to validate the model.

5.2.2.1 Infrastructure

Kitsap County maintains a database of sewer mapping in Graphical Information Systems (GIS) format. The database contains a very complete and comprehensive data set which includes elevations of rims and inverts of manholes, manhole and pipe numbering, pipe diameters and materials, and documentation of pipe conditions. Pumping facilities information stored in the database includes details of the pump station wet or dry well, known operational characteristics based on facilities tests, pump curves and motor controls (constant speed vs variable speed).

Conveyance system piping is defined as either force mains or gravity pipes. The database of physical attributes of the existing conveyance facilities was incorporated into the MIKE Urban modeling software to create a base model. The model uses these attributes and supplemental data, such as pump curves, to identify friction factors, head losses, and pumping capacities under a range of flows to simulate the system to evaluate the system capabilities and limitations.

5.2.2.2 Delineation of Existing Pump Station Basins

Delineation of the sanitary sewer drainage basins that serve existing pump stations is shown on Figure 5-1. The drainage basins illustrated on Figure 5-1 were incorporated into the model to define the area that contributes to each pump station.

5.2.2.3 Loading of Existing Flows

One of the key elements in developing a sanitary sewer system model is the method used to tell the model the quantity of flows and the location where they enter the system. This is referred to as “loading” the model. In this case, flow loading was based on parcel-level population/sewer user data. The “Sewer Permits” data set from the County GIS was utilized to define and distribute flow loading from each sewered parcel to the appropriate node in the model; a node typically represents a manhole in the conveyance system.

The “Sewer Permits” data set identified the number of ERUs that were attributed to each parcel, both for residential and non-residential users. Prior to loading the model, the data set was manually prepared so that the model could make use of the parcel-based data. Each ERU in the dataset was converted to an ‘equivalent population’. Historical sewage flow data was used to estimate the annual average flow (AAF) for the LAMIRD of 85 gallons of sewage per capita per day (gpcd).

The flow loading for each parcel was calculated in the model by applying the AAF of 85 gallons per day to the equivalent population assigned to each sewered parcel. The loading from each parcel was generally distributed to the node representing the manhole physically closest to that parcel within the defined pump station drainage basin. In a few cases, the physically closest manhole to a basin was not necessarily the most appropriate for loading due to factors such as topography. For these cases, the loading is graphically reassigned to a more appropriate manhole using editing tools available with the software. The flow loading process is partially automated using an application developed by DHI specifically for this project in which sewer "catchments" were delineated around each manhole and parcel "centroids" located within each catchment contributed their resultant flow to the associated manhole.

5.2.2.4 Model Calibration

Existing condition model pump simulation was calibrated at each pump station by evaluating the modeled pump output of discharge pressure, or total dynamic head (TDH) vs. discharge and comparing simulated pump discharge to the design operating point. The design operating point and associated pump curve were determined from pump manufacturers and design data. Simulated pump discharge and manufacturer's pump curves were plotted together to illustrate how simulated pump output correlates with manufacturer's data. Adjustments were made iteratively to pump parameters in the model to obtain the closest correlation.

The total volume generated in the model was verified against actual historical daily Manchester SewageTreatment Plant (MTP) flow volume data for AAF and average design flow (ADF) per capita. Actual average values for a five year period were compared to model flow results. The total flow results were within 1 percent of the actual values. Since this difference was considered insignificant, the model was not adjusted.

5.2.2.5 Model Execution for Existing Conditions

The MIKE Urban model is a continuous simulation model which allows flows to be dynamically routed through the system over time, as opposed to a single event model that performs an instantaneous analysis for a single point in time. In this case, the model was run to represent a period of 24 hours. The daily flow totals produced by the population are introduced to and routed through the system over a typical 24-hour period based on the diurnal curve discussed in the previous section.

The initial model runs were based on the AAF which is a dry weather flow, with additional runs modified to represent wet weather flow. Wet weather, or peak day flow, was simulated by applying a factor of 4.71 to the AAF. The development of this factor was discussed in Chapter 4.

5.2.2.6 Existing Conditions Results

Results of the existing conditions model run indicated no areas where problems could occur during a period of peak day flow. In general, problem areas are where the flow depth in manholes exceeds 50 percent of manhole depth and these problem areas were not observed in the existing conditions model run.

5.2.3 Future Sewage Conveyance System Facilities

Once the model of the existing infrastructure was completed and calibrated, future conditions are represented conceptually by loading the model with sewage flows predicted to be generated by future populations. Once the future flows are generated, the infrastructure requirements to convey the future flows to the MTP are identified and tabulated. The results of this analysis are presented in the following sections, with modeling data provided in Appendix C.

5.2.3.1 Delineation of Potential Future Pump Station Basins

The future flow loading on the existing facilities was estimated from unsewered areas of the LAMIRD. The basins were delineated based on topography, as either an area that could flow strictly by gravity to an existing pump station (e.g., Basin F may be sewered by gravity flow into the Pump Station F-1 collection system) or an area where a pump station is required to convey flow into the existing system.

For currently unsewered basins requiring pumping, a hypothetical pump station was located at a topographical low point in the basin. Again, based on topography as well as the most convenient flow routing, flows from the pump stations were typically routed directly to the nearest gravity sewer manhole. The representation of future pump stations is not intended to establish the exact location of future facilities, rather, they are provided as a means to approximate the future system requirements on a more global level. Specific locations are identified to tally flows at a reasonable location in order to approximate pump station sizes for evaluating the system. More specific location and hydraulic information must be developed during the final design process for each pump station.

Future basin delineations and future pump station locations may (and will likely) vary from those presented in this analysis. In some basins or areas within basins, alternative conveyance systems may be more appropriate than traditional pumping stations. The nature of each facility is not evaluated here, but could include grinder pumps and small diameter conveyance pipe (individual pumps), vacuum systems (good for shorelines) or septic tank effluent pump (STEP) systems.

5.2.3.2 Loading Build-Out Flows

Flow projections were developed for the future conditions, similar to the flow estimates for the existing condition. Parcel-based ERUs were assigned to the unserved and developable parcels within the LAMIRD in accordance with the Kitsap County Department of Community Development population allocations and Land Capacity Analysis as described in Chapter 2. ERUs were converted to equivalent populations and entered into the model assigned to their respective parcels. For the future condition, the AAF was set at 85 gpcd. Similar to loading for existing flows, the AAF was factored by 3.76 to obtain peak day flow.

Because no actual collection facilities currently exist in future basins, flow loading could not be assigned to local infrastructure. Rather, the sewage flows from the future basins were generally assigned into the existing system at the nearest available entry point (manhole or pump station).

5.3 Model Execution and Analysis Results

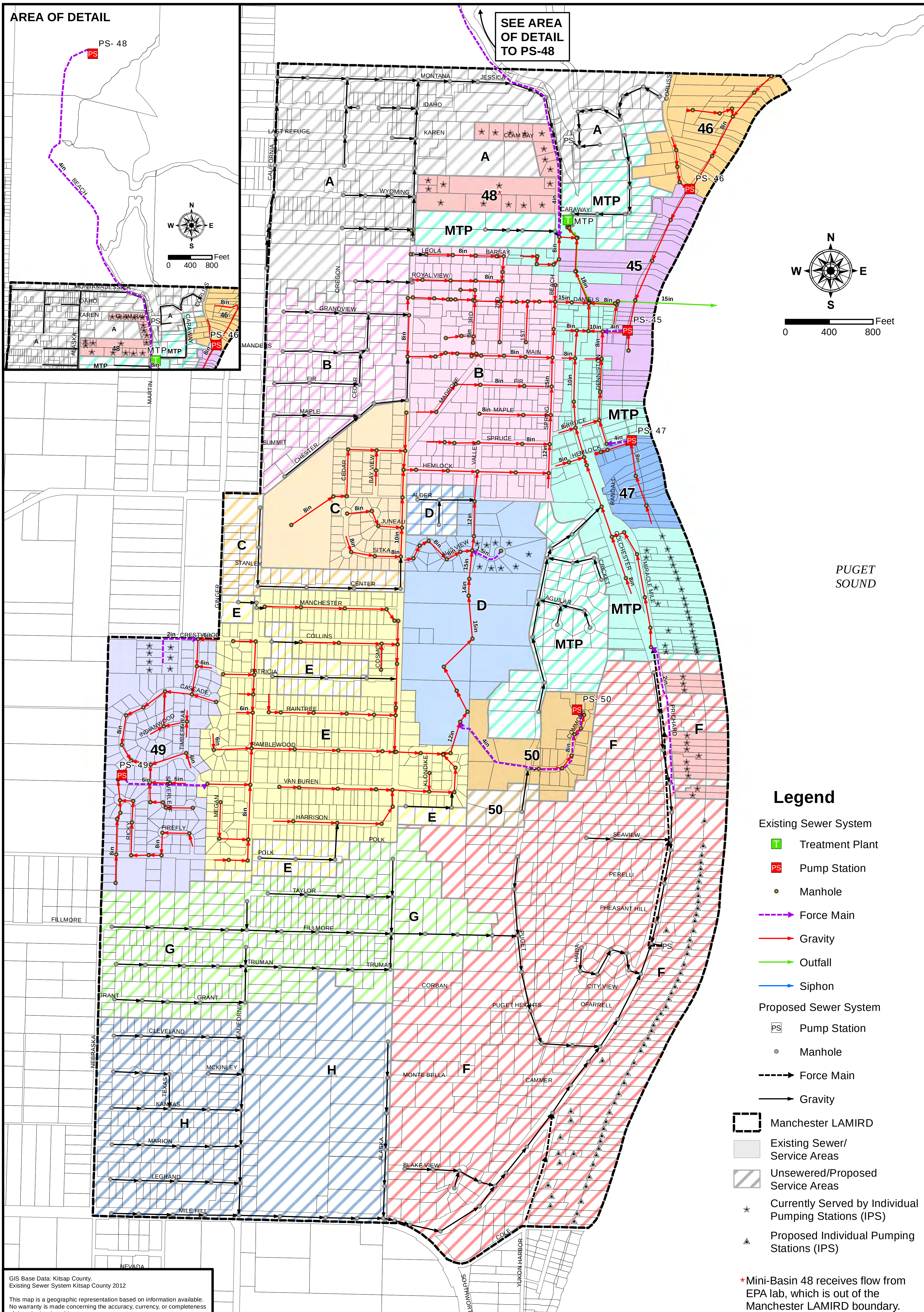
The modeling effort and data set described above were developed to determine the infrastructure requirements to provide adequate sewer service to the projected build-out population within the LAMIRD as defined in Chapter 2.

An initial review of existing pump stations is included in Chapter 3 which summarizes the hydraulic capacity of each station. That evaluation was expanded as part of the analysis to model projected future flows to each station and to determine if the existing capacity was adequate for future flows or if expansion of the pump station may be necessary.

The effects of the future flows (2019, 2030, and build-out) on the conveyance system were analyzed by applying the peak hour peaking factor of 3.76 to the existing facilities model with the future flow loading, as listed in Table 4-9. Modeled results through build-outdo not indicate any locations where the existing conveyance facilities do not have adequate capacity to accommodate the increased flows. As such, no improvements were made to the modeled system to accommodate future flows.

5.3.1 Future New Conveyance Facilities to Accommodate Build-Out Projected Flows

Future new conveyance facilities for areas that are currently unsewered are sized according to the modeled build-out flow requirements and the calculated total dynamic head for each facility. Using these variables, force main sizes and pump station horsepower were determined. The estimated capacities of future new pump stations are presented in Chapter 6. The conceptual locations of future force mains and gravity sewers are presented in Figures 6-1 and 6-2.



P:\Mapping\Maps_Generated\KitsapCounty\Projects\12-10274.00\009\maps\Fig 5-1 Mini Basins 11x17.mxd 10/2/2014 ctolentino

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MINI-BASINS MAP
MANCHESTER SEWER FACILITIES STRATEGY PLAN
Kitsap County
October 2014

Figure
5-1

Chapter 6 Collection Facilities Improvements

The Capital Improvement Program (CIP) is formulated to address the infrastructure needs as identified by the County to resolve known problems or capacity concerns, or where such concerns are anticipated. The conveyance system deficiencies in the existing sewer system were evaluated for projected build-out conditions. Recommended improvements for 2014 to 2019 and for 2020 to build-out are illustrated on Figures 6-1 and 6-2, respectively.

6.1 Existing System Upgrades

Six pump stations are projected to reach the end of their design life within the CIP planning period. New gravity sewers to ultimately expand the service area and a force main replacement will be built in conjunction with a road paving and stormwater improvement project along Alaska Avenue, including the reaches in Basins G and H that may not be connected to the sewer system until a later date when the remainder of the system is constructed. Sewer extensions will provide sewer to the remaining service area. The County reviews joint projects on an ongoing basis. The required facilities improvements are described below; all project timelines are subject to adjustment and are subject to availability of funds.

Pump Station Rehabilitation:

- Pump Stations 45, 46, and 47 will reach the end of their design lives and are projected for rehabilitation between 2014 and 2018.
- Pump Stations 48, 49, and 50 will reach the end of their design lives and are projected for rehabilitation between 2020 and 2033.
- Rehabilitation will include the following for each pump station:
  - New concrete wet well (PS 45, 46 and 47).
  - New mechanical components.
  - Two new pumps.
  - New valve vaults (PS 45, 46 and 47).
  - New electrical, instrumentation, and controls.
  - New equipment canopy/shelters.
  - New flow meter vaults.
  - New generator sets with weather/acoustical enclosures.

Beach Line CIPP Repair in Basins 45, 46, and 47:

- Project should be completed by 2015.
- Install approximately 3,330 feet of cured-in-place pipe liner in existing Beach Line gravity sewer.
- Install new manholes.
- Reconnect side sewers.

A cost effectiveness analysis was performed for Pump Stations 45, 46, 47 and associated beachlines to determine the components of the upgrades listed above for the three pump stations and associated beachlines. The Cost Effectiveness Analysis is included as Appendix H, and complies with the requirements of WAC 173-98-730.

New Gravity Pipeline at Alaska Avenue – Joint Project with Transportation/Stormwater:

- Project should be completed by 2019.
- Project will be built in conjunction with the road paving and stormwater improvement project along Alaska Avenue (Transportation Improvement Program #50).

- Install new gravity sewer pipe, manholes, and side sewer connections.
- Project will include the following:
    - Approximately 300 feet of gravity pipeline in Basin C in Alaska Avenue between Center Street and Sitka Court.
    - Approximately 900 feet of gravity pipeline in Basin G in Alaska Avenue between Truman Street and Polk Street.
    - Approximately 1,590 feet of gravity pipeline in Basin H in Alaska Avenue between Mile Hill Drive and Corban Street.

New Pipeline at Beach Drive – Joint Project with Transportation/Stormwater:

- Project should be completed by 2019.
- Project will be built in conjunction with the road paving and stormwater improvement project along Beach Drive (Transportation Improvement Program #49).
- Install new gravity sewer pipe, manholes, and side sewer connections.
- Project will include the following:
    - Approximately 840 feet of gravity pipeline in Basin A in Beach Drive between Jessica Way and proposed PS-A1.
    - Approximately 980 feet of force main from PS-A1.

New Gravity Pipeline at Chester Road – Joint Project with Transportation/Stormwater:

- Project should be completed by 2017.
- Project will be built in conjunction with the road paving and stormwater improvement project along Chester Road (Transportation Improvement Program #45).
- Install new gravity sewer pipe, manholes, and side sewer connections.
- Project will include the following:
    - Approximately 1,730 feet of gravity pipeline in Basin B in Alaska Avenue between Chester Road and Main Street and Chester Road between Madrone Avenue and Alaska Avenue.

Manchester Treatment Plant (MTP) Influent Pump Station Rehabilitation

- MTP Influent Pump Station Rehabilitation is recommended to minimize groundwater infiltration and address corrosion.
- Project should be completed by 2017.
- Project will include the following:
    - Structural retrofitting of existing wet well (based on Raven Lining System). Assumes four dewatering wells dewatering for 21 days to stop groundwater intrusion for lining system application.
    - New mechanical components including discharge piping.
    - Three new pumps.
    - New electrical, instrumentation, and controls.
    - New wet well hatch with fall prevention net.
    - New wet well ladder.
    - New wet well level controls.

Sewer Extension Projects:

- Sewer extension projects will provide service into currently unsewered areas.
- The following projects will be installed via sewer extensions:
    - Approximately 9,550 feet of gravity pipeline in Basin A.
    - Approximately 4,680 feet of gravity pipeline in Basin B.
    - Approximately 1,980 feet of gravity pipeline in Basin C.
    - Approximately 720 feet of gravity pipeline in Basin D.
    - Approximately 3,210 feet of gravity pipeline in Basin E.

- Approximately 8,890 feet of gravity pipeline in Basin G.
- Approximately 9,800 feet of gravity pipeline in Basin H.
- Approximately 480 feet of gravity pipeline in Basin 50.
- Approximately 5,310 feet of gravity pipeline in Basin WWTP.
- Pump Station PS-A1.

County Operations and Maintenance Projects in Basins 49 and E:

- Replace gravity sewer pipe, side sewer connections, and manholes.
- Replace faulty tees and side sewers.
- Projects will include the following:
  - Approximately 420 feet of gravity pipeline between manholes D10-1015 and D10-1014 will be replaced.
  - Approximately 50 feet of gravity pipeline between manhole D10-2042 and LS-49 will be replaced.
  - Approximately 205 feet of gravity pipeline between manholes D10-2053 and D10-2052 will be replaced.
  - One protruding side sewer service between manholes D10-1037 and D10-1036 will be replaced.
  - One tee with root intrusion will be replaced between manholes D10-1022 and D10-1021.
  - One tee with root intrusion will be replaced between manholes D10-2026 and D10-1025.

Several additional programs are recommended for review, but are not included in the capital improvement program at this time, to maintain the capacity of the existing sewer collection system. These are described below:

- As pipes continue to age, a regular program of pipe replacement would gradually bring these segments up to modern standards.
- Infiltration and inflow is not believed to be a significant issue for the sewer system as discussed in Chapter 4. Local I/I problem areas may exist however, and so it is recommended that an I/I reduction program be instituted. Better flow monitoring at individual pump stations will facilitate this analysis.
- Television inspection of a portion the sewer system each year would allow maintenance concerns to be identified and direct maintenance funds to the most cost-effective locations.
- Fats, oils, and grease (FOG) accumulations are a concern with most sewer systems in that these deposits may plug pipes and cause sewer overflows. An active study to the effectiveness of the current County FOG program and development of improved practices will contribute to better operating efficiencies.
- Asset management will be enhanced when the above programs are in place; Once in place, an updated asset management program will aid the County to make the best use of available sewer utility funds.

6.2 Colchester Sewer Alternatives

The Colchester area is a part of the Manchester LAMIRD. The residents of the Colchester area may desire to implement local sewer projects in their area. An analysis was performed as part of this Plan, and the recommended alternative for the Colchester area is to have a combined gravity sewer/pump station/force main system. Funding alternatives are currently being evaluated by the County based on the number of ULID participants and related property assessments.

Three sewer improvement alternatives were considered for the Colchester area; two of the alternatives include two sub-options, for a total of five evaluated configurations. The full memorandum describing in detail these alternatives is appended to this Plan (Appendix D). Following is a brief description of the five configurations:

- **Alternative 1A** consists of serving 72 parcels along the shoreline (east) side of Colchester Drive and Yukon Harbor Drive north of SE Cole Street to Miracle Mile Drive. The parcels will be served by Individual Pumping Systems (IPSs) that pump sewage to a 4-inch diameter force main that discharges into the gravity sewer system at the south end of Miracle Mile Drive.

- **Alternative 1B** consists of serving 72 parcels along the shoreline (east) side of Colchester Drive and Yukon Harbor Drive north of SE Cole Street to Miracle Mile Drive. The parcels will be served by IPSs that pump sewage to a 4-inch diameter force main along Yukon Harbor Drive from SE Cole Street to Colchester Drive as well as a 6-inch diameter force main along Colchester Drive from the new PS- to the south end of Miracle Mile Drive. Alternative 1B also includes a 12-inch gravity sewer along Colchester Drive from Yukon Harbor Drive to PS-F1, and an 8-inch gravity sewer along Colchester Drive from Miracle Mile Drive south to PS-F1. The gravity sewer will convey flow to PS-F1, and sewage will then be pumped north through the force main. The force main will provide service to the parcels on the shoreline side of these roads. Each parcel will be connected to the gravity sewer or force main by an IPS.

- **Alternative 2A** consists of serving 121 parcels along the shoreline (east) and west sides of Colchester Drive and Yukon Harbor Drive north of SE Cole Street to Miracle Mile Drive. The parcels will be served by IPSs that pump sewage to a 4-inch diameter force main that discharges into the gravity sewer system at the south end of Miracle Mile Drive.

- **Alternative 2B** consists of serving 121 parcels along the shoreline (east) and west sides of Colchester Drive and Yukon Harbor Drive north of SE Cole Street to Miracle Mile Drive. The parcels will be served by IPSs that pump sewage to a 4-inch diameter force main along Yukon Harbor Drive from SE Cole Street to Colchester Drive as well as a 6-inch diameter force main along Colchester Drive from the new PS- to the south end of Miracle Mile Drive. Alternative 1B also includes a 12-inch gravity sewer along Colchester Drive from Yukon Harbor Drive to PS-F1, and an 8-inch gravity sewer along Colchester Drive from Miracle Mile Drive south to PS-F1. The gravity sewer will convey flow to PS-F1, and sewage will then be pumped north through the force main. The force main will provide service to the parcels on the shoreline side of these roads. Each parcel will be connected to the gravity sewer or force main by an IPS.

- **Alternative 3** consists of serving 239 parcels along the shoreline (east) and west sides of Colchester Drive and Yukon Harbor Drive north of SE Cole Street to Miracle Mile Drive. Parcels located along the side streets west of Colchester Drive are also included. The parcels along the shoreline will be served by either a 4-inch force main along Yukon Harbor Drive from SE Cole Street to Colchester Drive as well as a 6-inch force main along Colchester Drive from PS-F1. Alternative 3 also includes a 12-inch gravity sewer along Colchester Drive from Southworth Drive to PS-F1, and an 8-inch gravity sewer along Colchester Drive from Miracle Mile Drive south to PS-F1, as well as 8-inch gravity sewers west of Colchester Drive. The gravity sewer will convey flow to PS-F1, and sewage will then be pumped north through the force main. The force main and gravity sewer will provide service to the parcels on both sides of Colchester Drive. The sewers in the side streets west of Colchester Drive will collect sewage from parcels not adjacent to the gravity main in Colchester Drive and convey the flow to the sewer main in Colchester Drive. The parcels on the shoreline (east) side of Colchester Drive will be served by IPSs. Homes directly on the west side of Colchester Drive will tie into the gravity sewer via gravity side sewers.

Total project costs vary from $3,475,100 to $11,652,000. Detailed costs are included as Appendix D.

A cost effectiveness analysis was performed for sewering the Colchester Area. The Cost Effectiveness Analysis is included as Appendix I, and complies with the requirements of WAC 173-98-730.

6.3 New Infrastructure Requirements

Capacity requirements are based on the build-out conditions allowed by current zoning and land use plans for the present sewer service area allowed within the LAMIRD boundary. However, these constraints may change and actual development may differ in future years. If so, then the capacity requirements should be reconsidered. The County reviews population and flows on an annual basis, and may adjust infrastructure improvement projects to meet customer needs.

All facilities, whether built as a capital improvement by the County or as a sewer extension, would be designed and constructed in accordance with the requirements of the current edition of the ‘Criteria for Sewage Works Design’ by the Department of Ecology and Kitsap County standards.

For gravity sewers, the minimum pipe gradient or slope should be sufficient to maintain a velocity of at least 2 feet per second to keep solids moving through the system. Force mains should not have velocities below 2 feet per second to prevent solids deposition at low velocities or exceeding 8 feet per second to prevent excessive wear that could occur from abrasion at higher velocities.

All sewage pump stations shall have at least two pumps, each with capacity for the peak hour flow projected for the design life of the pump, and controlled in an alternating lead-lag configuration. Stations shall use submersible pumps. Telemetry, magnetic flow meter, and emergency power shall be provided for all stations.

6.4 Preliminary Cost Estimate

Improvement projects for the 6-year CIP are listed in Table 6-1 and shown in Exhibit 6-1. These components are identified only to a preliminary level of design with approximate dimensions which will need to be refined during final design. The 6-year CIP shown in Table 6-1 is for the Manchester LAMIRD. The 6-year CIP is a component of the County’s “Capital Facilities Plan” that is available at www.kitsapgov.com/dcd/community_plan/comp_plan/capital_facilities.htm.

Construction costs were estimated from bid results for similar projects in the Puget Sound area and RS Means cost data for 2013. In addition to the costs to build the various components, the estimated construction cost also includes sales tax and a 35 percent contingency. Construction costs assumed that a private contractor would do the work.

Estimated project costs include the estimated construction costs plus surveying, engineering services, permits, bid advertisement, contract award, and engineering services during construction. No costs are included for financing, easements, right-of-way, or property acquisition.

Table 6-1 Capital Improvements - 2014 through 2019 Estimated Project Costs in 2013 Dollars

Capital Improvement	2014	2015	2016	2017	2018	2019	Total
Pump Station 45 Rehabilitation and Force Main	$240,800	$103,200		$876,000			$1,220,000
Pump Station 46 Rehabilitation	$217,000	$93,000	$714,000				$1,024,000
Pump Station 47 Rehabilitation	$217,000	$93,000			$714,000		$1,024,000
Beach Line CIPP Repair in Basins 45, 46 and 47	$130,200	$667,800					$798,000
Gravity Pipeline and Force Main from PS-A1 in Basin A (Beach Drive) – Joint Project with Trans/Storm						$731,000	$731,000
Gravity Pipeline in Basin B (Chester Road and Alaska Avenue) – Joint Project with Trans/Storm				$663,000			$663,000
Gravity Pipeline in Basin C (Alaska Avenue) – Joint Project with Trans/Storm						$111,000	$111,000
Gravity Pipeline in Basin G (Alaska Avenue) – Joint Project with Trans/Storm					$327,000		$327,000
Gravity Pipeline in Basin H (Alaska Avenue) – Joint Project with Trans/Storm			$544,000				$544,000
MTP Influent Pump Station Rehabilitation				$667,000			$667,000
6-Year CIP Subtotal	**$805,000**	**$957,000**	**$1,258,000**	**$2,206,000**	**$1,041,000**	**$842,000**	**$7,109,000**

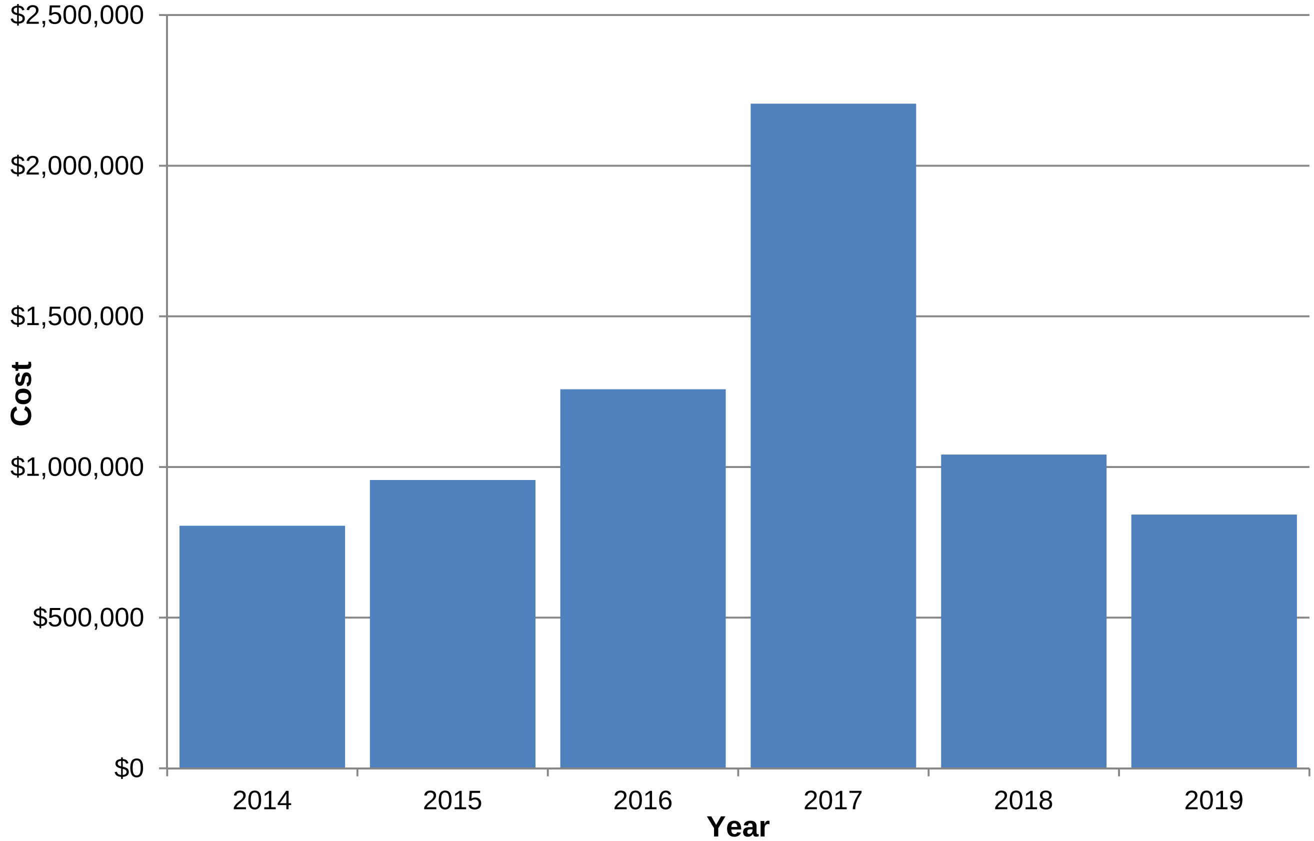


Exhibit 6-1 Capital Improvements – 2014 through 2019

Some sewage conveyance and collection improvements have been identified that will be required subsequent to 2019 and the completion of the six-year CIP shown in Table 6-1. A second period (2020 through build-out) of capital improvements immediately following the six-year CIP is recommended, and is summarized in Table 6-2. Precise dates for the longer term improvements cannot be established now.

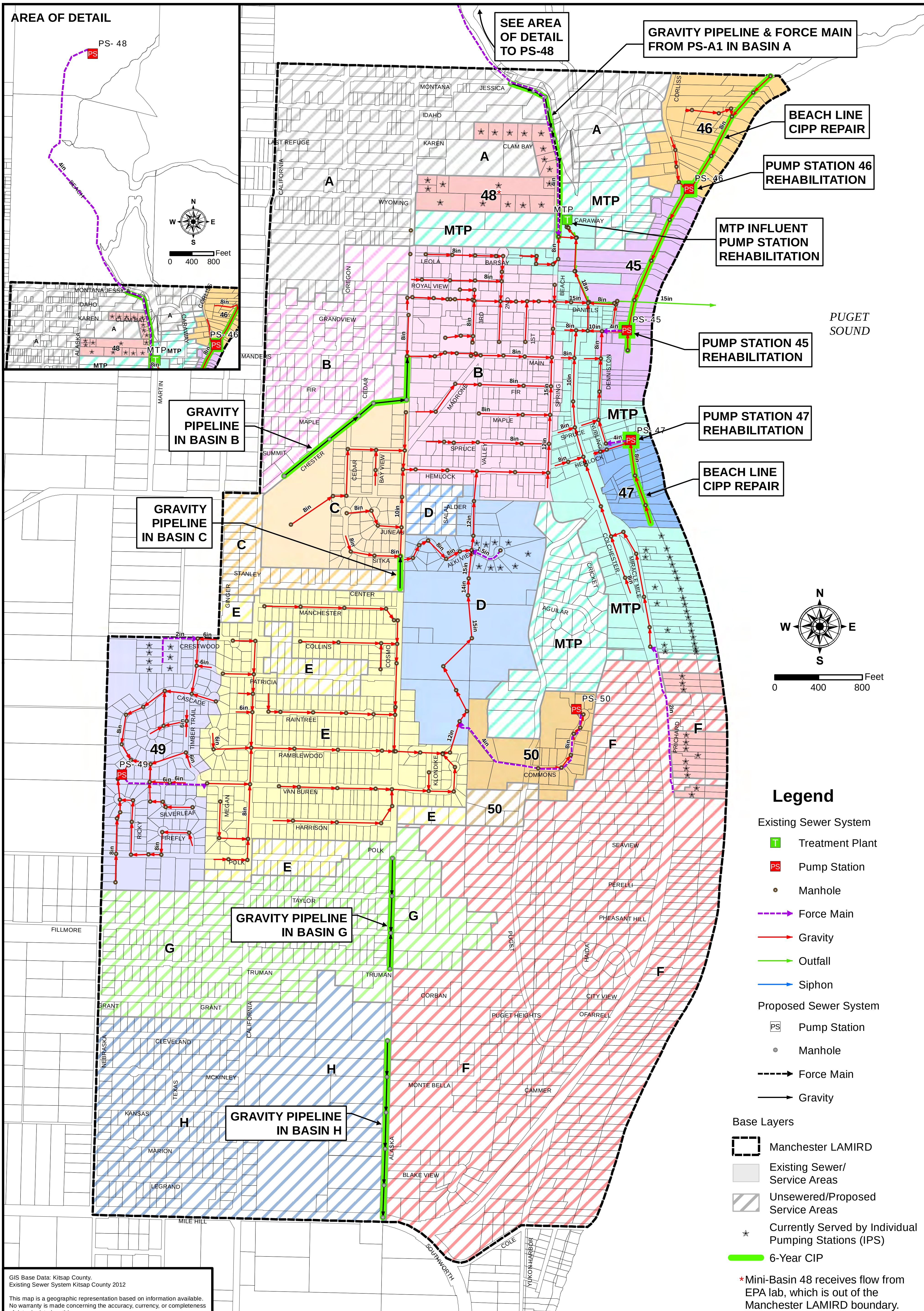
Table 6-2 Capital Improvements - 2020 through Build-out Estimated Project Costs in 2013 Dollars

Capital Improvement	Estimated Construction Costs	Estimated Project Costs
Build-Out CIP		
Pump Station 48, 49, and 50 Rehabilitation	$1,485,000	$2,229,000
Gravity Pipeline in Basin 49	$64,000	$102,000
Gravity Pipeline in Basin E	$141,000	$204,000
3 Tees in Basins 49 and E	$30,000	$45,000
Build-Out CIP Subtotal	**$1,720,000**	**$2,580,000**
Sewer Extension		
Gravity Pipeline in Basin A	$3,157,000	$4,263,000
Gravity Pipeline in Basin B	$1,508,000	$2,036,000
Gravity Pipeline in Basin C	$619,000	$836,000
Gravity Pipeline in Basin D	$235,000	$329,000
Gravity Pipeline in Basin E	$1,037,000	$1,453,000
Gravity Pipeline in Basin G	$2,844,000	$3,839,000
Gravity Pipeline in Basin H	$3,134,000	$4,230,000
Gravity Pipeline in Basin 50	$157,000	$235,000
Gravity Pipeline in Basin WWTP	$1,760,000	$2,376,000
Pump Station PS-A1	$627,000	$941,000
Sewer Extension Subtotal	**$15,078,000**	**$20,538,000**
Estimated Total Cost	**$16,798,000**	**$23,118,000**

6.5 Non-Economic Considerations

The pump stations that will be rehabilitated are in active service. Construction of improvements will occur over several months. Sewerage service will have to be maintained during that time period for both the pump station and the force main. This may require temporary facilites to be developed and in place during the construction period.

The projects are estimated to take approximately one year in duration from planning through construction. Actual schedules may be longer due to the time required for coordination and permitting.



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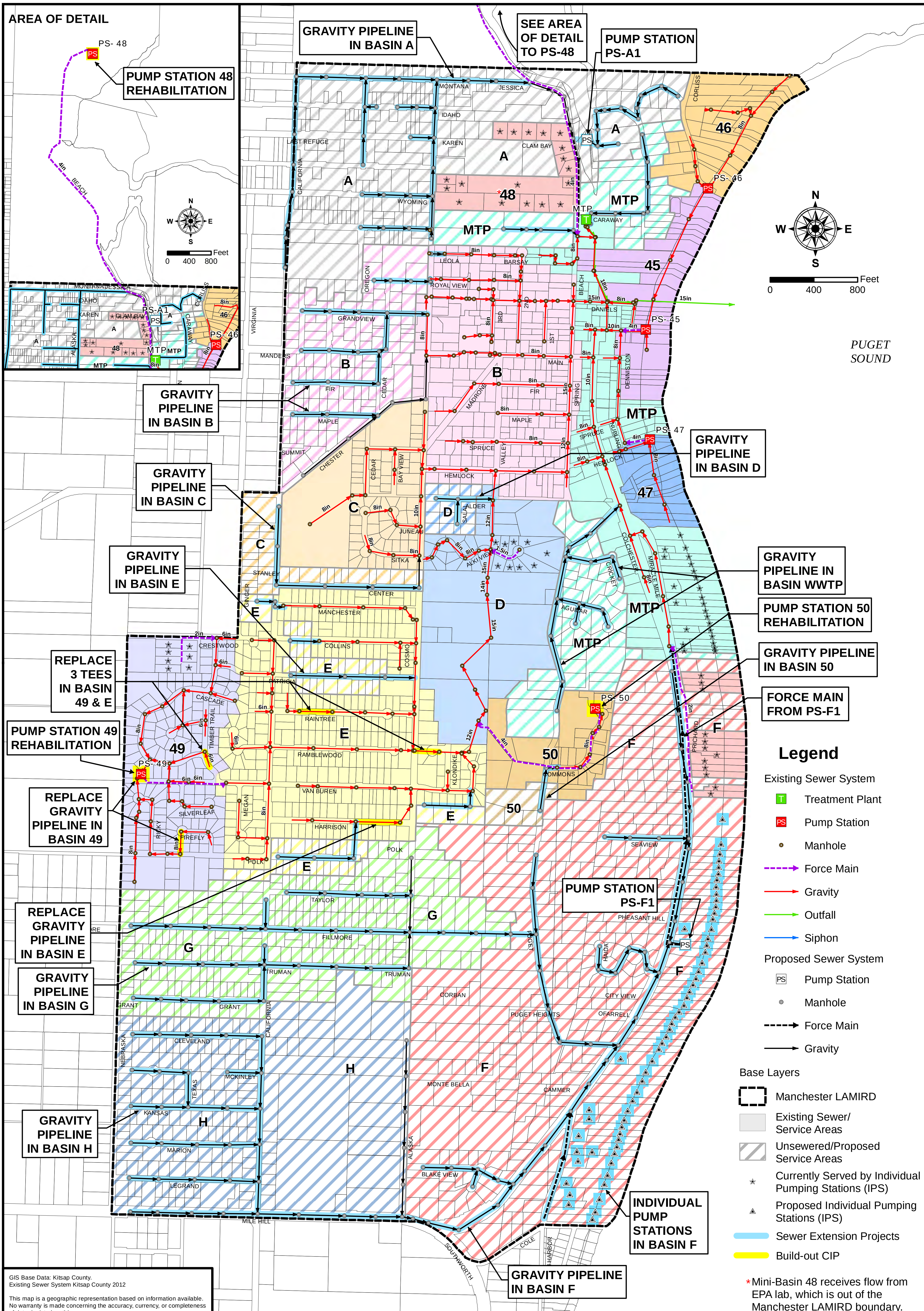
6-YEAR CAPITAL IMPROVEMENT PROJECTS

MANCHESTER SEWER FACILITIES STRATEGY PLAN
Kitsap County
October 2014

Figure

6-1



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BUILD-OUT CAPITAL IMPROVEMENT PROJECTS

MANCHESTER SEWER FACILITIES STRATEGY PLAN

Kitsap County

October 2014

Figure

6-2

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Chapter 7 Reclaimed Water

Kitsap County owns and operates the Manchester Sewage Treatment Plant (MTP). At this time, the MTP does not produce any reclaimed water; all effluent is discharged to the Puget Sound.

In other communities, potential reclaimed water customers include schools, parks, golf courses, and agriculture, where reclaimed water could be used for irrigation, dual-plumbed buildings, environmental enhancement projects, or other non-potable uses.

Chapter 8 Financial

Kitsap County Public Works operates all of the County-owned sewage collection and treatment facilities under one utility. That utility charges a uniform rate for connection to any of the County's sewer system and for monthly fees.

Cost per service, in terms of debt service and operation and maintenance costs, for all facilities, including existing and proposed for the Manchester LAMIRD during the planning period, can be found in Chapter 10 of the Central Kitsap County Wastewater Facility Plan, Brown and Caldwell, March 2011.

Chapter 9 Public Participation

Three Manchester Citizens' Advisory Committee (MCAC) meetings were held at the Manchester Library to involve the public with the Plan preparation. These meetings occurred in October of 2012 and February and October of 2013. The first MCAC meeting introduced the Plan and described the components of the makeup of the plan, including sewer extension design alternatives. The February 2013 meeting further detailed the Plan components, and discussed the work that was occurring, which included preliminary Capital Improvement Plan (CIP) analyses as well as sewer extension design alternatives. The third MCAC meeting in October 2013 presented the results of the CIP analyses, informed the MCAC that the County wanted to receive Department of Ecology (DOE) approval for the Plan, as well as presented a Colchester Alternatives memorandum, which are part of the Plan.

The County has the MCAC presentations available for public review at www.kitsapgov.com/ww/. Public notices, agendas, and presentations are included as Appendix G.

Additional approval processes included the Kitsap County Board of County Commissioners reviewing and accepting the Plan.

Appendix A

Daily Monitoring Reports

WASTEWATER TREATMENT PLANT MONITORING REPORT

Permit No. WA-002370-1 Discharge No. 001 Month January
Facility Name Manchester WWTP Year 2009
Receiving Water Puget Sound Location Manchester
Plant Type Conventional Activated Sludge - Secondary Treatment System NO DISCHARGE for month

	INFLUENT				EFFLUENT										
Frequency	2/Week	2/Week	2/Week	2/Week	Daily	Daily	2/Week	2/Week	1/Month	2/Week	2/Week	1/Month	2/Week	1/Month	1/Month
Type	24-hour	24-hour	24-hour	24-hour	Measure	Grab	24-hour	24-hour	Calc	24-hour	24-hour	Calc	Grab	24-hour	24-hour
Day of the Month	BOD 5-Day mg/L	BOD 5-Day LBS/Day	TSS mg/L	TSS LBS/Day	Flow MGD	pH Std Units	BOD 5-Day mg/L	BOD 5-Day LBS/Day	BOD 5-Day %Removal	TSS mg/L	TSS LBS/Day	TSS %Removal	Fecal Coliform #/100mL	Total Ammonia mg/L	Total Ammonia LBS/Day
1	201	472	226	530	0.2815	6.7	4.9	11.5	97.6	7.4	17.5	96.7			
2					0.2426	6.8									
3					0.2158	6.6									
4	204	389	193	369	0.2287	6.8	7.7	14.7	96.2	10.0	19.1	94.8		1.4	2.6
5					0.3021	6.8							1		
6					0.2898	7.0							6		
7					0.5269	6.8									
8	105	331	106	335	0.3778	6.8	9.6	30.3	90.9	17.3	54.5	83.7			
9					0.2708	6.8									
10					0.2473	6.8									
11	157	325	176	364	0.2482	6.9	4.6	9.5	97.1	7.3	15.1	95.8			
12					0.2245	6.9							6		
13					0.2377	6.9							1		
14					0.2108	6.9									
15	181	299	398	656	0.1977	6.9	4.8	7.9	97.4	8.1	13.3	98.0		0.4	0.6
16					0.1920	6.8									
17					0.1964	7.0									
18					0.1922	7.1									
19	194	312	253	407	0.1928	6.7	4.9	7.9	97.5	9.1	14.7	96.4			
20					0.1808	6.8							1		
21					0.1823	6.9							1		
22	195	292	287	430	0.1795	7.0	4.9	7.4	97.5	7.9	11.9	97.2			
23					0.1969	7.0									
24					0.1824	6.8									
25	194	322	296	491	0.1991	6.8	4.4	7.4	97.7	5.8	9.7	98.0			
26					0.1677	6.9							1		
27					0.1755	6.8							4		
28					0.1703	7.0									
29	215	299	286	398	0.1664	7.0	5.6	7.7	97.4	9.0	12.5	96.9			
30					0.1628	7.0									
31					0.1750	6.9									
Total					7.0141										
	AVG	AVG	AVG	AVG	AVG	MIN	AVG	AVG	AVG	AVG	AVG	AVG	GEM	AVG	AVG
	183	338	247	442	0.2263	6.6	5.7	11.6	96.6	9.1	18.7	95.3	2	0.9	1.6
Limit		832		832	0.46	6.0	30	115	85	30	115	85	200		
					MAX	MAX	AVW	AVW		AVW	AVW		GM7	MAX	MAX
					0.5269	7.1	8.7	22.5		13.6	36.8		2	1.4	2.6
Limit						9.0	45	173		45	173		400		

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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Stella V. Vakarcs, P.E./ Senior Program Manager
Name and Title (Typed or Printed)

Stella V. Vakarcs 2/11/09
Signature/Date

(360) 337-5777
Phone Number

Rev. 1, 5/31/07 by DCH

WASTEWATER TREATMENT PLANT MONITORING REPORT

Permit No. WA-002370-1 **Discharge No.** 001 **Month** February
Facility Name Manchester WWTP **Year** 2009
Receiving Water Puget Sound **Location** Manchester
Plant Type Conventional Activated Sludge - Secondary Treatment System **NO DISCHARGE for month** ☐

	INFLUENT				EFFLUENT										
Frequency	2/Week	2/Week	2/Week	2/Week	Daily	Daily	2/Week	2/Week	1/Month	2/Week	2/Week	1/Month	2/Week	1/Month	1/Month
Type	24-hour	24-hour	24-hour	24-hour	Measure	Grab	24-hour	24-hour	Calc	24-hour	24-hour	Calc	Grab	24-hour	24-hour
Day of the Month	BOD 5-Day mg/L	BOD 5-Day LBS/Day	TSS mg/L	TSS LBS/Day	Flow MGD	pH Std Units	BOD 5-Day mg/L	BOD 5-Day LBS/Day	BOD 5-Day %Removal	TSS mg/L	TSS LBS/Day	TSS %Removal	Fecal Coliform #/100mL	Total Ammonia mg/L	Total Ammonia LBS/Day
1	220	304	222	307	0.1654	7.0	7.3	10.1	96.7	10.0	13.9	95.5		2.4	3.3
2					0.1783	6.8							4		
3					0.1945	6.8							1		
4					0.1729	6.7									
5	203	296	273	397	0.1745	6.8	6.5	9.5	96.8	8.7	12.7	96.8			
6					0.1653	6.8									
7					0.2010	7.0									
8	180	377	190	398	0.2507	6.7	13.0	27.2	92.8	19.7	41.3	89.6			
9					0.2073	6.7							160		
10					0.2043	6.8							9		
11					0.2105	6.8									
12	267	455	211	360	0.2041	6.8	33.8	57.6	87.3	60.5	103	71.3			
13					0.1973	6.9									
14					0.1794	6.9									
15					0.1795	6.9									
16	312	477	213	326	0.1832	6.9	10.2	15.6	96.7	12.4	18.9	94.2		4.4	6.7
17					0.1707	6.9							5		
18					0.1620	6.9							1		
19	231	312	219	295	0.1617	6.9	6.7	9.1	97.1	9.2	12.5	95.8			
20					0.1540	6.9									
21					0.1698	6.9									
22	230	363	268	423	0.1892	7.0	6.6	10.4	97.1	8.6	13.5	96.8			
23					0.1833	6.9							4		
24					0.2292	6.9							3		
25					0.2079	6.8									
26	191	296	328	509	0.1859	6.8	5.3	8.2	97.2	7.8	12.1	97.6			
27					0.1724	6.8									
28					0.1883	6.8									
Total					5.2425										
	AVG	AVG	AVG	AVG	AVG	MIN	AVG	AVG	AVG	AVG	AVG	AVG	GEM	AVG	AVG
	229	360	241	377	0.1872	6.7	11.2	18.5	95.2	17.1	28.5	92.2	5	3.4	5.0
Limit		832		832	0.46	6.0	30	115	85	30	115	85	200		
					MAX	MAX	AVW	AVW		AVW	AVW		GM7	MAX	MAX
					0.2507	7.0	23.4	42.4		40.1	72.2		38	4.4	6.7
Limit						9.0	45	173		45	173		400		

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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Stella V. Vakarcs, P.E./ Senior Program Manager
Name and Title (Typed or Printed)

Stella V. Vakarcs 3/5/09
Signature/Date

(360) 337-5777
Phone Number

WASTEWATER TREATMENT PLANT MONITORING REPORT

Permit No. WA-002370-1 **Discharge No.** 001 **Month** March
Facility Name Manchester WWTP **Year** 2009
Receiving Water Puget Sound **Location** Manchester
Plant Type Conventional Activated Sludge - Secondary Treatment System **NO DISCHARGE for month**

	INFLUENT				EFFLUENT										
Frequency	2/Week	2/Week	2/Week	2/Week	Daily	Daily	2/Week	2/Week	1/Month	2/Week	2/Week	1/Month	2/Week	1/Month	1/Month
Type	24-hour	24-hour	24-hour	24-hour	Measure	Grab	24-hour	24-hour	Calc	24-hour	24-hour	Calc	Grab	24-hour	24-hour
Day of the Month	BOD 5-Day mg/L	BOD 5-Day LBS/Day	TSS mg/L	TSS LBS/Day	Flow MGD	pH Std Units	BOD 5-Day mg/L	BOD 5-Day LBS/Day	BOD 5-Day %Removal	TSS mg/L	TSS LBS/Day	TSS %Removal	Fecal Coliform #/100mL	Total Ammonia mg/L	Total Ammonia LBS/Day
1	194	367	198	375	0.2270	6.9	9.5	18.0	95.1	15.4	29.1	92.2		3.9	7.3
2					0.2072	6.8							1		
3					0.1944	6.8							5		
4					0.1968	6.7									
5	192	305	181	288	0.1901	6.8	5.6	8.8	97.1	9.3	14.7	94.9			
6					0.1987	6.8									
7					0.1964	6.8									
8	221	373	219	369	0.2025	6.7	9.1	15.4	95.9	14.7	24.9	93.3			
9					0.1809	6.9							1		
10					0.1677	6.9							1		
11					0.1741	6.8									
12	246	336	200	273	0.1638	6.8	6.1	8.3	97.5	8.3	11.4	95.8			
13					0.1586	6.7									
14					0.2074	6.8									
15	172	386	160	359	0.2692	6.8	7.9	17.7	95.4	11.1	24.9	93.1		2.9	6.5
16					0.2393	7.0							1		
17					0.2418	6.8							5		
18					0.2048	6.7									
19	201	357	194	344	0.2128	6.8	7.5	13.2	96.3	10.5	18.7	94.6			
20					0.1928	6.8									
21					0.1921	6.9									
22	221	385	234	408	0.2086	6.8	6.2	10.7	97.2	9.7	17.0	95.8			
23					0.1904	6.8							1		
24					0.1775	6.8							11		
25					0.1777	6.8									
26	186	267	234	336	0.1719	6.8	4.7	6.7	97.5	9.9	14.3	95.8			
27					0.1976	6.8									
28					0.2078	6.8									
29	183	295	205	330	0.1933	6.8	7.4	12.0	95.9	13.5	21.8	93.4			
30					0.1821	6.8							9		
31					0.1690	6.8							4		
Total					6.0944										
	AVG	AVG	AVG	AVG	AVG	MIN	AVG	AVG	AVG	AVG	AVG	AVG	GEM	AVG	AVG
	202	341	203	343	0.1966	6.7	7.1	12.3	96.4	11.4	19.6	94.3	3	3.4	6.9
Limit		**832**		**832**	**0.46**	**6.0**	**30**	**115**	**85**	**30**	**115**	**85**	**200**		
					MAX	MAX	AVW	AVW		AVW	AVW		GM7	MAX	MAX
					0.2692	7.0	7.7	15.5		12.3	21.9		3	3.9	7.3
Limit						**9.0**	**45**	**173**		**45**	**173**		**400**		

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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Stella V. Vakarcs, P.E./ Senior Program Manager
Name and Title (Typed or Printed)

Stella V. Vakarcs 4/8/09
Signature/Date

(360) 337-5777
Phone Number

WASTEWATER TREATMENT PLANT MONITORING REPORT

Permit No. WA-002370-1 **Discharge No.** 001 **Month** April
Facility Name Manchester WWTP **Year** 2009
Receiving Water Puget Sound **Location** Manchester
Plant Type Conventional Activated Sludge - Secondary Treatment System **NO DISCHARGE for month**

	INFLUENT				EFFLUENT											
Frequency	2/Week	2/Week	2/Week	2/Week	Daily	Daily	2/Week	2/Week	1/Month	2/Week	2/Week	1/Month	2/Week	1/Month	1/Month	
Type	24-hour	24-hour	24-hour	24-hour	Measure	Grab	24-hour	24-hour	Calc	24-hour	24-hour	Calc	Grab	24-hour	24-hour	
Day of the Month	BOD 5-Day mg/L	BOD 5-Day LBS/Day	TSS mg/L	TSS LBS/Day	Flow MGD	pH Std Units	BOD 5-Day mg/L	BOD 5-Day LBS/Day	BOD 5-Day %Removal	TSS mg/L	TSS LBS/Day	TSS %Removal	Fecal Coliform #/100mL	Total Ammonia mg/L	Total Ammonia LBS/Day	
1					0.1846	6.9										
2	183	344	161	303	0.2253	6.9	9.7	18.2	94.7	13.2	24.9	91.8		0.4	0.8	
3					0.2182	6.8										
4					0.1919	6.9										
5	168	277	239	395	0.1977	6.8	8.1	13.3	95.2	10.7	17.6	95.5				
6					0.1773	6.8							1			
7					0.1777	6.8							1			
8					0.1832	6.8										
9	248	365	268	393	0.1762	6.9	10.9	16.0	95.6	13.2	19.4	95.1				
10					0.1862	6.8										
11					0.1892	7.0										
12	192	421	238	521	0.2629	6.8	11.8	25.9	93.8	14.9	32.7	93.7				
13					0.2276	6.9							1			
14					0.1935	6.9							1			
15					0.1862	6.9										
16	255	369	298	431	0.1735	6.7	9.2	13.3	96.4	11.4	16.5	96.2				
17					0.1898	6.8										
18					0.1794	6.7										
19	219	302	224	309	0.1654	6.8	4.9	6.8	97.8	7.7	10.6	96.6		0.4	0.5	
20					0.1696	6.4							1			
21					0.1630	6.9							4			
22					0.1747	6.8										
23	225	322	191	273	0.1715	6.8	10.6	15.2	95.3	11.5	16.4	94.0				
24					0.1877	6.8										
25					0.1675	6.8										
26	222	360	195	316	0.1945	6.8	7.9	12.8	96.5	10.9	17.7	94.4				
27					0.1682	6.9							4			
28					0.1694	6.8							1			
29					0.1680	6.8										
30	238	316	395	525	0.1594	6.8	9.5	12.7	96.0	13.6	18.1	96.6				
Total					5.5792											
	AVG	AVG	AVG	AVG	AVG	MIN	AVG	AVG	AVG	AVG	AVG	AVG	GEM	AVG	AVG	
	217	342	245	385	0.1860	6.4	9.2	14.9	95.7	11.9	19.3	94.9	1	0.4	0.7	
Limit		832		832	0.46	6.0	30	115	85	30	115	85	200			
					MAX	MAX	AVW	AVW		AVW	AVW		GM7	MAX	MAX	
					0.2629	7.0	10.5	19.6		13.4	24.6		6	0.4	0.8	
Limit						9.0	45	173		45	173		400			

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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Stella V. Vakarcs 5/8/09
Signature/Date

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WASTEWATER TREATMENT PLANT MONITORING REPORT

Permit No. WA-002370-1 Discharge No. 001
Month May
Year 2009
Facility Name Manchester WWTP
Location Manchester
Receiving Water Puget Sound
Plant Type Conventional Activated Sludge - Secondary Treatment System
NO DISCHARGE for month

	INFLUENT				EFFLUENT										
Frequency	2/Week	2/Week	2/Week	2/Week	Daily	Daily	2/Week	2/Week	1/Month	2/Week	2/Week	1/Month	2/Week	1/Month	1/Month
Type	24-hour	24-hour	24-hour	24-hour	Measure	Grab	24-hour	24-hour	Calc	24-hour	24-hour	Calc	Grab	24-hour	24-hour
Day of the Month	BOD 5-Day mg/L	BOD 5-Day LBS/Day	TSS mg/L	TSS LBS/Day	Flow MGD	pH Std Units	BOD 5-Day mg/L	BOD 5-Day LBS/Day	BOD 5-Day %Removal	TSS mg/L	TSS LBS/Day	TSS %Removal	Fecal Coliform #/100mL	Total Ammonia mg/L	Total Ammonia LBS/Day
1					0.1698	6.8									
2					0.1933	7.1									
3	248	398	220	352	0.1922	7.2	10.6	17.0	95.7	18.3	29.4	91.7		14.4	23.1
4					0.2365	6.9							5		
5					0.3391	6.8							15		
6					0.2833	6.8									
7	166	302	362	657	0.2178	6.8	8.6	15.6	94.8	14.2	25.8	96.1			
8					0.2143	6.8									
9					0.1899	6.7									
10	226	395	227	397	0.2096	6.9	9.4	16.5	95.8	14.0	24.5	93.8			
11					0.2009	6.9							29		
12					0.1909	6.8							18		
13					0.2234	6.8									
14	198	356	185	332	0.2156	6.8	6.3	11.4	96.8	8.9	16.1	95.2		0.9	1.6
15					0.2060	6.8									
16					0.1789	6.8									
17	222	361	273	444	0.1946	6.9	6.6	10.7	97.0	8.8	14.4	96.8			
18					0.2081	6.9							1		
19					0.1996	6.8							20		
20					0.1930	6.8									
21	199	300	266	400	0.1804	6.8	7.0	10.6	96.5	12.6	19.0	95.3			
22					0.1665	6.8									
23					0.1732	6.8									
24					0.1807	6.8									
25	206	338	211	347	0.1966	6.8	8.4	13.8	95.9	16.2	26.6	92.3			
26					0.1749	6.7							3		
27					0.1942	6.8									
28	224	297	236	313	0.1589	6.8	5.2	6.9	97.7	7.7	10.2	96.8	9		
29					0.1552	6.8									
30					0.1598	6.8									
31	235	373	287	455	0.1900	6.8	7.8	12.3	96.7	13.8	21.9	95.2			
Total					6.1869										
	AVG	AVG	AVG	AVG	AVG	MIN	AVG	AVG	AVG	AVG	AVG	AVG	GEM	AVG	AVG
	214	347	252	411	0.1996	6.7	7.8	12.8	96.3	12.7	20.9	94.8	8	7.6	12.3
Limit		832		832	0.46	6.0	30	115	85	30	115	85	200		
					MAX	MAX	AVW	AVW		AVW	AVW		GM7	MAX	MAX
					0.3391	7.2	9.6	16.3		16.3	27.6		23	14.4	23.1
Limit						9.0	45	173		45	173		400		

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Signature/Date

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Phone Number

WASTEWATER TREATMENT PLANT MONITORING REPORT

Permit No.	WA-002370-1	Discharge No. 001	Month: June
Facility Name	Manchester WWTP		Year: 2009
Receiving Water	Puget Sound		Location: Manchester
Plant Type	Conventional Activated Sludge - Secondary Treatment System		NO DISCHARGE for month

	INFLUENT				EFFLUENT											
Frequency	2/Week	2/Week	2/Week	2/Week	Daily	Daily	2/Week	2/Week	1/Month	2/Week	2/Week	1/Month	2/Week	1/Month	1/Month	
Type	24-hour	24-hour	24-hour	24-hour	Measure	Grab	24-hour	24-hour	Calc	24-hour	24-hour	Calc	Grab	24-hour	24-hour	
Day of the Month	BOD 5-Day mg/L	BOD 5-Day LBS/Day	TSS mg/L	TSS LBS/Day	Flow MGD	pH Std Units	BOD 5-Day mg/L	BOD 5-Day LBS/Day	BOD 5-Day %Removal	TSS mg/L	TSS LBS/Day	TSS %Removal	Fecal Coliform #/100mL	Total Ammonia mg/L	Total Ammonia LBS/Day	
1					0.1643	6.8							1			
2					0.1540	6.8							1			
3	235	297	235	297	0.1514	6.8	6.7	8.4	97.2	8.7	11.0	96.3		1.0	1.3	
4					0.1595	6.8										
5					0.1917	6.8										
6					0.1751	6.9										
7	248	392	311	491	0.1892	6.8	7.0	11.1	97.2	12.3	19.4	96.0				
8					0.1642	6.9							1			
9					0.1561	6.8							1			
10					0.1582	6.9										
11	256	332	293	381	0.1555	6.9	5.6	7.2	97.8	8.5	11.0	97.1				
12					0.1488	6.9										
13					0.1591	6.9										
14	212	330	298	464	0.1866	7.0	6.3	9.9	97.0	8.7	13.5	97.1		2.4	3.7	
15					0.1833	6.9							1			
16					0.1562	6.9							1			
17					0.1625	6.9										
18	235	310	273	360	0.1583	6.9	6.3	8.4	97.3	8.6	11.4	96.8				
19					0.1591	6.9										
20					0.1637	6.8										
21	254	384	270	409	0.1812	6.9	5.7	8.6	97.8	8.8	13.2	96.8				
22					0.1674	6.9							10			
23					0.1789	6.8							1			
24					0.1591	6.8										
25	298	396	282	374	0.1592	6.8	6.1	8.1	98.0	9.3	12.4	96.7				
26					0.1457	6.9										
27					0.1611	6.9										
28	246	355	240	346	0.1730	7.0	6.0	8.6	97.6	5.7	8.2	97.6				
29					0.1534	7.0							1			
30					0.1523	6.9							1			
Total					4.9279											
	AVG	AVG	AVG	AVG	AVG	MIN	AVG	AVG	AVG	AVG	AVG	AVG	GEM	AVG	AVG	
	248	350	275	390	0.1643	6.8	6.2	8.8	97.5	8.8	12.5	96.8	1	1.7	2.5	
Limit		832		832	0.46	6.0	30	115	85	30	115	85	200			
					MAX	MAX	AVW	AVW		AVW	AVW		GM7	MAX	MAX	
					0.1917	7.0	7.2	10.4		11.3	16.5		3	2.4	3.7	
Limit						9.0	45	173		45	173		400			

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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Stella V. Vakarcs, P.E./ Senior Program Manager
Name and Title (Typed or Printed)

Stella V Vakarcs 7/13/09
Signature/Date

(360) 337-5777
Phone Number

WASTEWATER TREATMENT PLANT MONITORING REPORT

Permit No. WA-002370-1 **Discharge No.** 001 **Month** July
Facility Name Manchester WWTP **Year** 2009
Receiving Water Puget Sound **Location** Manchester
Plant Type Conventional Activated Sludge - Secondary Treatment System **NO DISCHARGE for month** ☐

	INFLUENT				EFFLUENT										
Frequency	2/Week	2/Week	2/Week	2/Week	Daily	Daily	2/Week	2/Week	1/Month	2/Week	2/Week	1/Month	2/Week	1/Month	1/Month
Type	24-hour	24-hour	24-hour	24-hour	Measure	Grab	24-hour	24-hour	Calc	24-hour	24-hour	Calc	Grab	24-hour	24-hour
Day of the Month	BOD 5-Day mg/L	BOD 5-Day LBS/Day	TSS mg/L	TSS LBS/Day	Flow MGD	pH Std Units	BOD 5-Day mg/L	BOD 5-Day LBS/Day	BOD 5-Day %Removal	TSS mg/L	TSS LBS/Day	TSS %Removal	Fecal Coliform #/100mL	Total Ammonia mg/L	Total Ammonia LBS/Day
1	228	286	314	394	0.1504	6.9	6.7	8.3	97.1	8.1	10.1	97.4			
2					0.1694	6.9									
3					0.1579	6.8									
4					0.1846	6.9									
5	260	383	258	379	0.1764	6.9	5.7	8.4	97.8	7.6	11.1	97.1		5.8	8.5
6					0.1707	7.0							37		
7					0.1601	6.9							1		
8					0.1623	6.9									
9	262	342	226	294	0.1563	6.8	5.7	7.5	97.8	8.5	11.1	96.2			
10					0.1758	6.9									
11					0.1559	6.9									
12	248	366	260	384	0.1768	6.9	6.3	9.2	97.5	9.5	14.0	96.4			
13					0.1597	6.9							1		
14					0.1528	6.9							1		
15					0.1534	6.8									
16	257	323	378	475	0.1508	6.9	5.2	6.5	98.0	7.2	9.0	98.1		1.7	2.1
17					0.1416	6.8									
18					0.1520	6.9									
19	239	356	276	410	0.1783	6.9	3.7	5.6	98.4	6.0	9.0	97.8			
20					0.1906	6.9							1		
21					0.1486	6.9							1		
22					0.1643	6.9									
23	239	321	214	287	0.1609	6.9	2.9	3.9	98.8	4.6	6.2	97.8			
24					0.1585	6.9									
25					0.1659	6.7									
26	229	359	242	379	0.1878	6.8	3.2	5.0	98.6	5.6	8.7	97.7			
27					0.1529	6.8							1		
28					0.1476	6.9							1		
29					0.1513	6.9									
30	232	296	268	342	0.1529	6.8	3.1	4.0	98.7	4.5	5.8	98.3			
31					0.1755	6.9									
Total					5.0418										
	AVG	AVG	AVG	AVG	AVG	MIN	AVG	AVG	AVG	AVG	AVG	AVG	GEM	AVG	AVG
	244	337	270	372	0.1626	6.7	4.7	6.5	98.1	6.8	9.4	97.4	2	3.7	5.3
Limit		832		832	0.46	6.0	30	115	85	30	115	85	200		
					MAX	MAX	AVW	AVW		AVW	AVW		GM7	MAX	MAX
					0.1906	7.0	6.3	8.5		8.3	11.5		6	5.8	8.5
Limit						9.0	45	173		45	173		400		

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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Stella V. Vakarcs, P.E./ Senior Program Manager — Stella V Vakarcs 8/11/09
Name and Title (Typed or Printed) — Signature/Date

(360) 337-5777
Phone Number

WASTEWATER TREATMENT PLANT MONITORING REPORT

Permit No.	WA-002370-1	**Discharge No.** 001	**Month** August
Facility Name	Manchester WWTP		**Year** 2009
Receiving Water	Puget Sound		**Location** Manchester
Plant Type	Conventional Activated Sludge - Secondary Treatment System		**NO DISCHARGE for month**

	INFLUENT				EFFLUENT										
Frequency	2/Week	2/Week	2/Week	2/Week	Daily	Daily	2/Week	2/Week	1/Month	2/Week	2/Week	1/Month	2/Week	1/Month	1/Month
Type	24-hour	24-hour	24-hour	24-hour	Measure	Grab	24-hour	24-hour	Calc	24-hour	24-hour	Calc	Grab	24-hour	24-hour
Day of the Month	BOD 5-Day mg/L	BOD 5-Day LBS/Day	TSS mg/L	TSS LBS/Day	Flow MGD	pH Std Units	BOD 5-Day mg/L	BOD 5-Day LBS/Day	BOD 5-Day %Removal	TSS mg/L	TSS LBS/Day	TSS %Removal	Fecal Coliform #/100mL	Total Ammonia mg/L	Total Ammonia LBS/Day
1					0.1582	6.9									
2	248	346	293	410	0.1674	6.9	4.1	5.7	98.3	5.4	7.6	98.1		2.5	3.5
3					0.1510	6.9							3		
4					0.1585	6.9							1		
5					0.1592	6.8									
6	295	384	256	334	0.1560	6.8	4.4	5.7	98.5	6.7	8.8	97.4			
7					0.1772	6.8									
8					0.1650	6.9									
9	264	383	282	410	0.1740	6.9	5.4	7.8	98.0	8.2	11.8	97.1			
10					0.1684	6.9							1		
11					0.1650	6.9							1		
12					0.1552	6.9									
13	303	409	419	566	0.1619	6.9	4.6	6.3	98.5	6.5	8.8	98.4		1.0	1.4
14					0.1499	6.8									
15					0.1584	6.9									
16	313	461	357	526	0.1766	6.9	4.9	7.2	98.4	6.6	9.8	98.1			
17					0.1884	6.9							1		
18					0.1555	6.9							8		
19					0.1530	6.9									
20	260	327	266	334	0.1505	6.9	3.5	4.3	98.7	5.3	6.6	98.0			
21					0.1590	6.9									
22					0.1566	6.9									
23	255	376	221	325	0.1765	6.9	4.7	7.0	98.1	6.4	9.4	97.1			
24					0.1546	6.9							1		
25					0.1806	6.9							1		
26					0.1539	6.9									
27	241	290	296	355	0.1440	6.9	4.9	5.9	98.0	7.1	8.5	97.6			
28					0.1566	6.9									
29					0.1606	6.8									
30	265	390	265	390	0.1763	6.9	5.3	7.8	98.0	6.8	9.9	97.5			
31					0.1662	6.9							1		
Total					5.0342										
	AVG	AVG	AVG	AVG	AVG	MIN	AVG	AVG	AVG	AVG	AVG	AVG	GEM	AVG	AVG
	272	374	295	406	0.1624	6.8	4.6	6.4	98.3	6.5	9.0	97.7	1	1.8	2.4
Limit		832		832	0.46	6.0	30	115	85	30	115	85	200		
					MAX	MAX	AVW	AVW		AVW	AVW		GM7	MAX	MAX
					0.1884	6.9	5.0	7.0		7.3	10.3		3	2.5	3.5
Limit						9.0	45	173		45	173		400		

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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Stella V. Vakarcs, P.E./ Senior Program Manager
Name and Title (Typed or Printed)

Stella V. Vakarcs 9/10/09
Signature/Date

(360) 337-5777
Phone Number

WASTEWATER TREATMENT PLANT MONITORING REPORT

Permit No. WA-002370-1 **Discharge No.** 001 **Month** September
Facility Name Manchester WWTP **Year** 2009
Receiving Water Puget Sound **Location** Manchester
Plant Type Conventional Activated Sludge - Secondary Treatment System **NO DISCHARGE for month**

	INFLUENT				EFFLUENT											
Frequency	2/Week	2/Week	2/Week	2/Week	Daily	Daily	2/Week	2/Week	1/Month	2/Week	2/Week	1/Month	2/Week	1/Month	1/Month	
Type	24-hour	24-hour	24-hour	24-hour	Measure	Grab	24-hour	24-hour	Calc	24-hour	24-hour	Calc	Grab	24-hour	24-hour	
Day of the Month	BOD 5-Day mg/L	BOD 5-Day LBS/Day	TSS mg/L	TSS LBS/Day	Flow MGD	pH Std Units	BOD 5-Day mg/L	BOD 5-Day LBS/Day	BOD 5-Day %Removal	TSS mg/L	TSS LBS/Day	TSS %Removal	Fecal Coliform #/100mL	Total Ammonia mg/L	Total Ammonia LBS/Day	
1					0.1558	6.9							1			
2					0.1597	6.9										
3	237	305	298	383	0.1541	6.9	4.7	6.0	98.0	7.8	10.0	97.4		1.3	1.7	
4					0.1809	6.9										
5					0.1796	6.9										
6					0.1852	6.9										
7	290	462	292	465	0.1907	6.9	10.0	15.9	96.6	17.9	28.4	93.9				
8					0.1617	6.9							1			
9					0.1587	6.9							1			
10	264	342	379	492	0.1554	6.9	4.2	5.4	98.4	5.8	7.6	98.5				
11					0.1427	6.9										
12					0.1611	6.9										
13	261	391	291	436	0.1796	6.9	5.8	8.7	97.8	7.4	11.1	97.5		3.2	4.7	
14					0.1941	6.9							1			
15					0.1662	6.9							1			
16					0.1822	6.9										
17	239	347	230	333	0.1740	6.8	3.9	5.6	98.4	7.0	10.1	97.0				
18					0.1620	6.9										
19					0.1724	6.8										
20	260	391	260	391	0.1804	6.8	6.3	9.5	97.6	11.8	17.8	95.4				
21					0.1646	6.9							3			
22					0.1772	6.9							1			
23					0.1553	6.9										
24	254	333	319	418	0.1573	6.9	3.9	5.1	98.5	6.3	8.3	98.0				
25					0.1452	6.8										
26					0.1564	6.9										
27	245	366	248	371	0.1791	6.9	5.1	7.6	97.9	8.1	12.1	96.7				
28					0.1632	6.9							1			
29					0.1593	6.9							1			
30					0.1557	6.8										
Total					5.0097											
	AVG	AVG	AVG	AVG	AVG	MIN	AVG	AVG	AVG	AVG	AVG	AVG	GEM	AVG	AVG	
	256	367	290	411	0.1670	6.8	5.5	8.0	97.9	9.0	13.2	96.8	1	2.2	3.2	
Limit		832		832	0.46	6.0	30	115	85	30	115	85	200			
					MAX	MAX	AVW	AVW		AVW	AVW		GM7	MAX	MAX	
					0.1941	6.9	7.1	10.7		11.9	18.0		2	3.2	4.7	
Limit						9.0	45	173		45	173		400			

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)

Stella V. Vakarcs 10/8/09
Signature/Date

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Phone Number

WASTEWATER TREATMENT PLANT MONITORING REPORT

Permit No. WA-002370-1 Discharge No. 001

Facility Name Manchester WWTP

Receiving Water Puget Sound

Plant Type Conventional Activated Sludge - Secondary Treatment System

Month October

Year 2009

Location Manchester

NO DISCHARGE for month

	INFLUENT				EFFLUENT										
Frequency	2/Week	2/Week	2/Week	2/Week	Daily	Daily	2/Week	2/Week	1/Month	2/Week	2/Week	1/Month	2/Week	1/Month	1/Month
Type	24-hour	24-hour	24-hour	24-hour	Measure	Grab	24-hour	24-hour	Calc	24-hour	24-hour	Calc	Grab	24-hour	24-hour
Day of the Month	BOD 5-Day mg/L	BOD 5-Day LBS/Day	TSS mg/L	TSS LBS/Day	Flow MGD	pH Std Units	BOD 5-Day mg/L	BOD 5-Day LBS/Day	BOD 5-Day %Removal	TSS mg/L	TSS LBS/Day	TSS %Removal	Fecal Coliform #/100mL	Total Ammonia mg/L	Total Ammonia LBS/Day
1	248	323	277	360	0.1559	6.8	5.1	6.6	97.9	8.2	10.7	97.0			
2					0.1777	6.9									
3					0.1674	6.9									
4	249	374	395	594	0.1801	6.8	6.0	9.0	97.6	8.8	13.2	97.8		2.1	3.1
5					0.1594	6.8							4		
6					0.1557	6.8							1		
7					0.1554	6.8									
8	220	276	311	389	0.1501	6.8	4.7	5.9	97.9	7.9	10.0	97.4			
9					0.1718	6.8									
10					0.1514	6.8									
11	286	406	328	465	0.1700	6.9	8.0	11.4	97.2	10.6	15.1	96.8		2.1	2.9
12					0.1665	6.9							1		
13					0.1665	6.9							1		
14					0.1828	6.9									
15	230	312	402	546	0.1627	6.8	5.7	7.7	97.5	8.4	11.4	97.9			
16					0.2281	6.8									
17					0.2262	6.8									
18	219	378	300	518	0.2070	6.8	8.2	14.2	96.2	11.1	19.3	96.3			
19					0.1773	6.8							1		
20					0.1695	6.9							1		
21					0.1721	6.8									
22	221	314	464	659	0.1702	6.8	6.5	9.3	97.0	9.1	12.9	98.0			
23					0.1992	6.8									
24					0.1733	6.8									
25	281	449	315	503	0.1917	6.9	7.2	11.5	97.5	9.8	15.6	96.9			
26					0.2065	6.8							1		
27					0.1795	6.9							3		
28					0.1790	6.8									
29	205	304	372	551	0.1775	6.8	5.6	8.4	97.2	7.1	10.5	98.1			
30					0.2029	6.8									
31					0.1913	7.0									
Total					5.5245										
	AVG	AVG	AVG	AVG	AVG	MIN	AVG	AVG	AVG	AVG	AVG	AVG	GEM	AVG	AVG
	240	348	352	510	0.1782	6.8	6.3	9.3	97.3	9.0	13.2	97.4	1	2.1	3.0
Limit		832		832	0.46	6.0	30	115	85	30	115	85	200		
					MAX	MAX	AVW	AVW		AVW	AVW		GM7	MAX	MAX
					0.2281	7.0	7.4	11.7		10.1	16.1		2	2.1	3.1
Limit						9.0	45	173		45	173		400		

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)

Stella V Vakarcs 11/12/09
Signature/Date

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Phone Number

WASTEWATER TREATMENT PLANT MONITORING REPORT

Permit No. WA-002370-1 **Discharge No.** 001
Facility Name Manchester WWTP
Receiving Water Puget Sound
Plant Type Conventional Activated Sludge - Secondary Treatment System

Month November
Year 2009
Location Manchester
NO DISCHARGE for month ☐

	INFLUENT				EFFLUENT											
Frequency	2/Week	2/Week	2/Week	2/Week	Daily	Daily	2/Week	2/Week	1/Month	2/Week	2/Week	1/Month	2/Week	1/Month	1/Month	
Type	24-hour	24-hour	24-hour	24-hour	Measure	Grab	24-hour	24-hour	Calc	24-hour	24-hour	Calc	Grab	24-hour	24-hour	
Day of the Month	BOD 5-Day mg/L	BOD 5-Day LBS/Day	TSS mg/L	TSS LBS/Day	Flow MGD	pH Std Units	BOD 5-Day mg/L	BOD 5-Day LBS/Day	BOD 5-Day %Removal	TSS mg/L	TSS LBS/Day	TSS %Removal	Fecal Coliform #/100mL	Total Ammonia mg/L	Total Ammonia LBS/Day	
1	234	376	298	478	0.1924	6.8	4.9	7.8	97.9	6.9	11.0	97.7		1.4	2.2	
2					0.1738	6.9							5			
3					0.1718	6.9							5			
4					0.1707	6.8										
5	207	367	295	524	0.2125	6.8	4.3	7.7	97.9	6.7	11.8	97.7				
6					0.2961	6.8										
7					0.2983	6.8										
8	205	410	242	484	0.2397	7.1	6.1	12.1	97.0	8.3	16.7	96.6				
9					0.2777	6.8							3			
10					0.2902	6.8							16			
11					0.2519	6.8										
12	210	385	364	667	0.2197	6.8	5.0	9.1	97.6	6.4	11.8	98.2		0.5	0.9	
13					0.2234	6.8										
14					0.2064	6.8										
15	267	520	230	448	0.2333	6.8	5.2	10.1	98.1	6.8	13.2	97.1				
16					0.4503	6.8							1			
17					0.3785	6.7							4			
18					0.3414	6.7										
19	146	506	137	476	0.4155	6.8	12.6	43.7	91.4	19.6	68.0	85.7				
20					0.3296	6.7										
21					0.3519	6.8										
22	133	435	135	443	0.3919	6.7	10.2	33.4	92.3	14.6	47.6	89.2				
23	136	313	168	388	0.2761	6.7	5.2	12.1	96.2	7.9	18.3	95.3	1			
24					0.1435	6.8							1			
25					0.2777	6.8										
26					0.3743	6.9										
27					0.2564	7.0										
28					0.2445	7.1										
29	204	419	379	779	0.2460	7.0	9.4	19.3	95.4	9.6	19.7	97.5				
30					0.2522	7.0							3			
Total					8.1875											
	AVG	AVG	AVG	AVG	AVG	MIN	AVG	AVG	AVG	AVG	AVG	AVG	GEM	AVG	AVG	
	194	415	250	521	0.2729	6.7	7.0	17.2	96.0	9.6	24.2	95.0	3	0.9	1.5	
Limit		832		832	0.46	6.0	30	115	85	30	115	85	200			
					MAX	MAX	AVW	AVW		AVW	AVW		GM7	MAX	MAX	
					0.4503	7.1	8.9	26.9		13.2	40.6		7	1.4	2.2	
Limit						9.0	45	173		45	173		400			

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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Stella V. Vakarcs, P.E./ Senior Program Manager
Name and Title (Typed or Printed)

Stella V. Vakarcs 12/10/09
Signature/Date

(360) 337-5777
Phone Number

WASTEWATER TREATMENT PLANT MONITORING REPORT

Permit No.	WA-002370-1	**Discharge No.** 001	**Month** December
Facility Name	Manchester WWTP		**Year** 2009
Receiving Water	Puget Sound		**Location** Manchester
Plant Type	Conventional Activated Sludge - Secondary Treatment System		**NO DISCHARGE for month**

	INFLUENT				EFFLUENT											
Frequency	2/Week	2/Week	2/Week	2/Week	Daily	Daily	2/Week	2/Week	1/Month	2/Week	2/Week	1/Month	2/Week	1/Month	1/Month	
Type	24-hour	24-hour	24-hour	24-hour	Measure	Grab	24-hour	24-hour	Calc	24-hour	24-hour	Calc	Grab	24-hour	24-hour	
Day of the Month	BOD 5-Day mg/L	BOD 5-Day LBS/Day	TSS mg/L	TSS LBS/Day	Flow MGD	pH Std Units	BOD 5-Day mg/L	BOD 5-Day LBS/Day	BOD 5-Day %Removal	TSS mg/L	TSS LBS/Day	TSS %Removal	Fecal Coliform #/100mL	Total Ammonia mg/L	Total Ammonia LBS/Day	
1					0.2071	6.9							15			
2					0.2086	6.9										
3	228	378	434	719	0.1986	6.9	4.9	8.2	97.8	6.6	11.0	98.5		2.7	4.5	
4					0.1939	6.9										
5					0.1976	7.0										
6	222	377	260	442	0.2035	7.1	12.8	21.7	94.2	13.3	22.6	94.9				
7					0.1861	7.2							53			
8					0.1993	7.1							33			
9					0.1723	7.0										
10	230	323	229	321	0.1684	7.0	7.5	10.6	96.7	7.7	10.8	96.6		8.1	11.4	
11					0.1696	7.0										
12					0.1785	6.9										
13	231	371	277	445	0.1923	7.0	5.6	9.0	97.6	6.0	9.6	97.9				
14					0.2075	7.0							3			
15					0.2422	6.9							1			
16					0.2867	6.8										
17	177	353	280	558	0.2393	6.8	4.1	8.2	97.7	9.0	18.0	96.8				
18					0.2508	6.8										
19					0.2408	6.8										
20	187	400	228	487	0.2561	6.8	3.8	8.1	98.0	4.5	9.5	98.0				
21					0.2606	6.8							1			
22					0.2209	6.8							1			
23	224	390	343	596	0.2085	6.8	4.0	7.0	98.2	5.2	9.0	98.5				
24					0.2321	6.8										
25					0.2035	6.9										
26					0.1972	6.9										
27	215	361	316	530	0.2011	7.0	7.7	12.9	96.4	7.8	13.0	97.5				
28					0.1956	7.0							9			
29					0.1939	7.0							1			
30	209	351	249	418	0.2011	7.0	7.8	13.1	96.3	8.5	14.3	96.6				
31					0.2234	7.0										
Total					6.5372											
	AVG	AVG	AVG	AVG	AVG	MIN	AVG	AVG	AVG	AVG	AVG	AVG	GEM	AVG	AVG	
	214	367	291	502	0.2109	6.8	6.5	11.0	97.0	7.6	13.1	97.3	4	5.4	7.9	
Limit		832		832	0.46	6.0	30	115	85	30	115	85	200			
					MAX	MAX	AVW	AVW		AVW	AVW		GM7	MAX	MAX	
					0.2867	7.2	10.2	16.1		10.5	16.7		42	8.1	11.4	
Limit						9.0	45	173		45	173		400			

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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Stella V. Vakarcs, P.E./ Senior Program Manager — Stella V. Vakarcs 1/12/2010

Name and Title (Typed or Printed) — Signature/Date

(360) 337-5777

Phone Number

WASTEWATER TREATMENT PLANT MONITORING REPORT

Permit No.	WA-002370-1	**Discharge No.** 001	**Month** January
Facility Name	Manchester WWTP		**Year** 2010
Receiving Water	Puget Sound		**Location** Manchester
Plant Type	Conventional Activated Sludge - Secondary Treatment System		**NO DISCHARGE for month**

	INFLUENT				EFFLUENT											
Frequency	2/Week	2/Week	2/Week	2/Week	Daily	Daily	2/Week	2/Week	1/Month	2/Week	2/Week	1/Month	2/Week	1/Month	1/Month	
Type	24-hour	24-hour	24-hour	24-hour	Measure	Grab	24-hour	24-hour	Calc	24-hour	24-hour	Calc	Grab	24-hour	24-hour	
Day of the Month	BOD 5-Day mg/L	BOD 5-Day LBS/Day	TSS mg/L	TSS LBS/Day	Flow MGD	pH Std Units	BOD 5-Day mg/L	BOD 5-Day LBS/Day	BOD 5-Day %Removal	TSS mg/L	TSS LBS/Day	TSS %Removal	Fecal Coliform #/100mL	Total Ammonia mg/L	Total Ammonia LBS/Day	
1					0.3204	6.9										
2					0.2802	6.8										
3	172	371	222	479	0.2586	6.9	6.0	13.0	96.5	7.0	15.1	96.9		3.3	7.1	
4					0.3672	6.8							3			
5					0.3148	6.8							1			
6					0.2521	6.8										
7	168	315	182	341	0.2245	6.8	4.9	9.1	97.1	6.0	11.2	96.7				
8					0.3486	6.8										
9					0.3163	6.7										
10	168	413	187	459	0.2943	6.8	4.4	10.8	97.4	5.5	13.4	97.1				
11					0.4704	6.8							3			
12					0.4615	6.7							3			
13					0.3660	6.7										
14	119	367	173	535	0.3699	6.7	4.3	13.4	96.4	7.1	21.8	95.9		1.2	3.6	
15					0.4366	6.7										
16					0.3329	6.7										
17					0.3181	6.7										
18	149	378	180	457	0.3042	6.7	5.4	13.7	96.4	8.0	20.4	95.5				
19					0.2669	6.8							1			
20					0.2613	6.7										
21	172	348	185	374	0.2424	6.7	4.9	9.9	97.2	8.4	17.1	95.4	1			
22					0.2546	6.7										
23					0.2127	6.7										
24	192	391	227	461	0.2438	6.8	5.0	10.2	97.4	8.8	17.8	96.1				
25					0.2249	6.8							1			
26					0.2066	6.8							1			
27					0.2087	6.8										
28	187	314	191	320	0.2009	6.8	4.0	6.7	97.9	9.4	15.8	95.1				
29					0.2027	6.8										
30					0.2172	6.8										
31	203	386	220	418	0.2278	6.8	5.0	9.5	97.5	8.2	15.6	96.3				
Total					9.0070											
	AVG	AVG	AVG	AVG	AVG	MIN	AVG	AVG	AVG	AVG	AVG	AVG	GEM	AVG	AVG	
	170	365	196	427	0.2905	6.7	4.9	10.7	97.1	7.6	16.5	96.1	2	2.2	5.4	
Limit		832		832	0.46	6.0	30	115	85	30	115	85	200			
					MAX	MAX	AVW	AVW		AVW	AVW		GM7	MAX	MAX	
					0.4704	6.9	5.4	12.1		9.1	18.7		3	3.3	7.1	
Limit						9.0	45	173		45	173		400			

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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Stella V. Vakarcs, P.E./ Senior Program Manager
Name and Title (Typed or Printed)

Stella V. Vakarcs 2/9/2010
Signature/Date

(360) 337-5777
Phone Number

WASTEWATER TREATMENT PLANT MONITORING REPORT

Permit No. WA-002370-1 **Discharge No.** 001 **Month** February
Facility Name Manchester WWTP **Year** 2010
Receiving Water Puget Sound **Location** Manchester
Plant Type Conventional Activated Sludge - Secondary Treatment System **NO DISCHARGE for month**

	INFLUENT				EFFLUENT											
Frequency	2/Week	2/Week	2/Week	2/Week	Daily	Daily	2/Week	2/Week	1/Month	2/Week	2/Week	1/Month	2/Week	1/Month	1/Month	
Type	24-hour	24-hour	24-hour	24-hour	Measure	Grab	24-hour	24-hour	Calc	24-hour	24-hour	Calc	Grab	24-hour	24-hour	
Day of the Month	BOD 5-Day mg/L	BOD 5-Day LBS/Day	TSS mg/L	TSS LBS/Day	Flow MGD	pH Std Units	BOD 5-Day mg/L	BOD 5-Day LBS/Day	BOD 5-Day %Removal	TSS mg/L	TSS LBS/Day	TSS %Removal	Fecal Coliform #/100mL	Total Ammonia mg/L	Total Ammonia LBS/Day	
1					0.2340	6.8							1			
2					0.2014	6.8							1			
3					0.2215	6.8										
4	172	324	191	359	0.2256	6.7	7.0	13.3	95.9	13.4	25.1	93.0		0.9	1.7	
5					0.2055	6.7										
6					0.2087	6.7										
7	243	446	273	502	0.2201	6.7	6.8	12.5	97.2	9.5	17.4	96.5				
8					0.2022	6.8							1			
9					0.2153	6.9							1			
10					0.1990	6.8										
11	189	362	400	767	0.2298	6.8	3.8	7.3	98.0	6.6	12.7	98.3		0.8	1.4	
12					0.2530	6.8										
13					0.2982	6.7										
14					0.3247	6.7										
15	156	352	167	377	0.2706	6.7	4.9	11.1	96.9	8.9	20.2	94.7				
16					0.2549	6.8							1			
17					0.2286	6.7							1			
18	173	301	181	315	0.2086	6.8	3.0	5.1	98.3	5.8	10.1	96.8				
19					0.2238	6.8										
20					0.1926	6.9										
21	190	335	220	389	0.2114	6.7	5.0	8.7	97.4	8.0	14.0	96.4				
22					0.1895	6.8							1			
23					0.2009	6.8							1			
24					0.2024	6.8										
25	187	336	206	371	0.2155	6.8	2.7	4.8	98.6	5.7	10.3	97.2				
26					0.2567	6.8										
27					0.2563	6.8										
28	166	339	184	377	0.2449	6.7	2.9	6.0	98.2	5.2	10.7	97.2				
Total					6.3958											
	AVG	AVG	AVG	AVG	AVG	MIN	AVG	AVG	AVG	AVG	AVG	AVG	GEM	AVG	AVG	
	185	350	228	432	0.2284	6.7	4.5	8.6	97.6	7.9	15.1	96.3	1	0.8	1.6	
Limit		832		832	0.46	6.0	30	115	85	30	115	85	200			
					MAX	MAX	AVW	AVW		AVW	AVW		GM7	MAX	MAX	
					0.3247	6.9	7.0	13.3		13.4	25.1		1	0.9	1.7	
Limit						9.0	45	173		45	173		400			

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Name and Title (Typed or Printed)

Stella V. Vakarcs 3/09/2010
Signature/Date

(360) 337-5777
Phone Number

WASTEWATER TREATMENT PLANT MONITORING REPORT

Permit No. WA-002370-1 **Discharge No.** 001
Facility Name Manchester WWTP
Receiving Water Puget Sound
Plant Type Conventional Activated Sludge - Secondary Treatment System

Month March
Year 2010
Location Manchester
NO DISCHARGE for month ☐

	INFLUENT				EFFLUENT										
Frequency	2/Week	2/Week	2/Week	2/Week	Daily	Daily	2/Week	2/Week	1/Month	2/Week	2/Week	1/Month	2/Week	1/Month	1/Month
Type	24-hour	24-hour	24-hour	24-hour	Measure	Grab	24-hour	24-hour	Calc	24-hour	24-hour	Calc	Grab	24-hour	24-hour
Day of the Month	BOD 5-Day mg/L	BOD 5-Day LBS/Day	TSS mg/L	TSS LBS/Day	Flow MGD	pH Std Units	BOD 5-Day mg/L	BOD 5-Day LBS/Day	BOD 5-Day %Removal	TSS mg/L	TSS LBS/Day	TSS %Removal	Fecal Coliform #/100mL	Total Ammonia mg/L	Total Ammonia LBS/Day
1					0.2463	6.8							1		
2					0.2099	6.9							1		
3					0.2012	6.7									
4	181	297	188	308	0.1964	6.7	3.7	6.1	97.9	6.2	10.2	96.7		0.5	0.8
5					0.1824	6.8									
6					0.1943	6.8									
7	224	386	216	373	0.2068	6.8	4.1	7.0	98.2	6.3	10.9	97.1			
8					0.1842	6.8							1		
9					0.1789	6.9							1		
10					0.1819	6.8									
11	245	496	237	479	0.2424	6.9	5.0	10.1	98.0	7.6	15.4	96.8			
12					0.2963	6.8									
13					0.2199	6.8									
14	185	345	216	402	0.2234	7.0	13.0	24.2	93.0	18.6	34.6	91.4		6.6	12.3
15					0.1969	6.9							1		
16					0.1957	6.9							1		
17					0.1906	6.8									
18	195	308	227	358	0.1894	6.8	5.8	9.2	97.0	9.6	15.2	95.8			
19					0.1716	6.8									
20					0.1897	6.9									
21	198	356	245	441	0.2157	6.9	12.2	22.0	93.8	19.3	34.8	92.1			
22					0.1803	6.9							16		
23					0.1791	6.9							1		
24					0.1808	6.9									
25	177	275	198	307	0.1863	6.9	5.2	8.1	97.1	10.6	16.4	94.7			
26					0.1659	6.9									
27					0.1827	6.9									
28	239	499	245	512	0.2503	6.9	6.1	12.7	97.4	11.1	23.1	95.5			
29					0.3763	6.9							13		
30					0.2749	6.8							1		
31					0.2252	6.8									
Total					6.5154										
	AVG	AVG	AVG	AVG	AVG	MIN	AVG	AVG	AVG	AVG	AVG	AVG	GEM	AVG	AVG
	206	370	221	398	0.2102	6.7	6.9	12.4	96.6	11.2	20.1	95.0	2	3.5	6.6
Limit		832		832	0.46	6.0	30	115	85	30	115	85	200		
					MAX	MAX	AVW	AVW		AVW	AVW		GM7	MAX	MAX
					0.3763	7.0	9.4	16.7		14.9	25.6		4	6.6	12.3
Limit						9.0	45	173		45	173		400		

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)

Stella V. Vakarcs 4/13/2010
Signature/Date

(360) 337-5777
Phone Number

WASTEWATER TREATMENT PLANT MONITORING REPORT

Permit No. WA-002370-1 Discharge No. 001

Facility Name: Manchester WWTP

Receiving Water: Puget Sound

Plant Type: Conventional Activated Sludge - Secondary Treatment System

Month: April

Year: 2010

Location: Manchester

NO DISCHARGE for month:

	INFLUENT				EFFLUENT											
Frequency	2/Week	2/Week	2/Week	2/Week	Daily	Daily	2/Week	2/Week	1/Month	2/Week	2/Week	1/Month	2/Week	1/Month	1/Month	
Type	24-hour	24-hour	24-hour	24-hour	Measure	Grab	24-hour	24-hour	Calc	24-hour	24-hour	Calc	Grab	24-hour	24-hour	
Day of the Month	BOD 5-Day mg/L	BOD 5-Day LBS/Day	TSS mg/L	TSS LBS/Day	Flow MGD	pH Std Units	BOD 5-Day mg/L	BOD 5-Day LBS/Day	BOD 5-Day %Removal	TSS mg/L	TSS LBS/Day	TSS %Removal	Fecal Coliform #/100mL	Total Ammonia mg/L	Total Ammonia LBS/Day	
1	201	361	215	386	0.2155	6.8	3.7	6.6	98.2	6.4	11.6	97.0				
2					0.3035	6.8										
3					0.2579	6.8										
4	180	372	180	372	0.2475	6.8	2.9	5.9	98.4	5.0	10.2	97.2		1.3	2.6	
5					0.2212	6.8							1			
6					0.2307	6.8							1			
7					0.2050	6.8										
8	176	281	189	302	0.1912	6.8	5.9	9.5	96.6	9.7	15.5	94.8				
9					0.1812	6.9										
10					0.1913	6.8										
11	198	341	212	364	0.2062	6.9	7.6	13.0	96.2	11.9	20.4	94.4				
12					0.1951	6.9							1			
13					0.2133	6.8							1			
14					0.1746	6.8										
15	200	304	338	514	0.1823	6.8	4.4	6.6	97.8	8.2	12.4	97.6		0.8	1.1	
16					0.1681	6.8										
17					0.1960	6.8										
18	256	415	264	427	0.1943	6.8	5.2	8.4	98.0	9.4	15.2	96.4				
19					0.1753	6.9							1			
20					0.2101	6.9							1			
21					0.1892	6.9										
22	208	319	225	344	0.1836	6.9	3.9	6.0	98.1	7.7	11.8	96.6				
23					0.1668	6.9										
24					0.1727	6.9										
25	214	351	211	346	0.1967	7.0	12.1	19.8	94.4	13.1	21.4	93.8				
26					0.1968	7.1							6			
27					0.2195	7.0							1			
28					0.1937	6.9										
29	210	313	233	348	0.1786	6.9	6.7	9.9	96.8	11.5	17.1	95.1				
30					0.1731	6.9										
Total					6.0306											
	AVG	AVG	AVG	AVG	AVG	MIN	AVG	AVG	AVG	AVG	AVG	AVG	GEM	AVG	AVG	
	205	340	230	378	0.2010	6.8	5.8	9.5	97.2	9.2	15.1	95.9	1	1.0	1.9	
Limit		**832**		**832**	**0.46**	**6.0**	**30**	**115**	**85**	**30**	**115**	**85**	**200**			
					MAX	MAX	AVW	AVW		AVW	AVW		GM7	MAX	MAX	
					0.3035	7.1	9.4	14.9		12.3	19.3		2	1.3	2.6	
Limit						**9.0**	**45**	**173**		**45**	**173**		**400**			

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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Stella V. Vakarcs, P.E./ Senior Program Manager
Name and Title (Typed or Printed)

Stella V Vakarcs 5/7/2010
Signature/Date

(360) 337-5777
Phone Number

WASTEWATER TREATMENT PLANT MONITORING REPORT

Permit No. WA-002370-1 **Discharge No.** 001 **Month** May
Facility Name Manchester WWTP **Year** 2010
Receiving Water Puget Sound **Location** Manchester
Plant Type Conventional Activated Sludge - Secondary Treatment System **NO DISCHARGE for month** ☐

	INFLUENT				EFFLUENT										
Frequency	2/Week	2/Week	2/Week	2/Week	Daily	Daily	2/Week	2/Week	1/Month	2/Week	2/Week	1/Month	2/Week	1/Month	1/Month
Type	24-hour	24-hour	24-hour	24-hour	Measure	Grab	24-hour	24-hour	Calc	24-hour	24-hour	Calc	Grab	24-hour	24-hour
Day of the Month	BOD 5-Day mg/L	BOD 5-Day LBS/Day	TSS mg/L	TSS LBS/Day	Flow MGD	pH Std Units	BOD 5-Day mg/L	BOD 5-Day LBS/Day	BOD 5-Day %Removal	TSS mg/L	TSS LBS/Day	TSS %Removal	Fecal Coliform #/100mL	Total Ammonia mg/L	Total Ammonia LBS/Day
1					0.1889	6.9									
2					0.2170	6.9									
3	182	321	226	397	0.2111	6.9	6.3	11.1	96.5	12.8	22.5	94.3	1		
4					0.2474	7.0							1		
5					0.1961	6.9									
6	241	365	269	408	0.1815	6.8	6.1	9.2	97.5	10.1	15.3	96.3		0.7	1.0
7					0.1893	6.9									
8					0.1734	6.9									
9	250	398	268	428	0.1910	6.9	6.2	9.9	97.5	8.6	13.7	96.8			
10					0.1853	6.9							1		
11					0.1720	6.9							1		
12					0.1746	6.9									
13	243	332	260	355	0.1636	6.9	6.9	9.5	97.1	13.8	18.9	94.7		0.8	1.1
14					0.1543	6.9									
15					0.1716	6.8									
16	245	400	254	414	0.1957	6.9	9.5	15.6	96.1	14.6	23.8	94.2			
17					0.2096	6.9							1		
18					0.1761	6.9							1		
19					0.1932	6.9									
20	214	340	226	359	0.1904	6.9	6.6	10.5	96.9	11.8	18.8	94.8			
21					0.2100	6.8									
22					0.2081	6.8									
23	217	408	229	430	0.2252	6.9	7.5	14.2	96.5	10.3	19.4	95.5			
24					0.2122	6.9							1		
25					0.1858	6.9							6		
26					0.2061	6.8									
27	215	343	207	330	0.1912	6.8	6.4	10.2	97.0	9.1	14.5	95.6			
28					0.1907	6.8									
29					0.1996	6.8									
30					0.2042	6.8									
31	207	396	213	408	0.2292	6.9	11.3	21.6	94.5	14.7	28.1	93.1			
Total					6.0441										
	AVG	AVG	AVG	AVG	AVG	MIN	AVG	AVG	AVG	AVG	AVG	AVG	GEM	AVG	AVG
	224	367	239	392	0.1950	6.8	7.4	12.4	96.6	11.8	19.4	95.0	1	0.8	1.1
Limit		832		832	0.46	6.0	30	115	85	30	115	85	200		
					MAX	MAX	AVW	AVW		AVW	AVW		GM7	MAX	MAX
					0.2474	7.0	8.1	13.1		13.2	21.3		2	0.8	1.1
Limit						9.0	45	173		45	173		400		

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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Stella V. Vakarcs, P.E./ Senior Program Manager
Name and Title (Typed or Printed)

Stella V. Vakarcs 6/7/2010
Signature/Date

(360) 337-5777
Phone Number

WASTEWATER TREATMENT PLANT MONITORING REPORT

Permit No. WA-002370-1 | Discharge No. 001 | Month June
Facility Name Manchester WWTP | Year 2010
Receiving Water Puget Sound | Location Manchester
Plant Type Conventional Activated Sludge - Secondary Treatment System | NO DISCHARGE for month

	INFLUENT				EFFLUENT											
Frequency	2/Week	2/Week	2/Week	2/Week	Daily	Daily	2/Week	2/Week	1/Month	2/Week	2/Week	1/Month	2/Week	1/Month	1/Month	
Type	24-hour	24-hour	24-hour	24-hour	Measure	Grab	24-hour	24-hour	Calc	24-hour	24-hour	Calc	Grab	24-hour	24-hour	
Day of the Month	BOD 5-Day mg/L	BOD 5-Day LBS/Day	TSS mg/L	TSS LBS/Day	Flow MGD	pH Std Units	BOD 5-Day mg/L	BOD 5-Day LBS/Day	BOD 5-Day %Removal	TSS mg/L	TSS LBS/Day	TSS %Removal	Fecal Coliform #/100mL	Total Ammonia mg/L	Total Ammonia LBS/Day	
1					0.1979	6.9							1			
2					0.2307	6.9							1			
3	185	318	182	313	0.2062	6.8	8.2	14.2	95.5	10.4	17.8	94.3				
4					0.2185	6.9										
5					0.1829	6.8										
6	222	415	230	429	0.2240	6.9	7.1	13.3	96.8	8.4	15.6	96.4		3.5	6.6	
7					0.1874	6.9							340			
8					0.1803	6.8							1			
9					0.1899	6.9										
10	251	376	232	347	0.1797	6.8	6.7	10.1	97.3	10.0	14.9	95.7				
11					0.1650	6.8										
12					0.1751	6.9										
13	227	378	271	451	0.1997	6.9	7.4	12.2	96.8	10.7	17.8	96.1				
14					0.2009	6.9							1			
15					0.1755	6.8							4			
16					0.1745	6.8										
17	232	341	178	262	0.1763	7.0	10.3	15.2	95.6	12.6	18.6	92.9		3.1	4.5	
18					0.1553	6.8										
19					0.1784	6.9										
20	259	428	241	398	0.1979	6.9	12.0	19.8	95.4	12.9	21.3	94.7				
21					0.1976	6.8							3			
22					0.1627	6.9							4			
23					0.1607	6.9										
24	264	358	284	386	0.1626	6.9	9.5	12.8	96.4	9.7	13.2	96.6				
25					0.1605	6.9										
26					0.1703	6.9										
27	225	351	261	407	0.1868	7.0	8.0	12.5	96.4	9.4	14.6	96.4				
28					0.1635	7.0							1			
29					0.1747	6.9							3			
30					0.1530	6.9										
Total					5.4881											
	AVG	AVG	AVG	AVG	AVG	MIN	AVG	AVG	AVG	AVG	AVG	AVG	GEM	AVG	AVG	
	233	371	235	374	0.1829	6.8	8.7	13.8	96.3	10.5	16.7	95.4	3	3.3	5.6	
Limit		832		832	0.46	6.0	30	115	85	30	115	85	200			
					MAX	MAX	AVW	AVW		AVW	AVW		GM7	MAX	MAX	
					0.2307	7.0	10.7	17.9		12.5	23.0		18	3.5	6.6	
Limit						9.0	45	173		45	173		400			

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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Stella V. Vakarcs, P.E./ Senior Program Manager
Name and Title (Typed or Printed)

Stella V Vakarcs 7/9/2010
Signature/Date

(360) 337-5777
Phone Number

WASTEWATER TREATMENT PLANT MONITORING REPORT

Permit No.	WA-002370-1	Discharge No. 001	Month July
Facility Name	Manchester WWTP		Year 2010
Receiving Water	Puget Sound		Location Manchester
Plant Type	Conventional Activated Sludge - Secondary Treatment System		NO DISCHARGE for month

	INFLUENT				EFFLUENT											
Frequency	2/Week	2/Week	2/Week	2/Week	Daily	Daily	2/Week	2/Week	1/Month	2/Week	2/Week	1/Month	2/Week	1/Month	1/Month	
Type	24-hour	24-hour	24-hour	24-hour	Measure	Grab	24-hour	24-hour	Calc	24-hour	24-hour	Calc	Grab	24-hour	24-hour	
Day of the Month	BOD 5-Day mg/L	BOD 5-Day LBS/Day	TSS mg/L	TSS LBS/Day	Flow MGD	pH Std Units	BOD 5-Day mg/L	BOD 5-Day LBS/Day	BOD 5-Day %Removal	TSS mg/L	TSS LBS/Day	TSS %Removal	Fecal Coliform #/100mL	Total Ammonia mg/L	Total Ammonia LBS/Day	
1	242	340	268	377	0.1686	6.9	9.5	13.3	96.1	14.2	20.0	94.7		3.8	5.3	
2					0.1563	7.0										
3					0.1687	7.0										
4					0.1864	7.0										
5	280	437	274	428	0.1870	7.1	12.9	20.1	95.4	17.7	27.6	93.6				
6					0.1605	7.1							1			
7					0.1659	7.0							37			
8	232	286	202	250	0.1478	7.0	9.9	12.1	95.8	12.6	15.6	93.8				
9					0.1462	7.0										
10					0.1635	7.0										
11	242	382	245	387	0.1893	7.0	8.9	14.1	96.3	13.8	21.9	94.4				
12					0.1699	7.1							1			
13					0.1575	7.1							1			
14					0.1564	7.0										
15	258	345	233	311	0.1601	7.0	9.5	12.7	96.3	10.5	14.0	95.5		7.6	10.1	
16					0.1906	6.9										
17					0.1676	7.7										
18	240	373	252	393	0.1864	7.0	6.6	10.3	97.2	9.2	14.3	96.4				
19					0.1691	7.0							1			
20					0.1632	7.0							1			
21					0.1563	7.0										
22	221	306	290	401	0.1658	7.0	8.9	12.3	96.0	9.3	12.9	96.8				
23					0.1596	6.9										
24					0.1623	6.9										
25	232	344	229	338	0.1774	7.0	7.8	11.6	96.6	10.9	16.2	95.2				
26					0.1907	7.0							1			
27					0.1565	6.8							1			
28					0.1613	6.8										
29	299	386	285	367	0.1547	7.0	5.3	6.9	98.2	7.3	9.4	97.4				
30					0.1477	7.0										
31					0.1650	7.0										
Total					5.1584											
	AVG	AVG	AVG	AVG	AVG	MIN	AVG	AVG	AVG	AVG	AVG	AVG	GEM	AVG	AVG	
	250	355	253	361	0.1664	6.8	8.8	12.6	96.4	11.7	16.9	95.3	2	5.7	7.7	
Limit		832		832	0.46	6.0	30	115	85	30	115	85	200			
					MAX	MAX	AVW	AVW		AVW	AVW		GM7	MAX	MAX	
					0.1907	7.7	11.4	16.1		15.2	21.6		6	7.6	10.1	
Limit						9.0	45	173		45	173		400			

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)

Stella V. Vakarcs 8/10/2010
Signature/Date

(360) 337-5777
Phone Number

WASTEWATER TREATMENT PLANT MONITORING REPORT

Permit No.	WA-002370-1	Discharge No. 001	Month: August
Facility Name	Manchester WWTP		Year: 2010
Receiving Water	Puget Sound		Location: Manchester
Plant Type	Conventional Activated Sludge - Secondary Treatment System		NO DISCHARGE for month

	INFLUENT				EFFLUENT											
Frequency	2/Week	2/Week	2/Week	2/Week	Daily	Daily	2/Week	2/Week	1/Month	2/Week	2/Week	1/Month	2/Week	1/Month	1/Month	
Type	24-hour	24-hour	24-hour	24-hour	Measure	Grab	24-hour	24-hour	Calc	24-hour	24-hour	Calc	Grab	24-hour	24-hour	
Day of the Month	BOD 5-Day mg/L	BOD 5-Day LBS/Day	TSS mg/L	TSS LBS/Day	Flow MGD	pH Std Units	BOD 5-Day mg/L	BOD 5-Day LBS/Day	BOD 5-Day %Removal	TSS mg/L	TSS LBS/Day	TSS %Removal	Fecal Coliform #/100mL	Total Ammonia mg/L	Total Ammonia LBS/Day	
1	272	403	256	379	0.1776	6.9	8.3	12.3	96.9	8.5	12.6	96.7		6.8	10.0	
2					0.1924	7.0							3			
3					0.1574	7.0							4			
4					0.1555	7.0										
5	229	295	236	304	0.1544	7.0	6.0	7.7	97.4	5.6	7.2	97.6				
6					0.1601	6.9										
7					0.1790	7.0										
8	238	386	239	387	0.1944	7.1	7.2	11.6	97.0	7.8	12.6	96.7				
9					0.1963	7.0							4			
10					0.1648	7.0							2			
11					0.1616	7.0										
12	655	914	653	911	0.1672	6.9	5.8	8.1	99.1	6.5	9.0	99.0				
13					0.1542	6.9										
14					0.1524	7.0										
15	227	322	221	314	0.1702	7.0	6.1	8.6	97.3	7.3	10.3	96.7				
16					0.1563	7.0							1			
17					0.1843	6.9							4			
18					0.1570	6.9										
19	290	393	298	403	0.1623	7.0	3.8	5.1	98.7	3.9	5.3	98.7		5.5	7.5	
20					0.1545	6.9										
21					0.1606	6.9										
22	264	393	253	377	0.1785	7.0	3.6	5.4	98.6	3.3	4.9	98.7				
23					0.1648	7.0							3			
24					0.1648	7.1							1			
25					0.1648	7.0										
26	1896	2567	2027	2745	0.1623	6.8	4.7	6.4	99.8	5.9	8.0	99.7				
27					0.1577	7.0										
28					0.1694	7.0										
29	872	1371	882	1387	0.1884	7.1	7.4	11.7	99.1	9.8	15.4	98.9				
30					0.1529	7.1							37			
31					0.1618	7.0							5			
Total					5.1773											
	AVG	AVG	AVG	AVG	AVG	MIN	AVG	AVG	AVG	AVG	AVG	AVG	GEM	AVG	AVG	
	549	783	563	801	0.1670	6.8	5.9	8.5	98.2	6.5	9.5	98.1	3	6.1	8.8	
Limit		832		832	0.46	6.0	30	115	85	30	115	85	200			
					MAX	MAX	AVW	AVW		AVW	AVW		GM7	MAX	MAX	
					0.1963	7.1	7.1	10.0		7.1	10.8		3	6.8	10.0	
Limit						9.0	45	173		45	173		400			

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)

Stella V. Vakarcs 9/13/2010
Signature/Date

(360) 337-5777
Phone Number

WASTEWATER TREATMENT PLANT MONITORING REPORT

Permit No. WA-002370-1 **Discharge No.** 001 **Month** September
Facility Name Manchester WWTP **Year** 2010
Receiving Water Puget Sound **Location** Manchester
Plant Type Conventional Activated Sludge - Secondary Treatment System **NO DISCHARGE for month** ☐

	INFLUENT				EFFLUENT										
Frequency	2/Week	2/Week	2/Week	2/Week	Daily	Daily	2/Week	2/Week	1/Month	2/Week	2/Week	1/Month	2/Week	1/Month	1/Month
Type	24-hour	24-hour	24-hour	24-hour	Measure	Grab	24-hour	24-hour	Calc	24-hour	24-hour	Calc	Grab	24-hour	24-hour
Day of the Month	BOD 5-Day mg/L	BOD 5-Day LBS/Day	TSS mg/L	TSS LBS/Day	Flow MGD	pH Std Units	BOD 5-Day mg/L	BOD 5-Day LBS/Day	BOD 5-Day %Removal	TSS mg/L	TSS LBS/Day	TSS %Removal	Fecal Coliform #/100mL	Total Ammonia mg/L	Total Ammonia LBS/Day
1					0.1554	7.0									
2	258	336	224	291	0.1560	7.0	6.2	8.0	97.6	6.4	8.4	97.1		9.4	12.3
3					0.1738	7.0									
4					0.1694	7.1									
5					0.1728	7.2									
6	280	436	240	374	0.1867	7.0	10.2	15.9	96.4	10.6	16.5	95.6			
7					0.1799	7.0							1		
8					0.1805	7.0							3		
9	218	308	296	417	0.1691	7.1	5.6	7.9	97.4	6.7	9.4	97.7			
10					0.1592	7.1									
11					0.1665	7.0									
12	332	526	326	516	0.1898	7.0									
13	301	506	284	477	0.2013	7.0	7.0	11.8	97.7	10.8	18.1	96.2	5	10.2	17.1
14					0.1646	7.0							1		
15					0.1751	7.0									
16	237	365	262	403	0.1844	7.0	5.3	8.1	97.8	7.3	11.3	97.2			
17					0.1873	7.0									
18					0.2036	6.9									
19	232	423	247	450	0.2183	7.0	7.3	13.2	96.9	8.5	15.4	96.6			
20					0.2037	7.1							1		
21					0.1682	7.0							3		
22					0.1681	7.0									
23	222	321	236	341	0.1733	7.0	6.4	9.2	97.1	9.8	14.2	95.8			
24					0.1583	7.0									
25					0.1716	6.9									
26	243	428	255	449	0.2113	7.0	8.0	14.2	96.7	9.4	16.6	96.3			
27					0.2183	7.0							1		
28					0.1786	7.0							1		
29					0.1738	7.0									
30	277	387	289	404	0.1674	7.0	7.0	9.7	97.5	8.8	12.2	97.0			
Total					5.3861										
	AVG	AVG	AVG	AVG	AVG	MIN	AVG	AVG	AVG	AVG	AVG	AVG	GEM	AVG	AVG
	260	403	266	412	0.1795	6.9	7.0	10.9	97.2	8.7	13.6	96.6	2	9.8	14.7
Limit		**832**		**832**	**0.46**	**6.0**	**30**	**115**	**85**	**30**	**115**	**85**	**200**		
					MAX	MAX	AVW	AVW		AVW	AVW		GM7	MAX	MAX
					0.2183	7.2	7.9	12.0		9.2	14.8		2	10.2	17.1
Limit						**9.0**	**45**	**173**		**45**	**173**		**400**		

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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Stella V. Vakarcs, P.E./ Senior Program Manager
Name and Title (Typed or Printed)

Stella V. Vakarcs 10/8/2010
Signature/Date

(360) 337-5777
Phone Number

WASTEWATER TREATMENT PLANT MONITORING REPORT

Permit No.	WA-002370-1	Discharge No. 001	Month October
Facility Name	Manchester WWTP		Year 2010
Receiving Water	Puget Sound		Location Manchester
Plant Type	Conventional Activated Sludge - Secondary Treatment System		NO DISCHARGE for month

	INFLUENT				EFFLUENT											
Frequency	2/Week	2/Week	2/Week	2/Week	Daily	Daily	2/Week	2/Week	1/Month	2/Week	2/Week	1/Month	2/Week	1/Month	1/Month	
Type	24-hour	24-hour	24-hour	24-hour	Measure	Grab	24-hour	24-hour	Calc	24-hour	24-hour	Calc	Grab	24-hour	24-hour	
Day of the Month	BOD 5-Day mg/L	BOD 5-Day LBS/Day	TSS mg/L	TSS LBS/Day	Flow MGD	pH Std Units	BOD 5-Day mg/L	BOD 5-Day LBS/Day	BOD 5-Day %Removal	TSS mg/L	TSS LBS/Day	TSS %Removal	Fecal Coliform #/100mL	Total Ammonia mg/L	Total Ammonia LBS/Day	
1					0.1543	7.0										
2					0.1663	6.9										
3	227	357	232	365	0.1887	7.0	6.3	9.9	97.2	9.2	14.4	96.1		6.8	10.7	
4					0.1702	7.0							5			
5					0.1655	7.0							6			
6					0.1633	7.0										
7	251	354	307	434	0.1692	7.0	7.5	10.6	97.0	10.9	15.4	96.5				
8					0.2119	6.9										
9					0.2684	6.9										
10	188	404	200	430	0.2578	7.0	11.2	24.1	94.0	15.5	33.4	92.2				
11					0.2148	6.9							5			
12					0.1964	6.9							23			
13					0.1698	6.9										
14	243	363	250	374	0.1791	7.0	7.5	11.2	96.9	11.5	17.1	95.4				
15					0.1867	6.9										
16					0.1866	6.9										
17	238	395	261	433	0.1987	7.0	8.9	14.8	96.2	13.6	22.5	94.8		6.5	10.8	
18					0.1669	7.0							1			
19					0.1582	6.9							1			
20					0.1673	6.9										
21	250	355	252	359	0.1704	7.0	8.7	12.3	96.5	12.6	18.0	95.0				
22					0.1717	6.9										
23					0.2070	7.0										
24	243	555	226	515	0.2735	6.9	15.5	35.4	93.6	19.4	44.2	91.4				
25					0.2382	7.0							18			
26					0.2017	6.9							4			
27					0.1889	6.9										
28	203	330	202	329	0.1949	6.9	7.6	12.4	96.2	10.1	16.4	95.0				
29					0.1715	6.9										
30					0.2142	6.9										
31					0.2271	6.9										
Total					5.9992											
	AVG	AVG	AVG	AVG	AVG	MIN	AVG	AVG	AVG	AVG	AVG	AVG	GEM	AVG	AVG	
	230	389	241	405	0.1935	6.9	9.1	16.3	96.0	12.8	22.7	94.5	5	6.6	10.7	
Limit		832		832	0.46	6.0	30	115	85	30	115	85	200			
					MAX	MAX	AVW	AVW		AVW	AVW		GM7	MAX	MAX	
					0.2735	7.0	11.6	23.9		14.7	30.3		11	6.8	10.8	
Limit						9.0	45	173		45	173		400			

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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Stella V. Vakarcs, P.E./ Senior Program Manager
Name and Title (Typed or Printed)

Stella V. Vakarcs 11/9/2010
Signature/Date

(360) 337-5777
Phone Number

WASTEWATER TREATMENT PLANT MONITORING REPORT

Permit No. WA-002370-1 Discharge No. 001 Month November
Facility Name Manchester WWTP Year 2010
Receiving Water Puget Sound Location Manchester
Plant Type Conventional Activated Sludge - Secondary Treatment System NO DISCHARGE for month

	INFLUENT				EFFLUENT												
Frequency	2/Week	2/Week	2/Week	2/Week	Daily	Daily	2/Week	2/Week	1/Month	2/Week	2/Week	1/Month	2/Week	1/Month	1/Month	
Type	24-hour	24-hour	24-hour	24-hour	Measure	Grab	24-hour	24-hour	Calc	24-hour	24-hour	Calc	Grab	24-hour	24-hour	
Day of the Month	BOD 5-Day mg/L	BOD 5-Day LBS/Day	TSS mg/L	TSS LBS/Day	Flow MGD	pH Std Units	BOD 5-Day mg/L	BOD 5-Day LBS/Day	BOD 5-Day %Removal	TSS mg/L	TSS LBS/Day	TSS %Removal	Fecal Coliform #/100mL	Total Ammonia mg/L	Total Ammonia LBS/Day	
1	118	276	164	383	0.2798	6.9	3.1	7.2	97.4	6.2	14.5	96.2	48			
2					0.2707	6.8							8			
3					0.2083	6.9										
4	216	365	212	358	0.2025	6.9	3.8	6.4	98.2	5.6	9.4	97.4		0.4	0.7	
5					0.1895	6.9										
6					0.2678	6.8										
7	163	356	213	466	0.2618	6.8	9.8	21.3	94.0	11.5	25.2	94.6				
8					0.2368	6.9							193			
9					0.1850	6.9							43			
10					0.2057	6.8										
11	203	353	210	364	0.2083	6.9	4.4	7.6	97.9	6.8	11.8	96.8				
12					0.1894	6.9										
13					0.1976	6.8										
14	254	453	235	419	0.2136	6.9	5.0	8.9	98.0	5.6	9.9	97.6		2.0	3.5	
15					0.2281	6.9							1			
16					0.2195	6.9							11			
17					0.2195	6.9										
18	194	351	259	468	0.2168	6.9	4.8	8.6	97.5	4.8	8.7	98.1				
19					0.2107	6.8										
20					0.2220	6.8										
21	222	412	221	411	0.2226	6.9	2.7	5.0	98.8	3.5	6.5	98.4				
22					0.1761	6.9							1			
23	184	205	189	211	0.1338	7.0	3.5	3.9	98.1	4.6	5.1	97.6				
24					0.2235	6.9							1			
25					0.1952	6.9										
26					0.2270	7.0										
27					0.2136	6.9										
28	247	434	293	515	0.2103	6.8	3.7	6.4	98.5	5.2	9.1	98.2				
29					0.2139	6.9							1			
30					0.2702	6.9										
Total					6.5196											
	AVG	AVG	AVG	AVG	AVG	MIN	AVG	AVG	AVG	AVG	AVG	AVG	GEM	AVG	AVG	
	200	356	222	399	0.2173	6.8	4.5	8.4	97.6	6.0	11.1	97.2	7	1.2	2.1	
Limit		832		832	0.46	6.0	30	115	85	30	115	85	200			
					MAX	MAX	AVW	AVW		AVW	AVW		GM7	MAX	MAX	
					0.2798	7.0	7.1	14.4		9.2	18.5		91	2.0	3.5	
Limit						9.0	45	173		45	173		400			

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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Stella V. Vakarcs, P.E./ Senior Program Manager
Name and Title (Typed or Printed)

Stella V. Vakarcs 12/8/2010
Signature/Date

(360) 337-5777
Phone Number

WASTEWATER TREATMENT PLANT MONITORING REPORT

Permit No. WA-002370-1 Discharge No. 001 Month December
Facility Name Manchester WWTP Year 2010
Receiving Water Puget Sound Location Manchester
Plant Type Conventional Activated Sludge - Secondary Treatment System NO DISCHARGE for month

	INFLUENT				EFFLUENT										
Frequency	2/Week	2/Week	2/Week	2/Week	Daily	Daily	2/Week	2/Week	1/Month	2/Week	2/Week	1/Month	2/Week	1/Month	1/Month
Type	24-hour	24-hour	24-hour	24-hour	Measure	Grab	24-hour	24-hour	Calc	24-hour	24-hour	Calc	Grab	24-hour	24-hour
Day of the Month	BOD 5-Day mg/L	BOD 5-Day LBS/Day	TSS mg/L	TSS LBS/Day	Flow MGD	pH Std Units	BOD 5-Day mg/L	BOD 5-Day LBS/Day	BOD 5-Day %Removal	TSS mg/L	TSS LBS/Day	TSS %Removal	Fecal Coliform #/100mL	Total Ammonia mg/L	Total Ammonia LBS/Day
1					0.2513	7.0									
2	199	417	222	465	0.2513	6.9	2.7	5.6	98.7	3.7	7.8	98.3	3	0.4	0.9
3					0.2293	6.8									
4					0.2039	6.8									
5	219	391	248	443	0.2140	6.8	4.7	8.4	97.9	4.3	7.7	98.3			
6					0.1941	6.9							1		
7					0.2613	6.9							1		
8					0.3796	6.8									
9	111	370	159	530	0.3999	6.7	4.5	15.1	95.9	5.7	18.9	96.4			
10					0.2885	6.7									
11					0.5160	6.8									
12	76	487	102	660	0.7727	6.8	7.7	49.9	89.7	11.4	73.3	88.9		1.4	8.8
13					0.4925	6.7							1		
14					0.4970	6.7							26		
15					0.3425	6.7									
16	152	370	188	458	0.2916	6.7	5.1	12.5	96.6	6.0	14.7	96.8			
17					0.2692	6.8									
18					0.2664	6.9									
19	175	387	181	401	0.2649	6.9	4.6	10.1	97.4	4.0	8.8	97.8			
20					0.2604	6.9							1		
21					0.2452	6.9							1		
22	504	1030	478	977	0.2450	6.8	7.1	14.4	98.6	7.6	15.6	98.4			
23					0.3535	6.9									
24					0.3614	6.8									
25					0.3452	6.8									
26	158	447	221	625	0.3391	6.8	5.1	14.4	96.8	6.9	19.6	96.9			
27					0.3659	6.8							1		
28					0.3566	6.7							1		
29	150	355	165	390	0.2832	6.7	5.1	12.0	96.6	6.2	14.7	96.2			
30					0.2731	6.8									
31					0.2334	6.8									
Total					10.0480										
	AVG	AVG	AVG	AVG	AVG	MIN	AVG	AVG	AVG	AVG	AVG	AVG	GEM	AVG	AVG
	194	473	218	550	0.3241	6.7	5.2	15.8	96.5	6.2	20.1	96.4	2	0.9	4.8
Limit		832		832	0.46	6.0	30	115	85	30	115	85	200		
					MAX	MAX	AVW	AVW		AVW	AVW		GM7	MAX	MAX
					0.7727	7.0	6.4	31.2		8.7	44.0		5	1.4	8.8
Limit						9.0	45	173		45	173		400		

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)

Stella V. Vakarcs 1/6/2011
Signature/Date

(360) 337-5777
Phone Number

WASTEWATER TREATMENT PLANT MONITORING REPORT

Permit No. WA-002370-1 **Discharge No.** 001 **Month** January
Facility Name Manchester WWTP **Year** 2011
Receiving Water Puget Sound **Location** Manchester
Plant Type Conventional Activated Sludge - Secondary Treatment System **NO DISCHARGE for month** ☐

	INFLUENT				EFFLUENT										
Frequency	2/Week	2/Week	2/Week	2/Week	Daily	Daily	2/Week	2/Week	1/Month	2/Week	2/Week	1/Month	2/Week	1/Month	1/Month
Type	24-hour	24-hour	24-hour	24-hour	Measure	Grab	24-hour	24-hour	Calc	24-hour	24-hour	Calc	Grab	24-hour	24-hour
Day of the Month	BOD 5-Day mg/L	BOD 5-Day LBS/Day	TSS mg/L	TSS LBS/Day	Flow MGD	pH Std Units	BOD 5-Day mg/L	BOD 5-Day LBS/Day	BOD 5-Day %Removal	TSS mg/L	TSS LBS/Day	TSS %Removal	Fecal Coliform #/100mL	Total Ammonia mg/L	Total Ammonia LBS/Day
1					0.2221	6.9									
2					0.2357	6.9									
3	204	355	176	306	0.2088	7.0	6.5	11.4	96.8	7.9	13.8	95.5	1		
4					0.1972	6.9							3		
5					0.2056	7.0									
6	193	326	202	342	0.2025	6.8	5.5	9.3	97.1	5.2	8.8	97.4		0.9	1.5
7					0.2462	6.9									
8					0.2105	6.9									
9	230	422	229	420	0.2199	6.9	4.1	7.5	98.2	4.4	8.1	98.1			
10					0.1958	6.9							1		
11					0.1905	6.9							4		
12					0.3549	6.9									
13	104	334	111	355	0.3844	6.8	5.4	17.4	94.8	6.6	21.2	94.0		0.4	1.3
14					0.3647	6.8									
15					0.3225	6.8									
16					0.3289	6.7									
17	145	335	182	421	0.2767	6.8	3.7	8.5	97.5	4.0	9.2	97.8			
18					0.2474	6.8							3		
19					0.2282	6.8							1		
20	224	393	259	454	0.2103	6.8	2.3	4.0	99.0	3.4	6.0	98.7			
21					0.2437	6.8									
22					0.2051	6.8									
23	240	443	265	490	0.2212	6.8	2.9	5.3	98.8	4.0	7.3	98.5			
24					0.2167	6.9							3		
25					0.2143	6.9							3		
26					0.2174	6.9									
27	286	448	311	487	0.1878	6.9	2.6	4.1	99.1	3.6	5.6	98.8			
28					0.2283	6.8									
29					0.1997	6.8									
30	318	551	365	632	0.2076	6.9	2.9	5.0	99.1	3.7	6.5	99.0			
31					0.1907	6.9							4		
Total					7.3852										
	AVG	AVG	AVG	AVG	AVG	MIN	AVG	AVG	AVG	AVG	AVG	AVG	GEM	AVG	AVG
	216	401	233	434	0.2382	6.7	4.0	8.0	97.8	4.8	9.6	97.5	2	0.6	1.4
Limit		832		832	0.46	6.0	30	115	85	30	115	85	200		
					MAX	MAX	AVW	AVW		AVW	AVW		GM7	MAX	MAX
					0.3844	7.0	6.0	12.5		6.6	14.6		3	0.9	1.5
Limit						9.0	45	173		45	173		400		

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)

Stella V. Vakarcs 2/9/2011
Signature/Date

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Phone Number

WASTEWATER TREATMENT PLANT MONITORING REPORT

Permit No. WA-002370-1 Discharge No. 001 Month February
Facility Name Manchester WWTP Year 2011
Receiving Water Puget Sound Location Manchester
Plant Type Conventional Activated Sludge - Secondary Treatment System NO DISCHARGE for month ☐

	INFLUENT				EFFLUENT										
Frequency	2/Week	2/Week	2/Week	2/Week	Daily	Daily	2/Week	2/Week	1/Month	2/Week	2/Week	1/Month	2/Week	1/Month	1/Month
Type	24-hour	24-hour	24-hour	24-hour	Measure	Grab	24-hour	24-hour	Calc	24-hour	24-hour	Calc	Grab	24-hour	24-hour
Day of the Month	BOD 5-Day mg/L	BOD 5-Day LBS/Day	TSS mg/L	TSS LBS/Day	Flow MGD	pH Std Units	BOD 5-Day mg/L	BOD 5-Day LBS/Day	BOD 5-Day %Removal	TSS mg/L	TSS LBS/Day	TSS %Removal	Fecal Coliform #/100mL	Total Ammonia mg/L	Total Ammonia LBS/Day
1					0.1993	6.9							1		
2					0.1817	6.9									
3	217	318	409	599	0.1755	6.8	2.4	3.5	98.9	3.9	5.7	99.0		0.5	0.7
4					0.2090	6.9									
5					0.1911	6.8									
6	245	427	240	418	0.2089	6.9	2.5	4.4	99.0	3.7	6.4	98.5			
7					0.1859	6.9							1		
8					0.1727	6.9							4		
9					0.1709	6.9									
10	251	348	250	347	0.1664	6.9	2.6	3.6	99.0	3.9	5.4	98.5			
11					0.2000	6.8									
12					0.2103	6.9									
13	225	419	213	397	0.2230	7.0	4.1	7.7	98.2	6.2	11.6	97.1			
14					0.3135	6.9							1		
15					0.3198	6.9									
16					0.2854	6.8							8		
17	185	473	187	477	0.3062	6.7	4.3	11.0	97.7	7.9	20.1	95.8		1.2	2.9
18					0.2230	6.8									
19					0.2156	6.8									
20					0.2112	6.9									
21	199	350	196	344	0.2109	6.9	6.2	10.9	96.9	11.1	19.6	94.3			
22					0.2201	6.9							1		
23					0.2093	6.9							1		
24	210	374	177	315	0.2134	6.9	4.5	8.0	97.9	7.9	14.1	95.5			
25					0.1812	6.8									
26					0.2007	6.9									
27	294	669	224	509	0.2726	7.0	6.0	13.7	97.9	10.7	24.3	95.2			
28					0.2782	6.9							6		
Total					6.1557										
	AVG	AVG	AVG	AVG	AVG	MIN	AVG	AVG	AVG	AVG	AVG	AVG	GEM	AVG	AVG
	228	422	237	426	0.2198	6.7	4.1	7.8	98.2	6.9	13.4	96.7	2	0.8	1.8
Limit		832		832	0.46	6.0	30	115	85	30	115	85	200		
					MAX	MAX	AVW	AVW		AVW	AVW		GM7	MAX	MAX
					0.3198	7.0	5.3	9.5		9.5	16.8		3	1.2	2.9
Limit						9.0	45	173		45	173		400		

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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Stella V. Vakarcs, P.E./ Senior Program Manager
Name and Title (Typed or Printed)

Stella V. Vakarcs 3/11/2011
Signature/Date

(360) 337-5777
Phone Number

WASTEWATER TREATMENT PLANT MONITORING REPORT

Permit No.	WA-002370-1	**Discharge No.**	001	**Month**	March
Facility Name	Manchester WWTP			**Year**	2011
Receiving Water	Puget Sound			**Location**	Manchester
Plant Type	Conventional Activated Sludge - Secondary Treatment System			**NO DISCHARGE for month**	

	INFLUENT				EFFLUENT										
Frequency	2/Week	2/Week	2/Week	2/Week	Daily	Daily	2/Week	2/Week	1/Month	2/Week	2/Week	1/Month	2/Week	1/Month	1/Month
Type	24-hour	24-hour	24-hour	24-hour	Measure	Grab	24-hour	24-hour	Calc	24-hour	24-hour	Calc	Grab	24-hour	24-hour
Day of the Month	BOD 5-Day mg/L	BOD 5-Day LBS/Day	TSS mg/L	TSS LBS/Day	Flow MGD	pH Std Units	BOD 5-Day mg/L	BOD 5-Day LBS/Day	BOD 5-Day %Removal	TSS mg/L	TSS LBS/Day	TSS %Removal	Fecal Coliform #/100mL	Total Ammonia mg/L	Total Ammonia LBS/Day
1					0.2560	6.8							3		
2					0.2624	6.8									
3	151	315	189	395	0.2497	6.8	5.1	10.6	96.6	9.4	19.6	95.0		0.5	1.0
4					0.2275	6.9									
5					0.2278	6.8									
6	189	366	188	365	0.2320	6.9	4.5	8.6	97.6	7.0	13.6	96.3			
7					0.2408	6.9							1		
8					0.2254	6.9							1		
9					0.4038	6.8									
10	103	324	117	369	0.3775	6.8	4.2	13.3	95.9	7.2	22.6	93.9			
11					0.2696	6.8									
12					0.3506	6.8									
13	124	466	120	450	0.4506	6.8	4.4	16.6	96.4	6.9	26.0	94.2		1.0	3.9
14					0.5262	6.8							6		
15					0.4944	6.9							4		
16					0.3628	6.9									
17	148	357	161	388	0.2889	6.8	3.6	8.6	97.6	4.9	11.8	96.9			
18					0.2846	6.8									
19					0.2715	6.8									
20	170	405	166	396	0.2856	6.9	3.4	8.2	98.0	4.3	10.2	97.4			
21					0.2723	6.9							1		
22					0.2200	6.8							6		
23					0.2130	6.8									
24	174	331	179	341	0.2276	6.9	3.2	6.1	98.1	2.8	5.3	98.4			
25					0.2146	6.9									
26					0.2278	6.9									
27	163	347	239	509	0.2550	6.9	3.0	6.3	98.2	3.0	6.4	98.8			
28					0.2150	7.0							8		
29					0.2209	7.0							1		
30					0.2158	6.9									
31	205	358	269	471	0.2095	6.9	3.0	5.3	98.5	3.6	6.3	98.7			
Total					8.7790										
	AVG	AVG	AVG	AVG	AVG	MIN	AVG	AVG	AVG	AVG	AVG	AVG	GEM	AVG	AVG
	159	363	181	409	0.2832	6.8	3.8	9.3	97.4	5.5	13.5	96.6	2	0.8	2.4
Limit		**832**		**832**	**0.46**	**6.0**	**30**	**115**	**85**	**30**	**115**	**85**	**200**		
					MAX	MAX	AVW	AVW		AVW	AVW		GM7	MAX	MAX
					0.5262	7.0	5.1	12.6		9.4	19.6		5	1.0	3.9
Limit						**9.0**	**45**	**173**		**45**	**173**		**400**		

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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Stella V. Vakarcs, P.E./ Senior Program Manager
Name and Title (Typed or Printed)

Stella V. Vakarcs 4/7/2011
Signature/Date

(360) 337-5777
Phone Number

WASTEWATER TREATMENT PLANT MONITORING REPORT

Permit No. WA-002370-1 Discharge No. 001
Facility Name Manchester WWTP
Receiving Water Puget Sound
Plant Type Conventional Activated Sludge - Secondary Treatment System

Month April
Year 2011
Location Manchester
NO DISCHARGE for month

	INFLUENT				EFFLUENT											
Frequency	2/Week	2/Week	2/Week	2/Week	Daily	Daily	2/Week	2/Week	1/Month	2/Week	2/Week	1/Month	2/Week	1/Month	1/Month	
Type	24-hour	24-hour	24-hour	24-hour	Measure	Grab	24-hour	24-hour	Calc	24-hour	24-hour	Calc	Grab	24-hour	24-hour	
Day of the Month	BOD 5-Day mg/L	BOD 5-Day LBS/Day	TSS mg/L	TSS LBS/Day	Flow MGD	pH Std Units	BOD 5-Day mg/L	BOD 5-Day LBS/Day	BOD 5-Day %Removal	TSS mg/L	TSS LBS/Day	TSS %Removal	Fecal Coliform #/100mL	Total Ammonia mg/L	Total Ammonia LBS/Day	
1					0.3184	6.9										
2					0.2706	6.9										
3	163	349	237	508	0.2563	6.9	2.2	4.6	98.7	3.4	7.2	98.6		1.9	4.1	
4					0.2336	6.9							4			
5					0.2209	6.9							3			
6					0.2029	6.9										
7	184	306	183	304	0.1992	6.9	2.8	4.7	98.5	4.0	6.7	97.8				
8					0.1835	7.0										
9					0.1977	6.9										
10	205	387	188	354	0.2261	6.9	3.7	7.0	98.2	3.8	7.2	98.0				
11					0.2231	7.0							58			
12					0.1832	6.9							1			
13					0.1991	6.9										
14	165	322	184	359	0.2336	6.9	3.0	5.8	98.2	4.4	8.6	97.6		0.6	1.1	
15					0.2105	6.9										
16					0.2146	7.0										
17	176	328	204	380	0.2230	7.0	3.1	5.7	98.3	4.7	8.7	97.7				
18					0.2019	6.9							14			
19					0.2202	6.9							1			
20					0.1899	6.9										
21	188	279	227	337	0.1777	6.9	2.9	4.3	98.5	5.5	8.2	97.6				
22					0.1663	7.0										
23					0.1822	6.9										
24	203	346	205	349	0.2041	6.9	4.2	7.2	97.9	5.6	9.6	97.3				
25					0.1997	7.0							1			
26					0.2142	7.1							1			
27					0.1920	7.1										
28	159	229	212	305	0.1725	7.0	2.6	3.7	98.4	6.1	8.7	97.1				
29					0.1619	7.0										
30					0.1746	7.0										
Total					6.2534											
	AVG	AVG	AVG	AVG	AVG	MIN	AVG	AVG	AVG	AVG	AVG	AVG	GEM	AVG	AVG	
	180	318	205	362	0.2084	6.9	3.0	5.4	98.3	4.7	8.1	97.7	3	1.3	2.6	
Limit		**832**		**832**	**0.46**	**6.0**	**30**	**115**	**85**	**30**	**115**	**85**	**200**			
					MAX	MAX	AVW	AVW		AVW	AVW		GM7	MAX	MAX	
					0.3184	7.1	3.4	6.4		5.8	9.2		8	1.9	4.1	
Limit						**9.0**	**45**	**173**		**45**	**173**		**400**			

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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Stella V. Vakarcs, P.E./ Senior Program Manager
Name and Title (Typed or Printed)

Stella V. Vakarcs 5/9/2011
Signature/Date

(360) 337-5777
Phone Number

WASTEWATER TREATMENT PLANT MONITORING REPORT

Permit No. WA-002370-1 **Discharge No.** 001 **Month** May
Facility Name Manchester WWTP **Year** 2011
Receiving Water Puget Sound **Location** Manchester
Plant Type Conventional Activated Sludge - Secondary Treatment System **NO DISCHARGE for month**

	INFLUENT				EFFLUENT										
Frequency	2/Week	2/Week	2/Week	2/Week	Daily	Daily	2/Week	2/Week	1/Month	2/Week	2/Week	1/Month	2/Week	1/Month	1/Month
Type	24-hour	24-hour	24-hour	24-hour	Measure	Grab	24-hour	24-hour	Calc	24-hour	24-hour	Calc	Grab	24-hour	24-hour
Day of the Month	BOD 5-Day mg/L	BOD 5-Day LBS/Day	TSS mg/L	TSS LBS/Day	Flow MGD	pH Std Units	BOD 5-Day mg/L	BOD 5-Day LBS/Day	BOD 5-Day %Removal	TSS mg/L	TSS LBS/Day	TSS %Removal	Fecal Coliform #/100mL	Total Ammonia mg/L	Total Ammonia LBS/Day
1	151	241	507	808	0.1911	7.0	3.1	5.0	97.9	5.6	9.0	98.9		1.9	3.0
2					0.1894	7.0							1		
3					0.1711	7.0							1		
4					0.1961	7.0									
5	220	327	261	388	0.1780	7.0	2.7	4.0	98.8	4.5	6.7	98.3			
6					0.1722	7.0									
7					0.1844	6.9									
8	218	350	247	397	0.1927	7.0	3.5	5.5	98.4	5.7	9.2	97.7			
9					0.1828	7.0							1		
10					0.1750	7.0							1		
11					0.1928	6.8									
12	150	220	213	312	0.1756	7.0	2.8	4.1	98.1	5.0	7.4	97.6			
13					0.2020	6.9									
14					0.2257	7.0									
15	187	516	213	587	0.3306	7.0	3.8	10.5	98.0	8.3	22.9	96.1		2.5	6.8
16					0.2306	7.0							5		
17					0.1995	6.9							1		
18	111	189	257	437	0.2044	6.9	1.7	2.8	98.5	4.4	7.5	98.3	1		
19					0.1827	6.9									
20					0.1727	7.0									
21					0.1853	6.9									
22	253	399	316	498	0.1891	7.0	4.5	7.1	98.2	3.6	5.7	98.9			
23					0.1660	7.1							1		
24					0.1572	7.1							1		
25					0.1929	7.0									
26	237	315	230	306	0.1594	7.1	3.9	5.2	98.4	3.1	4.1	98.7			
27					0.1567	7.1									
28					0.2109	7.0									
29					0.1980	6.9									
30	214	369	241	416	0.2064	7.1	4.8	8.2	97.8	4.9	8.5	98.0			
31					0.1948	7.0							1		
Total					5.9661										
	AVG	AVG	AVG	AVG	AVG	MIN	AVG	AVG	AVG	AVG	AVG	AVG	GEM	AVG	AVG
	193	325	276	461	0.1925	6.8	3.4	5.8	98.2	5.0	9.0	98.0	1	2.2	4.9
Limit		832		832	0.46	6.0	30	115	85	30	115	85	200		
					MAX	MAX	AVW	AVW		AVW	AVW		GM7	MAX	MAX
					0.3306	7.1	4.2	6.7		6.4	15.2		2	2.5	6.8
Limit						9.0	45	173		45	173		400		

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)

Stella V. Vakarcs 6/14/2011
Signature/Date

(360) 337-5777
Phone Number

WASTEWATER TREATMENT PLANT MONITORING REPORT

Permit No. WA-002370-1 **Discharge No.** 001 **Month** June
Facility Name Manchester WWTP **Year** 2011
Receiving Water Puget Sound **Location** Manchester
Plant Type Conventional Activated Sludge - Secondary Treatment System **NO DISCHARGE for month** ☐

	INFLUENT				EFFLUENT											
Frequency	2/Week	2/Week	2/Week	2/Week	Daily	Daily	2/Week	2/Week	1/Month	2/Week	2/Week	1/Month	2/Week	1/Month	1/Month	
Type	24-hour	24-hour	24-hour	24-hour	Measure	Grab	24-hour	24-hour	Calc	24-hour	24-hour	Calc	Grab	24-hour	24-hour	
Day of the Month	BOD 5-Day mg/L	BOD 5-Day LBS/Day	TSS mg/L	TSS LBS/Day	Flow MGD	pH Std Units	BOD 5-Day mg/L	BOD 5-Day LBS/Day	BOD 5-Day %Removal	TSS mg/L	TSS LBS/Day	TSS %Removal	Fecal Coliform #/100mL	Total Ammonia mg/L	Total Ammonia LBS/Day	
1					0.1809	6.9										
2	207	345	223	372	0.1997	7.1	4.6	7.7	97.8	4.3	7.1	98.1	1			
3					0.1956	7.0										
4					0.1610	7.0										
5	240	362	244	369	0.1810	7.1	5.2	7.9	97.8	3.6	5.4	98.5		5.4	8.2	
6					0.1646	7.2							1			
7					0.1783	7.1							1			
8					0.1793	7.1										
9	293	420	336	481	0.1716	7.1	3.7	5.3	98.7	2.7	3.9	99.2				
10					0.1606	7.1										
11					0.1737	7.1										
12	231	353	276	421	0.1829	7.0	5.6	8.6	97.6	4.9	7.5	98.2		8.7	13.2	
13					0.1731	7.2							4			
14					0.1993	7.1							1			
15					0.1672	7.1										
16	211	293	238	330	0.1665	7.1	5.2	7.2	97.6	3.6	5.1	98.5				
17					0.1535	7.2										
18					0.1855	7.1										
19	264	420	253	403	0.1906	7.0	4.9	7.7	98.2	3.7	5.9	98.5				
20					0.1697	7.1							1			
21					0.1852	7.1							1			
22					0.1579	7.1										
23	233	310	276	367	0.1592	7.1	4.0	5.4	98.3	3.3	4.4	98.8				
24					0.1599	7.1										
25					0.1621	7.1										
26	246	374	277	421	0.1821	7.1	3.8	5.7	98.5	2.6	4.0	99.1				
27					0.1702	7.1							1			
28					0.1920	7.0							1			
29					0.1622	7.1										
30	243	316	259	336	0.1557	7.0	1.4	1.8	99.4	2.2	2.9	99.1				
Total					5.2209											
	AVG	AVG	AVG	AVG	AVG	MIN	AVG	AVG	AVG	AVG	AVG	AVG	GEM	AVG	AVG	
	241	355	265	389	0.1740	6.9	4.3	6.4	98.2	3.4	5.1	98.7	1	7.0	10.7	
Limit		**832**		**832**	**0.46**	**6.0**	**30**	**115**	**85**	**30**	**115**	**85**	**200**			
					MAX	MAX	AVW	AVW		AVW	AVW		GM7	MAX	MAX	
					0.1997	7.2	5.4	7.9		4.3	7.1		2	8.7	13.2	
Limit						**9.0**	**45**	**173**		**45**	**173**		**400**			

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)

Stella V. Vakarcs 7/11/2011
Signature/Date

(360) 337-5777
Phone Number

WASTEWATER TREATMENT PLANT MONITORING REPORT

Permit No.	WA-002370-1	**Discharge No.** 001	**Month** July
Facility Name	Manchester WWTP		**Year** 2011
Receiving Water	Puget Sound		**Location** Manchester
Plant Type	Conventional Activated Sludge - Secondary Treatment System		**NO DISCHARGE for month**

	INFLUENT				EFFLUENT										
Frequency	2/Week	2/Week	2/Week	2/Week	Daily	Daily	2/Week	2/Week	1/Month	2/Week	2/Week	1/Month	2/Week	1/Month	1/Month
Type	24-hour	24-hour	24-hour	24-hour	Measure	Grab	24-hour	24-hour	Calc	24-hour	24-hour	Calc	Grab	24-hour	24-hour
Day of the Month	BOD 5-Day mg/L	BOD 5-Day LBS/Day	TSS mg/L	TSS LBS/Day	Flow MGD	pH Std Units	BOD 5-Day mg/L	BOD 5-Day LBS/Day	BOD 5-Day %Removal	TSS mg/L	TSS LBS/Day	TSS %Removal	Fecal Coliform #/100mL	Total Ammonia mg/L	Total Ammonia LBS/Day
1					0.1546	7.0									
2					0.1647	7.0									
3					0.1797	7.1									
4	249	409	269	442	0.1969	7.0	4.1	6.8	98.3	4.8	7.9	98.2		6.7	11.0
5					0.1849	7.1							1		
6					0.1641	7.1							1		
7	280	430	271	417	0.1841	7.1	3.8	5.9	98.6	4.9	7.6	98.2			
8					0.1512	7.1									
9					0.1595	7.0									
10	251	370	234	345	0.1766	7.1	5.4	8.0	97.8	5.8	8.6	97.5		10.3	15.2
11					0.1622	7.1							4		
12					0.1855	7.0							1		
13					0.1533	7.1									
14	238	325	292	398	0.1635	7.1	4.6	6.3	98.1	6.4	8.7	97.8			
15					0.1532	7.1									
16					0.1743	7.1									
17	231	362	228	357	0.1878	7.1	6.5	10.2	97.2	10.0	15.6	95.6			
18					0.1917	7.1							1		
19					0.1661	7.1							1		
20					0.1561	7.1									
21	246	326	207	274	0.1590	7.1	3.5	4.6	98.6	3.7	4.9	98.2			
22					0.1445	7.2									
23					0.1627	7.0									
24	228	300	200	263	0.1577	7.0	4.0	5.2	98.3	4.6	6.0	97.7			
25					0.1787	7.0							23		
26					0.1987	6.9							1		
27					0.1598	6.9									
28	237	317	250	334	0.1602	6.9	2.3	3.1	99.0	3.0	4.0	98.8			
29					0.1526	7.0									
30					0.1598	6.9									
31	257	396	266	410	0.1847	7.0	2.7	4.1	99.0	1.6	2.4	99.4			
Total					5.2280										
	AVG	AVG	AVG	AVG	AVG	MIN	AVG	AVG	AVG	AVG	AVG	AVG	GEM	AVG	AVG
	246	359	246	360	0.1686	6.9	4.1	6.0	98.3	5.0	7.3	97.9	2	8.5	13.1
Limit		**832**		**832**	**0.46**	**6.0**	**30**	**115**	**85**	**30**	**115**	**85**	**200**		
					MAX	MAX	AVW	AVW		AVW	AVW		GM7	MAX	MAX
					0.1987	7.2	5.0	7.4		6.8	10.3		5	10.3	15.2
Limit						**9.0**	**45**	**173**		**45**	**173**		**400**		

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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Stella V. Vakarcs, P.E./ Senior Program Manager
Name and Title (Typed or Printed)

Stella V. Vakarcs 8/10/2011
Signature/Date

(360) 337-5777
Phone Number

WASTEWATER TREATMENT PLANT MONITORING REPORT

Permit No. WA-002370-1 Discharge No. 001 Month August
Facility Name Manchester WWTP Year 2011
Receiving Water Puget Sound Location Manchester
Plant Type Conventional Activated Sludge - Secondary Treatment System NO DISCHARGE for month

	INFLUENT				EFFLUENT											
Frequency	2/Week	2/Week	2/Week	2/Week	Daily	Daily	2/Week	2/Week	1/Month	2/Week	2/Week	1/Month	2/Week	1/Month	1/Month	
Type	24-hour	24-hour	24-hour	24-hour	Measure	Grab	24-hour	24-hour	Calc	24-hour	24-hour	Calc	Grab	24-hour	24-hour	
Day of the Month	BOD 5-Day mg/L	BOD 5-Day LBS/Day	TSS mg/L	TSS LBS/Day	Flow MGD	pH Std Units	BOD 5-Day mg/L	BOD 5-Day LBS/Day	BOD 5-Day %Removal	TSS mg/L	TSS LBS/Day	TSS %Removal	Fecal Coliform #/100mL	Total Ammonia mg/L	Total Ammonia LBS/Day	
1					0.1575	7.0							5			
2					0.1858	6.9							5			
3					0.1552	7.0										
4	204	266	291	380	0.1564	6.9	3.3	4.3	98.4	2.9	3.8	99.0		2.3	3.0	
5					0.1610	7.0										
6					0.1607	7.0										
7	184	263	261	373	0.1713	7.0	3.6	5.1	98.1	3.9	5.6	98.5				
8					0.1625	7.0							9			
9					0.1830	7.0							1			
10					0.1633	7.0										
11	249	338	275	373	0.1627	7.0	2.9	4.0	98.8	3.2	4.3	98.8				
12					0.1694	7.0										
13					0.1650	7.2										
14	274	422	237	366	0.1848	6.9	5.3	8.1	98.1	4.2	6.5	98.2		4.7	7.2	
15					0.1897	7.0							1			
16					0.1578	7.0							1			
17					0.1552	7.0										
18	257	321	291	363	0.1497	6.9	4.3	5.4	98.3	3.7	4.6	98.7				
19					0.1539	6.8										
20					0.1575	7.1										
21	221	309	250	350	0.1676	7.1	9.0	12.6	95.9	10.3	14.5	95.9				
22					0.1261	7.2							6			
23					0.2279	7.1							1			
24					0.1463	7.0										
25	234	291	402	500	0.1491	6.9	3.7	4.6	98.4	3.8	4.7	99.1				
26					0.1480	7.0										
27					0.1614	7.0										
28	267	381	280	401	0.1712	7.0	5.2	7.4	98.1	5.1	7.3	98.2				
29					0.1675	6.9							1			
30					0.1875	6.9							1			
31					0.1601	6.8										
Total					5.1149											
	AVG	AVG	AVG	AVG	AVG	MIN	AVG	AVG	AVG	AVG	AVG	AVG	GEM	AVG	AVG	
	236	324	286	388	0.1650	6.8	4.6	6.4	98.0	4.6	6.4	98.3	2	3.5	5.1	
Limit		832		832	0.46	6.0	30	115	85	30	115	85	200			
					MAX	MAX	AVW	AVW		AVW	AVW		GM7	MAX	MAX	
					0.2279	7.2	6.3	8.6		7.1	9.6		5	4.7	7.2	
Limit						9.0	45	173		45	173		400			

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)

Stella V. Vakarcs 9/12/2011
Signature/Date

(360) 337-5777
Phone Number

WASTEWATER TREATMENT PLANT MONITORING REPORT

Permit No.	WA-002370-1	**Discharge No.**	001
Facility Name	Manchester WWTP		
Receiving Water	Puget Sound		
Plant Type	Conventional Activated Sludge - Secondary Treatment System		

Month September
Year 2011
Location Manchester
NO DISCHARGE for month ☐

	INFLUENT				EFFLUENT											
Frequency	2/Week	2/Week	2/Week	2/Week	Daily	Daily	2/Week	2/Week	1/Month	2/Week	2/Week	1/Month	2/Week	1/Month	1/Month	
Type	24-hour	24-hour	24-hour	24-hour	Measure	Grab	24-hour	24-hour	Calc	24-hour	24-hour	Calc	Grab	24-hour	24-hour	
Day of the Month	BOD 5-Day mg/L	BOD 5-Day LBS/Day	TSS mg/L	TSS LBS/Day	Flow MGD	pH Std Units	BOD 5-Day mg/L	BOD 5-Day LBS/Day	BOD 5-Day %Removal	TSS mg/L	TSS LBS/Day	TSS %Removal	Fecal Coliform #/100mL	Total Ammonia mg/L	Total Ammonia LBS/Day	
1	229	302	248	327	0.1583	6.9	2.4	3.2	98.9	2.2	2.9	99.1				
2					0.1479	6.8										
3					0.1577	6.8										
4					0.1583	6.9										
5	204	210	413	425	0.1232	6.9	2.5	2.5	98.8	4.0	4.1	99.0		1.6	1.6	
6					0.1588	6.9							1			
7					0.1807	6.9							6			
8	359	464	333	431	0.1549	7.0	4.2	5.4	98.8	3.7	4.8	98.9				
9					0.1471	7.0										
10					0.1554	6.9										
11	237	338	200	286	0.1711	6.8	4.1	5.8	98.3	4.1	5.9	97.9				
12					0.1655	6.9							1			
13					0.1715	6.9							1			
14					0.1533	6.9										
15	283	382	266	359	0.1619	6.9	3.1	4.2	98.9	2.8	3.8	98.9				
16					0.1440	6.8										
17					0.1680	6.8										
18	228	358	291	458	0.1884	6.9	2.8	4.4	98.8	4.4	6.9	98.5				
19					0.1591	7.0							1			
20					0.1763	6.8							33			
21					0.1527	6.8										
22	273	367	254	341	0.1609	6.9	4.7	6.4	98.3	4.5	6.1	98.2				
23					0.1651	7.0										
24					0.1872	6.8										
25	277	462	273	455	0.1998	6.9	4.8	8.0	98.3	3.8	6.3	98.6				
26					0.2207	7.1							1			
27					0.1996	7.0							3			
28					0.1597	6.8										
29	279	356	261	333	0.1529	6.8	4.2	5.3	98.5	4.5	5.8	98.3				
30					0.1442	7.2										
Total					4.9441											
	AVG	AVG	AVG	AVG	AVG	MIN	AVG	AVG	AVG	AVG	AVG	AVG	GEM	AVG	AVG	
	263	360	282	379	0.1648	6.8	3.6	5.0	98.6	3.8	5.2	98.6	2	1.6	1.6	
Limit		832		832	0.46	6.0	30	115	85	30	115	85	200			
					MAX	MAX	AVW	AVW		AVW	AVW		GM7	MAX	MAX	
					0.2207	7.2	4.5	6.6		4.4	6.5		6	1.6	1.6	
Limit						9.0	45	173		45	173		400			

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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Stella V. Vakarcs, P.E./ Senior Program Manager
Name and Title (Typed or Printed)

Stella V. Vakarcs 10/10/2011
Signature/Date

(360) 337-5777
Phone Number

WASTEWATER TREATMENT PLANT MONITORING REPORT

Permit No. WA-002370-1 **Discharge No.** 001 **Month** October
Facility Name Manchester WWTP **Year** 2011
Receiving Water Puget Sound **Location** Manchester
Plant Type Conventional Activated Sludge - Secondary Treatment System **NO DISCHARGE for month** ☐

	INFLUENT				EFFLUENT										
Frequency	2/Week	2/Week	2/Week	2/Week	Daily	Daily	2/Week	2/Week	1/Month	2/Week	2/Week	1/Month	2/Week	1/Month	1/Month
Type	24-hour	24-hour	24-hour	24-hour	Measure	Grab	24-hour	24-hour	Calc	24-hour	24-hour	Calc	Grab	24-hour	24-hour
Day of the Month	BOD 5-Day mg/L	BOD 5-Day LBS/Day	TSS mg/L	TSS LBS/Day	Flow MGD	pH Std Units	BOD 5-Day mg/L	BOD 5-Day LBS/Day	BOD 5-Day %Removal	TSS mg/L	TSS LBS/Day	TSS %Removal	Fecal Coliform #/100mL	Total Ammonia mg/L	Total Ammonia LBS/Day
1					0.1630	6.6									
2	156	234	234	352	0.1799	6.7	2.1	3.1	98.7	10.4	15.6	95.6		0.6	0.9
3					0.1627	6.8							1		
4					0.1875	6.9							1		
5					0.1541	6.7									
6	276	362	268	351	0.1572	6.9	6.6	8.7	97.6	10.6	14.0	96.0			
7					0.1485	6.8									
8					0.1529	6.9									
9	304	416	288	394	0.1639	6.9	9.0	12.3	97.0	14.1	19.3	95.1			
10					0.1927	7.1							105		
11					0.2044	6.9							3		
12					0.1639	7.0									
13	363	485	310	414	0.1602	7.0	10.1	13.5	97.2	17.5	23.3	94.4			
14					0.1525	7.0									
15					0.1604	7.0									
16	276	405	333	488	0.1759	7.0	8.9	13.0	96.8	17.3	25.3	94.8		2.1	3.1
17					0.1734	7.0							1		
18					0.1568	7.0							1		
19					0.1549	7.0									
20	253	341	213	287	0.1615	7.0	10.9	14.6	95.7	10.5	14.2	95.1			
21					0.1532	7.0									
22					0.1688	6.9									
23	267	392	245	360	0.1758	6.9	11.6	17.0	95.7	8.8	13.0	96.4			
24					0.1931	7.0							3		
25					0.1707	7.0							1		
26					0.1562	7.0									
27	266	344	251	325	0.1552	7.0	6.1	8.0	97.7	7.4	9.6	97.0			
28					0.1619	6.9									
29					0.1678	6.9									
30	227	358	242	381	0.1891	6.9	7.5	11.8	96.7	8.7	13.7	96.4			
31					0.1609	7.1							6		
Total					5.1786										
	AVG 265	AVG 371	AVG 265	AVG 372	AVG 0.1671	MIN 6.6	AVG 8.1	AVG 11.3	AVG 97.0	AVG 11.7	AVG 16.4	AVG 95.6	GEM 3	AVG 1.3	AVG 2.0
Limit		832		832	0.46	6.0	30	115	85	30	115	85	200		
					MAX 0.2044	MAX 7.1	AVW 9.9	AVW 13.8		AVW 15.8	AVW 21.3		GM7 18	MAX 2.1	MAX 3.1
Limit						9.0	45	173		45	173		400		

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)

Stella V. Vakarcs 11/14/2011
Signature/Date

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Phone Number

WASTEWATER TREATMENT PLANT MONITORING REPORT

Permit No. WA-002370-1 **Discharge No.** 001 **Month** November
Facility Name Manchester WWTP **Year** 2011
Receiving Water Puget Sound **Location** Manchester
Plant Type Conventional Activated Sludge - Secondary Treatment System **NO DISCHARGE for month** ☐

	INFLUENT				EFFLUENT											
Frequency	2/Week	2/Week	2/Week	2/Week	Daily	Daily	2/Week	2/Week	1/Month	2/Week	2/Week	1/Month	2/Week	1/Month	1/Month	
Type	24-hour	24-hour	24-hour	24-hour	Measure	Grab	24-hour	24-hour	Calc	24-hour	24-hour	Calc	Grab	24-hour	24-hour	
Day of the Month	BOD 5-Day mg/L	BOD 5-Day LBS/Day	TSS mg/L	TSS LBS/Day	Flow MGD	pH Std Units	BOD 5-Day mg/L	BOD 5-Day LBS/Day	BOD 5-Day %Removal	TSS mg/L	TSS LBS/Day	TSS %Removal	Fecal Coliform #/100mL	Total Ammonia mg/L	Total Ammonia LBS/Day	
1					0.1578	6.9							6			
2					0.1674	7.0										
3	283	387	267	365	0.1637	7.0	6.6	9.0	97.7	4.9	6.7	98.2		0.7	1.0	
4					0.1757	6.9										
5					0.1721	6.9										
6	288	428	329	489	0.1780	7.1	6.4	9.4	97.8	6.1	9.0	98.2				
7					0.1622	7.0							29			
8					0.1588	6.9							1			
9	288	370	291	375	0.1541	7.0	6.4	8.2	97.8	7.8	10.1	97.3				
10					0.1464	7.1										
11					0.1658	7.1										
12					0.1727	6.9										
13	276	430	289	450	0.1865	7.0	6.5	10.1	97.6	8.0	12.4	97.2		1.2	1.8	
14					0.1924	6.9							4			
15					0.1615	6.8							1			
16					0.1813	6.9										
17	264	388	285	419	0.1761	7.1	4.1	6.1	98.4	5.1	7.5	98.2				
18					0.1615	7.1										
19					0.1821	6.9										
20	246	380	239	369	0.1851	7.1	3.6	5.5	98.5	4.0	6.2	98.3				
21	212	403	265	504	0.2277	7.0	3.0	5.7	98.6	4.4	8.3	98.4	5			
22					0.5017	7.0							24			
23					0.4276	6.8										
24					0.3608	6.9										
25					0.2543	7.0										
26					0.2393	6.8										
27	223	497	222	494	0.2669	7.0	6.2	13.7	97.2	8.4	18.7	96.2				
28					0.2242	6.9							1			
29					0.2118	6.7							1			
30					0.1956	6.9										
Total					6.3112											
	AVG	AVG	AVG	AVG	AVG	MIN	AVG	AVG	AVG	AVG	AVG	AVG	GEM	AVG	AVG	
	260	410	274	433	0.2104	6.7	5.3	8.5	98.0	6.1	9.9	97.7	4	0.9	1.4	
Limit		832		832	0.46	6.0	30	115	85	30	115	85	200			
					MAX	MAX	AVW	AVW		AVW	AVW		GM7	MAX	MAX	
					0.5017	7.1	6.6	13.7		8.4	18.7		11	1.2	1.8	
Limit						9.0	45	173		45	173		400			

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Signature/Date

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WASTEWATER TREATMENT PLANT MONITORING REPORT

Permit No. WA-002370-1 **Discharge No.** 001 **Month** December
Facility Name Manchester WWTP **Year** 2011
Receiving Water Puget Sound **Location** Manchester
Plant Type Conventional Activated Sludge - Secondary Treatment System **NO DISCHARGE for month**

	INFLUENT				EFFLUENT										
Frequency	2/Week	2/Week	2/Week	2/Week	Daily	Daily	2/Week	2/Week	1/Month	2/Week	2/Week	1/Month	2/Week	1/Month	1/Month
Type	24-hour	24-hour	24-hour	24-hour	Measure	Grab	24-hour	24-hour	Calc	24-hour	24-hour	Calc	Grab	24-hour	24-hour
Day of the Month	BOD 5-Day mg/L	BOD 5-Day LBS/Day	TSS mg/L	TSS LBS/Day	Flow MGD	pH Std Units	BOD 5-Day mg/L	BOD 5-Day LBS/Day	BOD 5-Day %Removal	TSS mg/L	TSS LBS/Day	TSS %Removal	Fecal Coliform #/100mL	Total Ammonia mg/L	Total Ammonia LBS/Day
1	193	308	194	310	0.1915	7.0	2.4	3.9	98.8	2.4	3.8	98.8		0.5	0.8
2					0.2138	6.8									
3					0.1808	7.0									
4	245	412	247	415	0.2015	6.9	2.8	4.7	98.9	3.9	6.5	98.4			
5					0.1838	7.0							5		
6					0.1722	7.0							1		
7					0.1723	7.0									
8	260	366	205	288	0.1685	7.0	3.5	4.9	98.7	3.5	4.9	98.3		0.5	0.8
9					0.1693	6.9									
10					0.1749	7.0									
11	277	443	255	408	0.1917	7.0	3.3	5.3	98.8	5.5	8.8	97.9			
12					0.1768	7.1							1		
13					0.1972	7.0							3		
14					0.1659	6.9									
15	240	338	246	347	0.1689	6.9	5.3	7.5	97.8	6.0	8.4	97.6			
16					0.1675	6.9									
17					0.1769	6.9									
18	315	489	289	449	0.1861	7.0	4.2	6.5	98.7	5.5	8.5	98.1			
19					0.1793	7.0							3		
20					0.1767	6.8							1		
21					0.1912	7.0									
22	292	412	281	396	0.1689	6.9	5.1	7.2	98.2	6.2	8.8	97.8			
23					0.2016	7.0									
24					0.1768	7.0									
25					0.1757	7.0									
26	277	421	270	410	0.1821	6.9	4.0	6.0	98.6	3.7	5.6	98.6			
27					0.2444	6.9							1		
28					0.2779	6.9									
29	177	369	166	346	0.2500	6.9	5.9	12.3	96.7	8.6	18.0	94.8	1		
30					0.2340	6.9									
31					0.2143	6.8									
Total					5.9323										
	AVG	AVG	AVG	AVG	AVG	MIN	AVG	AVG	AVG	AVG	AVG	AVG	GEM	AVG	AVG
	253	395	239	374	0.1914	6.8	4.1	6.5	98.3	5.0	8.2	97.8	2	0.5	0.8
Limit		**832**		**832**	**0.46**	**6.0**	**30**	**115**	**85**	**30**	**115**	**85**	**200**		
					MAX	MAX	AVW	AVW		AVW	AVW		GM7	MAX	MAX
					0.2779	7.1	4.9	9.1		6.2	11.8		2	0.5	0.8
Limit						**9.0**	**45**	**173**		**45**	**173**		**400**		

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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 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 the 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.

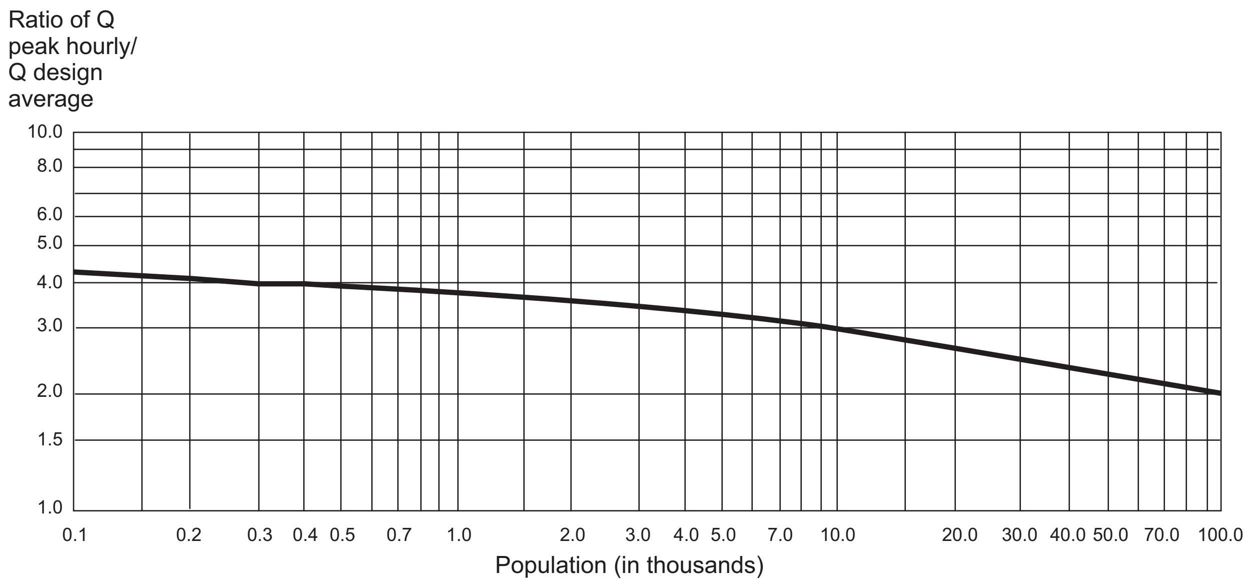
Stella V. Vakarcs, P.E./ Senior Program Manager
Name and Title (Typed or Printed)

Stella V. Vakarcs 1/11/2011
Signature/Date

(360) 337-5777
Phone Number

Appendix B

DOE Figure C1-1
(Peaking Factors Development)



Source: Fair, G.M. and Gayer, J.C. *Water Supply and Wastewater Disposal*, First Ed., John Wiley and Sons, Inc., New York (1954), p. 136.

LEGEND

$$\frac{\text{Q peak hourly}}{\text{Q design average}} = \frac{18 + \sqrt{P}}{4 + \sqrt{P}}$$

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

Figure C1-1. Ratio of Peak Hourly Flow to Design Average Flow

C1-3.3.3 Infiltration/Inflow

Use of the per capita flows (see Table G2-1) and the peaking factor (see C1-3.3.2) is intended to cover normal I/I for systems built with modern construction techniques. However, an additional allowance should be made for I/I with existing conditions such as high ground water, older systems, or a number of illicit connections. I/I allowances for existing systems should be made from actual flow data to the greatest extent possible.

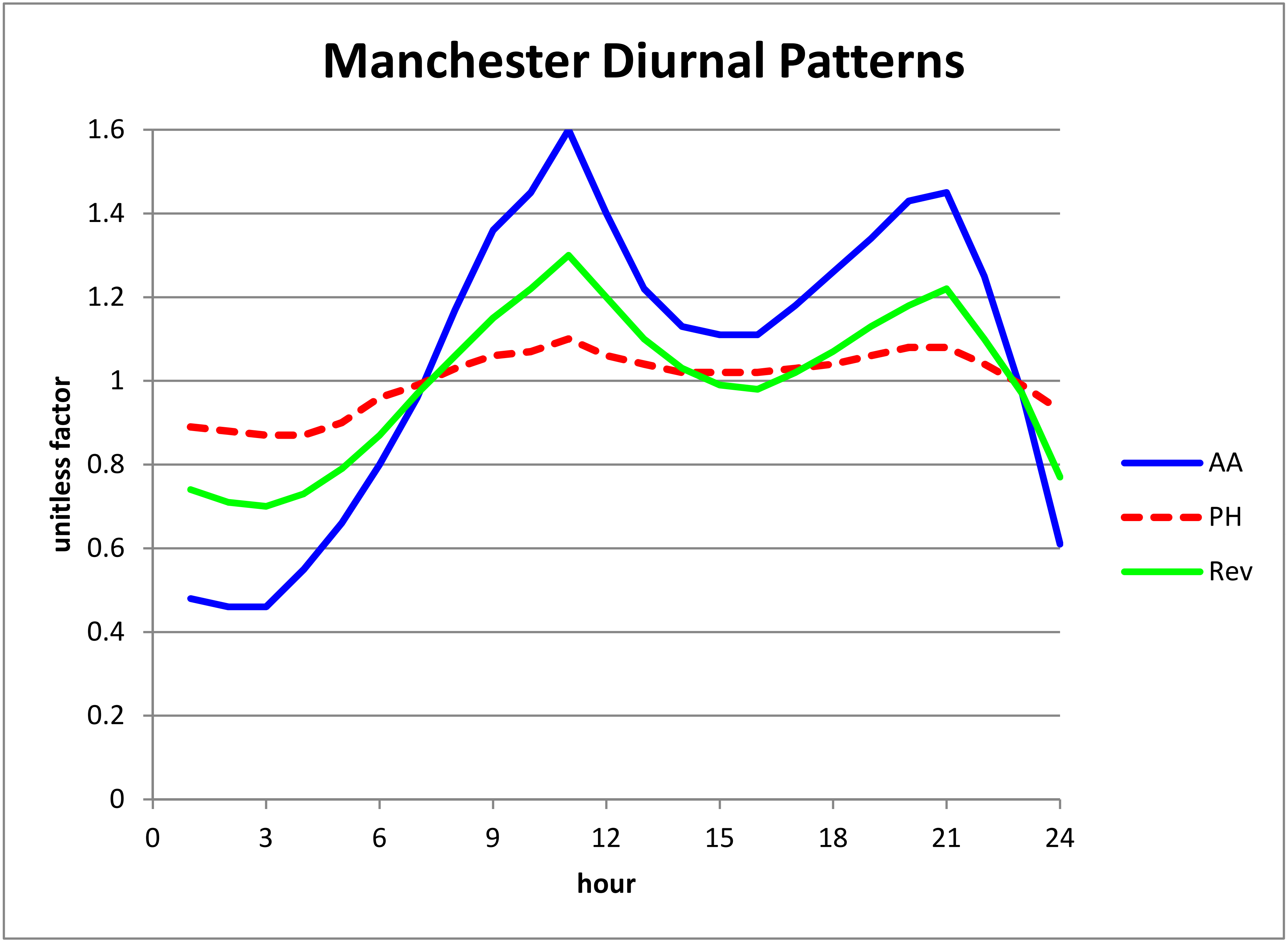
C1-3.4 Design Factors

The design engineer shall utilize current design criteria. At a minimum, the design of gravity sanitary sewers will include the following:

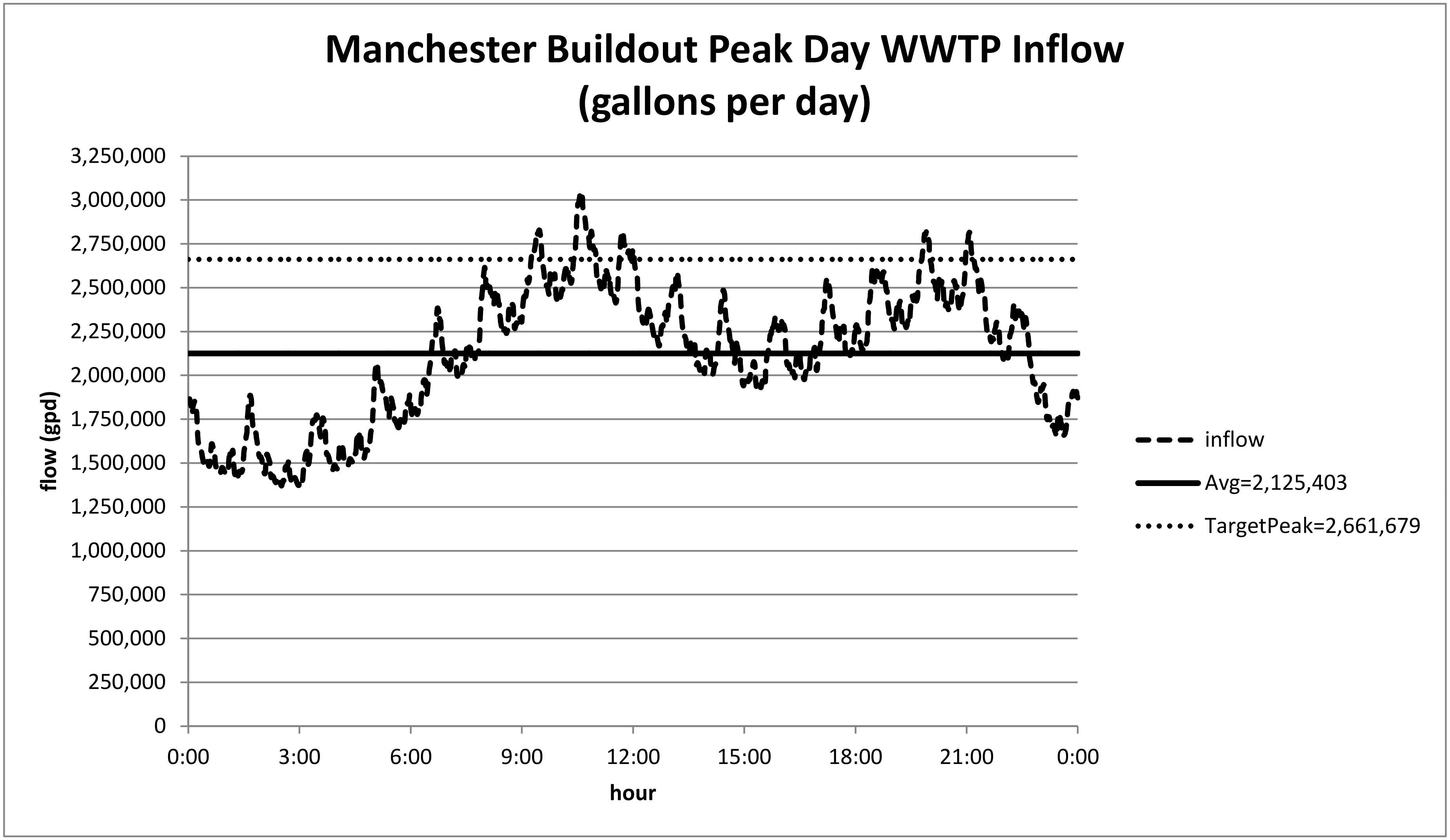
- Peak sewage flows from residential, commercial, institutional, and industrial sources.
- I/I.
- Topography and depth of excavation.
- Treatment plant location.
- Soils conditions.
- Flow impacts from upstream pump stations, if applicable.
- Maintenance.

Appendix C

Model Development and Results



Manchester Diurnal Patterns
unitless factor
1.6
1.4
1.2
1
0.8
0.6
0.4
0.2
0
0
3
6
9
12
15
18
21
24
hour
AA
PH
Rev


Manchester Buildout Peak Day WWTP Inflow
(gallons per day)
3,250,000
3,000,000
2,750,000
2,500,000
2,250,000
2,000,000
1,750,000
1,500,000
1,250,000
1,000,000
750,000
500,000
250,000
0
flow (gpd)
0:00
3:00
6:00
9:00
12:00
15:00
18:00
21:00
0:00
hour
inflow
Avg=2,125,403
TargetPeak=2,661,679

		2009		2019		2030		Buildout	
		Average	Peak	Average	Peak	Average	Peak	Average	Peak
Pump Starts	LS-45	44	175	57	198	73	232	81	237
	LS-46	18	79	26	103	32	121	36	127
	LS-47	20	82	22	79	25	88	27	88
	PS-48	9	39	20	61	24	65	25	65
	PS-49	7	21	7	20	7	20	7	20
	PS-50	0	0	55	161	78	172	93	164
Run Time (min)	LS-45	57	265	75	311	97	392	109	407
	LS-46	14	63	20	84	25	100	28	105
	LS-47	47	218	52	211	59	240	64	240
	PS-48	49	247	115	500	142	584	149	587
	PS-49	131	599	132	546	132	535	133	503
	PS-50	0	0	123	520	183	752	231	874
Run Time (min)	LS-45	1	2	1	2	1	2	1	2
	LS-46	1	1	1	1	1	1	1	1
	LS-47	2	3	2	3	2	3	2	3
	PS-48	5	6	6	8	6	9	6	9
	PS-49	19	29	19	27	19	27	19	25
	PS-50			2	3	2	4	2	5
Fill Time (min)	LS-45	31	7	24	6	18	5	16	4
	LS-46	79	17	55	13	44	11	39	11
	LS-47	70	15	63	16	55	14	51	14
	PS-48	155	31	66	15	54	13	52	13
	PS-49	187	40	187	45	187	45	187	47
	PS-50			24	6	16	4	13	3
Flowrate (cfs)	LS-45	0.419	0.434	0.436	0.434	0.436	0.434	0.436	0.435
	LS-46	0.679	0.679	0.664	0.679	0.679	0.680	0.679	0.680
	LS-47	0.237	0.236	0.222	0.236	0.237	0.236	0.226	0.236
	PS-48	0.366	0.641	0.638	0.642	0.641	0.642	0.435	0.642
	PS-49	0.630	0.669	0.608	0.669	0.672	0.669	0.671	0.633
	PS-50			0.407	0.407	0.407	0.407	0.407	0.407
Velocity (fps)	LS-45	4.8	5.0	5.0	5.0	5.0	5.0	5.0	5.0
	LS-46	7.8	7.8	7.6	7.8	7.8	7.8	7.8	7.8
	LS-47	2.7	2.7	2.5	2.7	2.7	2.7	2.6	2.7
	PS-48	1.9	3.3	3.2	3.3	3.3	3.3	2.2	3.3
	PS-49	3.2	3.4	3.1	3.4	3.4	3.4	3.4	3.2
	PS-50			4.7	4.7	4.7	4.7	4.7	4.7

Kitsap County
Manshester Sewer Facilities Strategy Plan
Model Summary Tables

		2009		2019		2030		Buildout	
		Average	Peak	Average	Peak	Average	Peak	Average	Peak
Pump Starts	LS-45	44	175	57	198	73	232	81	237
	LS-46	18	79	26	103	32	121	36	127
	LS-47	20	82	22	79	25	88	27	88
	PS-48	9	39	20	61	24	65	25	65
	PS-49	7	21	7	20	7	20	7	20
	PS-50	0	0	55	161	78	172	93	164
Run Time (min)	LS-45	57	265	75	311	97	392	109	407
	LS-46	14	63	20	84	25	100	28	105
	LS-47	47	218	52	211	59	240	64	240
	PS-48	49	247	115	500	142	584	149	587
	PS-49	131	599	132	546	132	535	133	503
	PS-50	0	0	123	520	183	752	231	874
Run Time (min)	LS-45	1	2	1	2	1	2	1	2
	LS-46	1	1	1	1	1	1	1	1
	LS-47	2	3	2	3	2	3	2	3
	PS-48	5	6	6	8	6	9	6	9
	PS-49	19	29	19	27	19	27	19	25
	PS-50			2	3	2	4	2	5
Fill Time (min)	LS-45	31	7	24	6	18	5	16	4
	LS-46	79	17	55	13	44	11	39	11
	LS-47	70	15	63	16	55	14	51	14
	PS-48	155	31	66	15	54	13	52	13
	PS-49	187	40	187	45	187	45	187	47
	PS-50			24	6	16	4	13	3
Flowrate (cfs)	LS-45	0.419	0.434	0.436	0.434	0.436	0.434	0.436	0.435
	LS-46	0.679	0.679	0.664	0.679	0.679	0.680	0.679	0.680
	LS-47	0.237	0.236	0.222	0.236	0.237	0.236	0.226	0.236
	PS-48	0.366	0.641	0.638	0.642	0.641	0.642	0.435	0.642
	PS-49	0.630	0.669	0.608	0.669	0.672	0.669	0.671	0.633
	PS-50			0.407	0.407	0.407	0.407	0.407	0.407
Velocity (fps)	LS-45	4.8	5.0	5.0	5.0	5.0	5.0	5.0	5.0
	LS-46	7.8	7.8	7.6	7.8	7.8	7.8	7.8	7.8
	LS-47	2.7	2.7	2.5	2.7	2.7	2.7	2.6	2.7
	PS-48	1.9	3.3	3.2	3.3	3.3	3.3	2.2	3.3
	PS-49	3.2	3.4	3.1	3.4	3.4	3.4	3.4	3.2
	PS-50			4.7	4.7	4.7	4.7	4.7	4.7

Appendix D

Colchester Alternatives Evaluation Memo

MEMORANDUM

Date: **November 5, 2014**

To: Dan Kranenburg/Stella Vakarcs (Kitsap County Wastewater Division)

From: Adam Schuyler, PE

CC: File

Subject: Colchester Sewer Alternatives Evaluation

Introduction

Residents of the Colchester area of Manchester are investigating forming a Local Improvement District (LID) to implement sewer improvements sooner than specified in the Draft Manchester Development Strategy Plan. The purpose of this memorandum is to provide information that the County and residents can use to determine if LID formation is appropriate.

Prior to the determination of alternatives, a hydraulic analysis was performed considering vacuum sewers as well as individual pumping systems (IPS). The analysis, which is provided as Appendix A, explained that vacuum sewers are not hydraulically feasible for the Manchester area and are not considered past that analysis. The alternatives considered from here on will only consider IPS.

Three sewer improvement alternatives were considered for the Colchester area; two of the alternatives include two sub-options, for a total of five evaluated configurations. The alternatives are presented below. Figures presenting each alternative are attached to this memorandum.

Three of the alternatives and sub-options include a gravity sewer and pump station. Typically, gravity sewer systems have lower maintenance costs than IPS. Because there are many parcels that will be on IPS no matter which alternative is selected, maintenance costs will remain high when looking only at the LID area. However, as the sewer service area is expanded, the relative maintenance costs will reduce as more parcels are added to the gravity system instead of an IPS system.

Alternative 1A – Force Main, East Side Parcels Only

Alternative 1A consists of serving 72 parcels along the shoreline (east) side of Colchester Drive and Yukon Harbor Drive north of SE Cole Street to Miracle Mile Drive as shown on Figure 1. The parcels will be served by IPSs that pump sewage to a 4-inch diameter, approximately 5,560 lineal foot (lf) force main that discharges into the gravity sewer system at the south end of Miracle Mile Drive.

Alternative 1B – Force Main, Gravity Sewer, and Pump Station, East Side Parcels Only

Alternative 1B consists of serving 72 parcels along the shoreline (east) side of Colchester Drive and Yukon Harbor Drive north of SE Cole Street to Miracle Mile Drive as shown on Figure 2. Alternative 1B consists of approximately 1,045 lf of 4-inch diameter force main along Yukon Harbor Drive from SE Cole Street to Colchester Drive and approximately 3,100 lf of 6-inch diameter force main along Colchester Drive from a new 200 gpm pump station on the east side of Colchester Drive near Haida Drive (PS-F1) to the south end of Miracle Mile Drive. PS-F1 costs included in this memorandum consider Phase 1 of a two-phased pump station installation. Phase 1 includes a wet well, duplex submersible pumps and controls, a valve vault, a temporary generator connection, miscellaneous yard piping, site fencing and restoration, and site parking. The Phase 2 (ultimate) configuration will include a third pump, and a permanent, on-site generator housed in a building. Phase 1 costs are approximately $608,000 (2013 dollars); Phase 2 costs are approximately $1,025,000 (2013 dollars), in addition to Phase 1 costs. Payment for Phase 2 is not accounted for in the cost analysis and will be considered in the future when additional parcels connect to the sewer system.

Alternative 1B also includes approximately 1,850 lf of 12-inch gravity sewer along Colchester Drive from Yukon Harbor Drive to PS-F1, and approximately 2,700 lf of 8-inch gravity sewer along Colchester Drive from Miracle Mile Drive south to PS-F1. The gravity sewer will convey flow to PS-F1, and sewage will then be pumped north through the force main. The force main will provide service to the parcels on the shoreline side of these roads. Each parcel will be connected to the gravity sewer or force main by an IPS.

Alternative 2A - Force Main, East and Adjacent West Side Parcels

Alternative 2A consists of serving 121 parcels along the shoreline (east) and west sides of Colchester Drive and Yukon Harbor Drive north of SE Cole Street to Miracle Mile Drive as shown on Figure 3. The parcels will be served by IPSs that pump sewage to a 4-inch diameter, approximately 5,560 lf force main that discharges into the gravity sewer system at the south end of Miracle Mile Drive.

Alternative 2B - Force Main, Gravity Sewer, and Pump Station, East and Adjacent West Side Parcels

Alternative 2B consists of serving 121 parcels along the shoreline (east) and west sides of Colchester Drive and Yukon Harbor Drive north of SE Cole Street to Miracle Mile Drive as shown on Figure 4. Alternative 2B consists of approximately 1,045 lf of 4-inch force main along Yukon Harbor Drive from SE Cole Street to Colchester Drive and approximately 3,100 lf of 6-inch force main along Colchester Drive from a new 200 gpm pump station on the east side of Colchester Drive near SE Haida Drive (PS-F1) to the south end Miracle Mile Drive. PS-F1 costs included in this memorandum consider Phase 1 of a two-phased pump station installation. Phase 1 includes a wet well, duplex submersible pumps and controls, a valve vault, a temporary generator connection, miscellaneous yard piping, site fencing and restoration, and site parking. The Phase 2 (ultimate) configuration will include a third pump, and a permanent, on-site generator housed in a building. Phase 1 costs are approximately $608,000; Phase 2 costs are approximately $1,025,000, in addition to Phase 1 costs. Payment for Phase 2 is not accounted for in the cost analysis and will be considered in the future when additional parcels connect to the sewer system.

Alternative 2B also includes approximately 1,850 lf of 12-inch gravity sewer along Colchester Drive from Yukon Harbor Drive to PS-F1, and approximately 2,700 lf of 8-inch gravity sewer along Colchester Drive from Miracle Mile Drive south to PS-F1. The gravity sewer will convey flow to PS-F1, and sewage will then be pumped north through the force main. The force main and gravity sewer will provide service to the parcels on the shoreline side of these roads and parcels adjacent to the pipe on its west side. Each parcel will be connected to the gravity sewer or force main by an IPS on the east/shoreline side of Colchester Drive. Homes on the west side of Colchester Drive will tie into the gravity sewer via a gravity side sewer.

Alternative 3 - Force Main, Gravity Sewer, and Pump Station, East and West Side Parcels

Alternative 3 consists of serving 239 parcels along the shoreline (east) and west sides of Colchester Drive and Yukon Harbor Drive north of SE Cole Street to Miracle Mile Drive. Parcels located along the side streets west of Colchester Drive are also included. The alternative is shown on Figure 5. Alternative 3 consists of approximately 1,045 lf of 4-inch force main along

Yukon Harbor Drive from SE Cole Street to Colchester Drive and approximately 3,100 lf of 6-inch force main along Colchester Drive from the new 200 gpm PS-F1 located on the east side of Colchester Drive near SE Haida Drive to the south end of Miracle Mile Drive. PS-F1 costs included in this memorandum consider Phase 1 of a two-phased pump station installation. Phase 1 includes a wet well, duplex submersible pumps and controls, a valve vault, a temporary generator connection, miscellaneous yard piping, site fencing and restoration, and site parking. The Phase 2 (ultimate) configuration will include a third pump, and a permanent, on-site generator housed in a building. Phase 1 costs are approximately $608,000; Phase 2 costs are approximately $1,025,000, in addition to Phase 1 costs. Payment for Phase 2 is not accounted for in the cost analysis and will be considered in the future when additional parcels connect to the sewer system.

Alternative 3 also includes approximately 3,400 lf of 12-inch gravity sewer along Colchester Drive from Southworth Drive to PS-F1, and approximately 2,700 lf of 8-inch gravity sewer along Colchester Drive from Miracle Mile Drive south to PS-F1, and approximately 7,300 lf of 8-inch gravity sewers west of Colchester Drive. The gravity sewer will convey flow to PS-F1, and sewage will then be pumped north through the force main. The force main and gravity sewer will provide service to the parcels on both sides of Colchester Drive. The sewers in the side streets west of Colchester Drive will collect sewage from parcels not adjacent to the gravity main in Colchester Drive and convey the flow to the sewer main in Colchester Drive. The parcels on the shoreline (east) side of Colchester Drive will be served by IPSs. Homes directly on the west side of Colchester Drive will tie into the gravity sewer via gravity side sewers.

Alternatives Evaluation

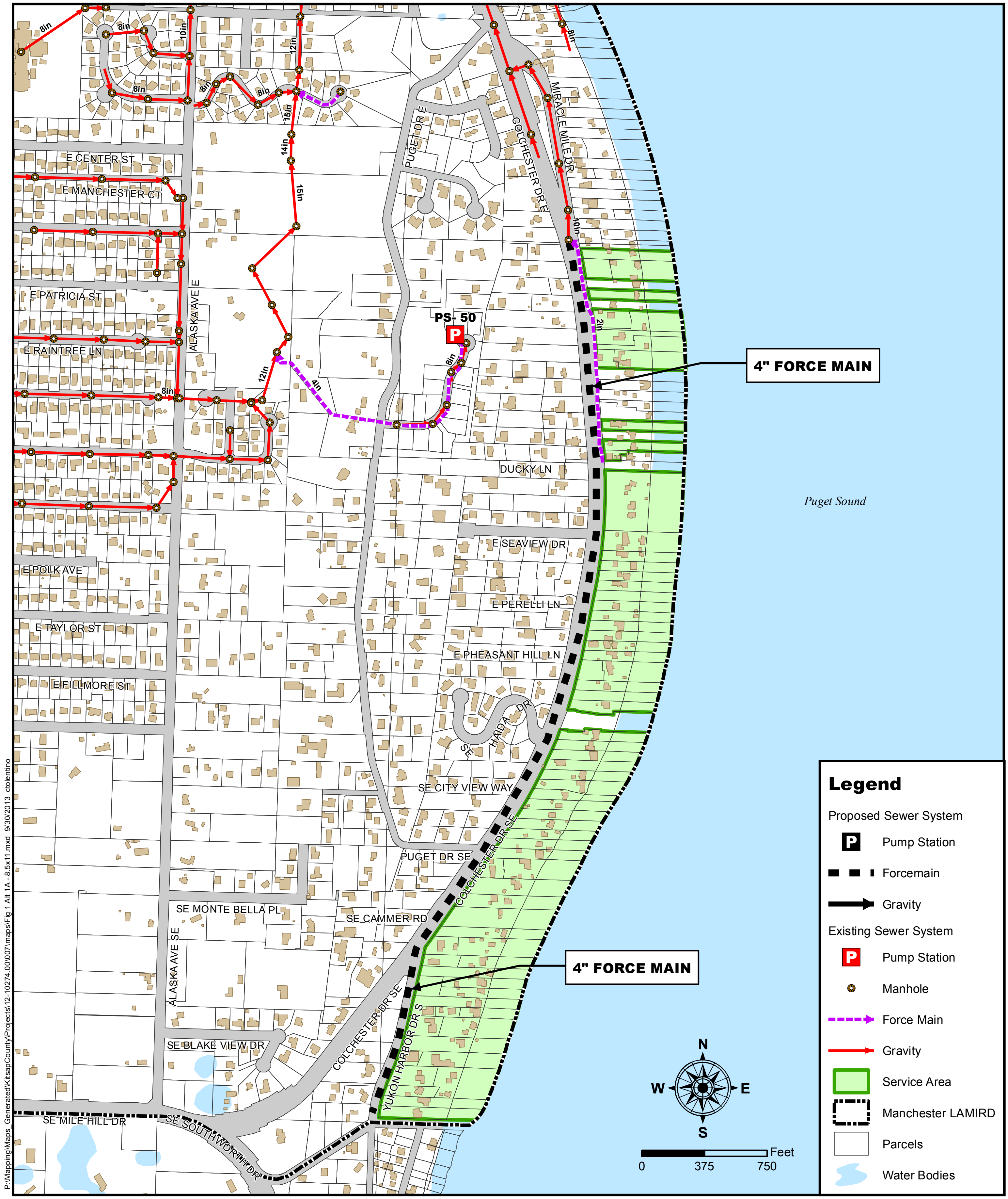
A summary of the evaluation that includes costs, pros, and cons for each alternative is presented in Table 1. Costs are presented in 2013 dollars and include 8.6% sales tax, 5% for planning, 15% for design and permitting, 10% for construction management, and 35% contingency.

Table 1 Summary of Alternatives Evaluation

Alt	Description	Number of Parcels – IPS	Number of Parcels – Gravity	Area Covered (Sq Ft)	Area Covered (Sq Ft) – IPS	Area Covered (Sq Ft) Gravity	Total Opinion of Probable Cost[1]	Assessable Costs	Private Costs – IPS	Private Costs – Gravity	Assessable Costs per Parcel	Private Costs per Parcel – IPS	Private Costs per Parcel – Gravity	Assessable Costs per Sq Ft	Private Costs per Sq Ft – IPS	Private Costs per Sq Ft – Gravity	Pros	Cons
1A[2]	4" Force Main, East Side Parcels	72	N/A	2,169,000	2,169,000	0	$3,475,100	$1,518,000	$1,957,100	N/A	$21,100	$27,200	N/A	$0.70	$0.90	N/A	▪ Lowest project cost	▪ Smallest area covered ▪ Only benefits shoreline parcels ▪ Requires double construction ▪ IPS increase maintenance
1B[2]	4" and 6" Force Mains, 8" and 12" Gravity Sewers, Pump Station[5], East Side Parcels	72	N/A	2,169,000	2,169,000	0	$5,702,100	$3,745,000	$1,957,100	N/A	$52,000	$27,200	N/A	$1.73	$0.90	N/A	▪ Gravity sewers lover lifetime maintenance for future connections	▪ Smallest area covered ▪ Only benefits shoreline parcels ▪ Highest cost per square foot ▪ Gravity sewer and pump station increase cost for LID
2A[3]	4" Force Main, East and Adjacent West Side Parcels	121	N/A	3,266,000	3,266,000	0	$4,807,700	$1,518,000	$3,289,700	N/A	$12,600	$27,200	N/A	$0.46	$1.01	N/A	▪ Larger area covered	▪ IPS increase maintenance ▪ Requires double construction ▪ Highest cost per square foot (IPS)
2B[3]	4" and 6" Force Mains, 8" and 12" Gravity Sewers, Pump Station[5], East and Adjacent West Side	79	42	3,266,00	2,360,000	906,000	$6,479,700	$3,745,000	$2,147,300	$587,300	$31,000	$27,200	$14,000	$1.15	$0.91	$0.65	▪ Gravity sewers lower lifetime maintenance for future connections ▪ Lowest cost per square foot (Private, Gravity)	▪ High total cost and cost per parcel
3[4]	4" and 6" Force Mains, 8" and 12" Gravity Sewers, Pump Stations[5], East and West Side Parcels	82	157	5,632,000	2,523,000	3,108,000	$11,652,000	$7,226,000	$2,228,700	$2,196,200	$30,200	$27,200	$14,000	$1.28	$0.88	$0.71	▪ Largest area covered ▪ Gravity sewers lower lifetime maintenance for future connections	▪ Highest total cost ▪ Highest cost per square foot (Gravity)

Notes:

1) Opinion of Probable Project Costs includes construction, surveying, inspection, engineering services during construction, planning, design, permitting, sales tax, and 35% contingency at present value in 2013 dollars. Detailed estimates are included in the appendix.
2) Alternative 1 covers the east side of Colchester Drive from Cole Street to Miracle Mile.
3) Alternative 2 covers the east side and most of the parcels adjacent to Colchester Drive on its west side from Cole Street to Miracle Mile.
4) Alternative 3 covers an expanded area of parcels on the west side in addition to the east side of Colchester Drive, for a total of 239 Parcels.
5) Alternatives 1B, 2B, and 3 employ a Flygt submersible pump package.
6) All Parcels include costs for decommissioning the septic tank and installing a side sewer connection.
7) Assessable costs include sewer mains, side sewers to property lines and appurtenances.
8) Private costs include individual pump stations, sewer to right-of-way, septic tank decommissioning, and Kitsap County Sewer Connection Fee.



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

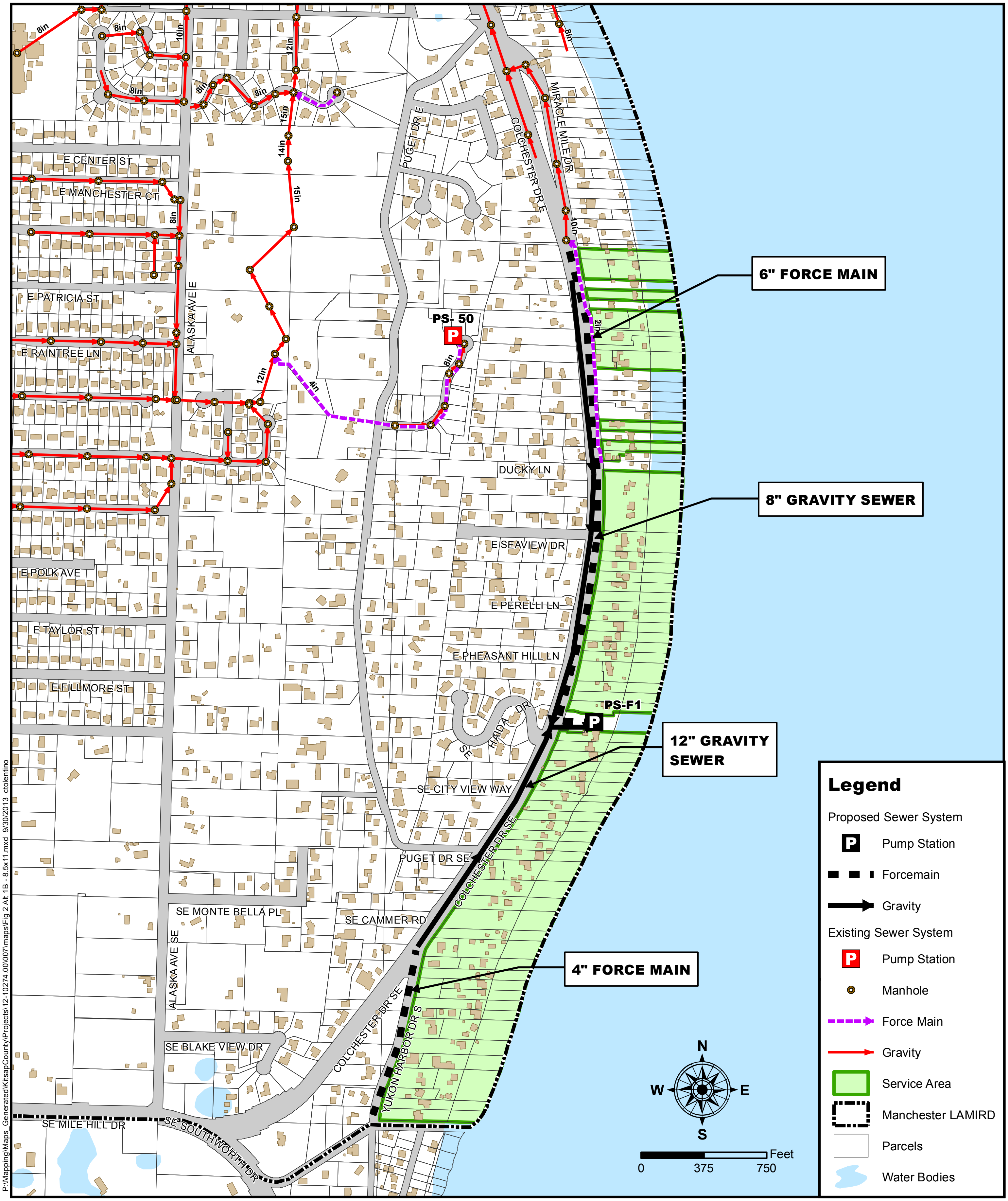
BHC Consultants, LLC
1601 Fifth Avenue, Suite 500
Seattle, Washington 98101

206.505.3400
206.505.3406 (fax)
www.bhcconsultants.com

ALTERNATIVE 1A

COLCHESTER SEWER
ALTERNATIVES EVALUATION
Kitsap County
October 2013

Figure
1



GIS Data: Kitsap County
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ALTERNATIVE 1B

COLCHESTER SEWER
ALTERNATIVES EVALUATION
Kitsap County
October 2013

Figure

2

BHC Consultants, LLC
1601 Fifth Avenue, Suite 500
Seattle, Washington 98101
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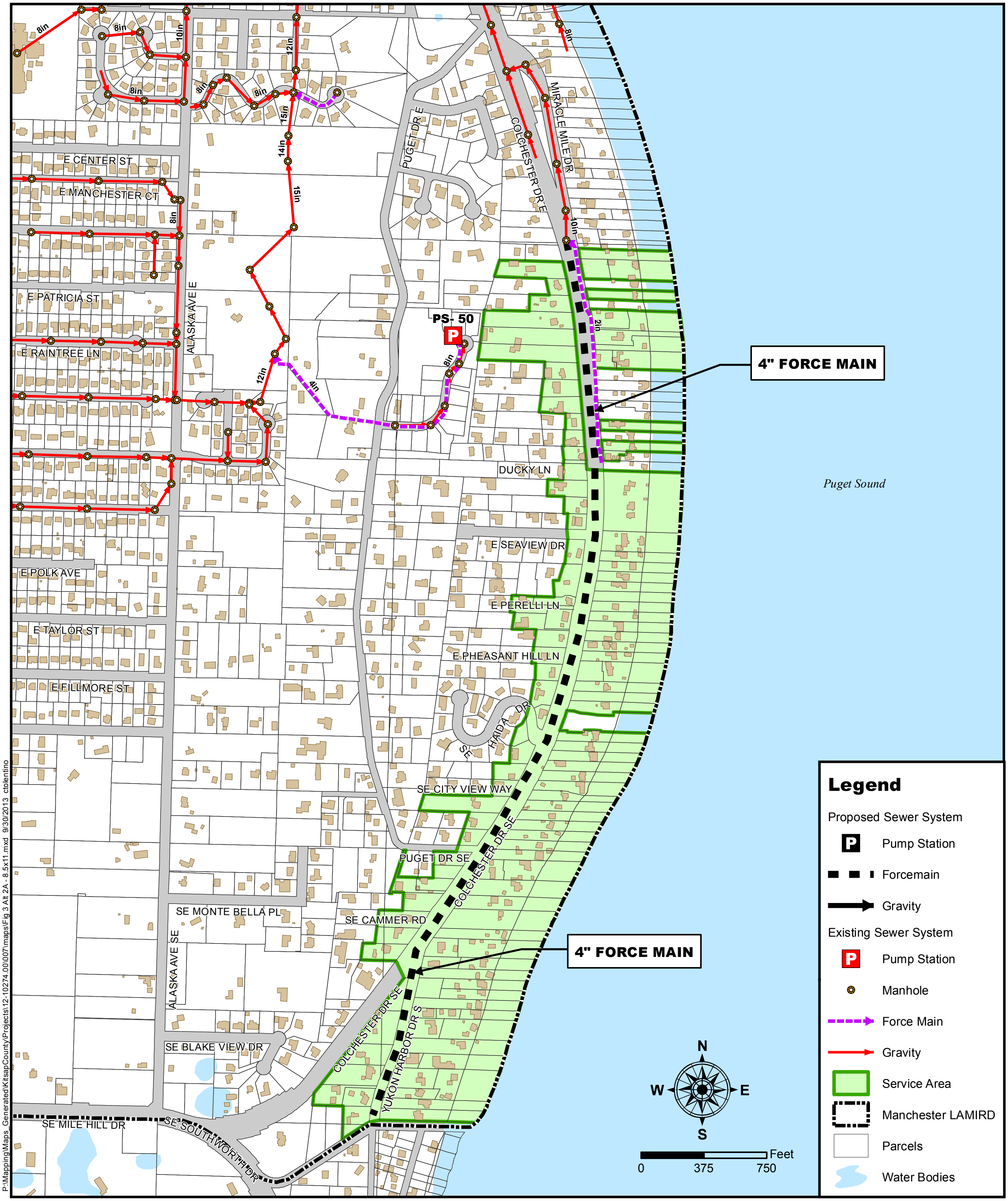
www.bhcconsultants.com



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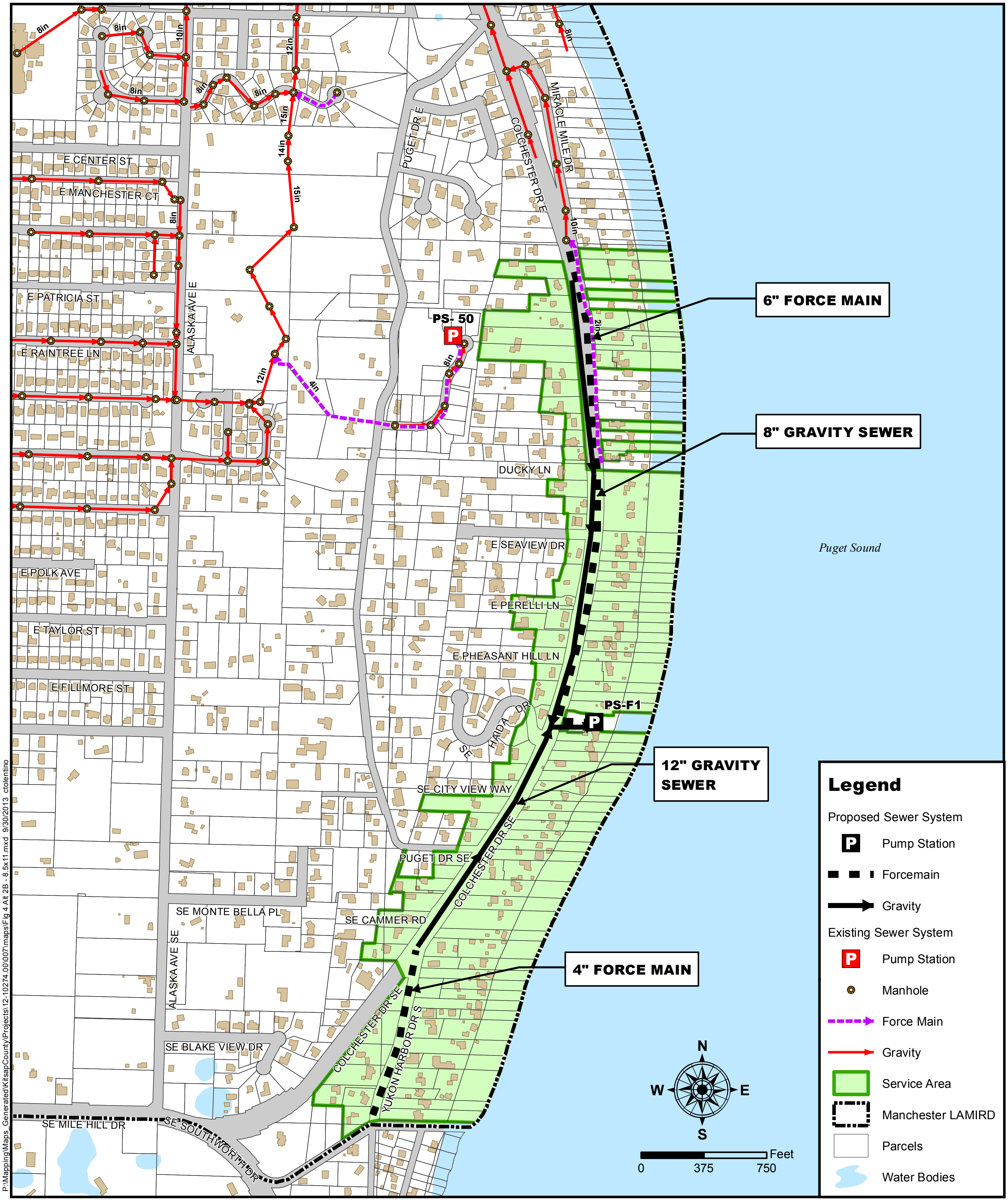
ALTERNATIVE 2A

COLCHESTER SEWER ALTERNATIVES EVALUATION
Kitsap County
October 2013

Figure 3



P:\Mapping\Maps_Generated\KitsapCounty\Projects\12-10274.00\007\maps\Fig 4 Alt 2B - 8.5x11.mxd 9/30/2013 ctolentino

GIS Data: Kitsap County
This map is a geographic representation based on information available.
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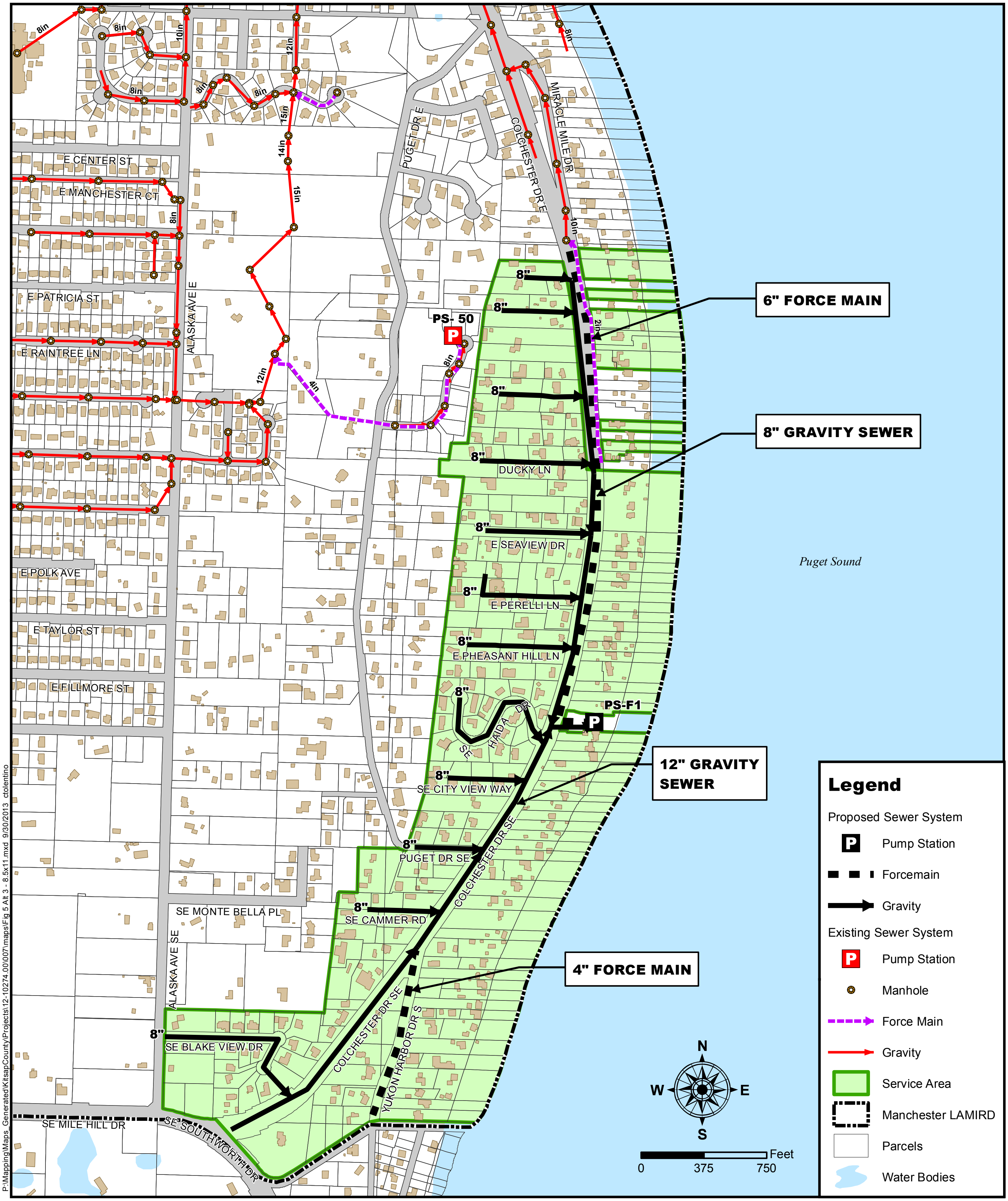
ALTERNATIVE 2B

COLCHESTER SEWER ALTERNATIVES EVALUATION
Kitsap County
October 2013

Figure
4



P:\Mapping\Maps_Generated\KitsapCounty\Projects\12-10274.00\007\maps\Fig 5 Alt 3 - 8.5x11.mxd 9/30/2013 ctolentino

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206.505.3400
206.505.3406 (fax)
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ALTERNATIVE 3

COLCHESTER SEWER
ALTERNATIVES EVALUATION
Kitsap County
October 2013

Figure

5

Appendix A

Vacuum Sewer and Grinder Pump Alternative Analysis Memorandum

TECHNICAL MEMORANDUM

Date:	November 5, 2014
To:	Dan Kranenburg, PE & Stella Vakarcs, PE – Kitsap County Public Works Sewer Utility Division
From:	Adam Schuyler, PE – BHC Consultants
Reviewed By:	Marty Harper, PE, PhD – BHC Consultants
Subject:	**Manchester Strategic Development Plan – Vacuum Sewer and Grinder Pump Alternative Analysis**
Project No:	12-10274.00

Purpose
The purpose of this memorandum is to provide an alternatives analysis for grinder pump and vacuum sewer alternatives for the Colchester Drive SE area of the Manchester LAMIRD. Gravity sewers are not possible for the homes along the shoreline side of Colchester Drive SE due to topographic constraints.

Summary and Conclusion
Grinder pumps are recommended as the gravity sewer alternative for the Colchester Drive SE area as they have no practical lift limitations and are not constrained by the topography of the area.

Alternative 1 – Vacuum Sewers
A vacuum sewer system uses differential air pressure to move sewage from the house to the vacuum station. A central source of power operates the vacuum pumps to maintain a vacuum, resulting in differential air pressure; that vacuum becomes the driving force to propel the sewage to the vacuum station. A vacuum sewer system is most effective in flat slopes, as the lift limitation on a vacuum sewer is 10-15 feet.

Because the elevation difference between the private sewer laterals and proposed sewers in Colchester Drive SE is greater than 15 feet, a vacuum sewer system is not feasible for this area.

Alternative 2 - Grinder Pump Units (Individual Pumping Stations)
A grinder pump sewer system uses an individual pump to move sewage to the public sewer main (gravity or pressurized). A grinder pump is placed in a tank that is buried in an outdoor location on the homeowner’s property. The tank provides wastewater holding storage capacity. When water is used in the house, wastewater flows into the tank. When the wastewater in the tank reaches a pre-set level, the grinder pump automatically turns on, grinds the waste into a slurry, and pumps it out of the tank through a small diameter pressurized side sewer and into the public sewer main. The pump is isolated from the sewer main by the check valve at the pumping unit, as well as a manual shutoff plug valves at the property line that would be installed by the County during installation of the sewer main. A grinder pump will normally run for one or

two minutes and automatically turn off when the tank is emptied. The pump is powered by electricity and is connected to a control panel near the home's electric meter.

Grinder pumps are reliable, and have an expected life of approximately 10 years. In the event of a power outage, grinder pumps will not operate unless the home has a private emergency generator. Grinder pumps systems typically have low installation costs for the homeowner and low environmental impacts during construction due to small diameter piping and shallow trench depth. Additionally, infiltration and inflow is virtually eliminated in a grinder pump system due to the tight joints used in the piping. There are no practical lift limitations for a grinder pump.

The typical grinder pump installation package includes a holding tank, grinder pump, check valve, switch box, and a control panel with a warning light. Grinder pumps typically run off of household electricity and are installed with an alarm system to alert homeowners of any malfunction of the grinder pump system.

For the Colchester area, the pumps will discharge through a 1-1/2 inch lateral to a check valve vault and into a proposed gravity main on Colchester Dr SE. The gravity main will collect and convey wastewater to a pump station located on the County owned site near SE Haida Dr and Colchester Dr SE.

The gravity sewer lines, force main, and pump station near SE Haida Dr and Colchester Dr SE will be owned and operated by the County. Additionally, the County will own the IPS in the Colchester area. The homeowner will be responsible for the installation of all on-site piping and structures, including piping from the existing building sewer system to the grinder pump station and from the grinder pump station to the valve vault, located on the homeowner-side of the property line. Due to the health concerns along the Puget Sound shoreline because of the failing septic systems in the Colchester area, the County is willing to either operate and maintain the IPSs with County staff or contract out with a third party for the operation and maintenance of the IPSs in the Colchester area. The final decision as to the means of operation and maintenance will be determined as the project progresses.

Appendix B

Detailed Opinions of Probable Project Costs

Kitsap County Wastewater Division
Colchester Sewer Alternatives Evaluation
Alternative 1A: 72 Parcels using IPS
Preliminary Engineer's Opinion of Probable Project Costs
Prepared by: P. Cunningham/J. Beall/E. Schuyler
Reviewed by: A. Schuyler/J. Gross
26 August 2013

ASSESSABLE COSTS

Bid Item No.	Bid Item Description	Unit Bid Price	Quantity	Unit	Total
1	Mobilization	$67,500	1	ls	$67,500
2	Temporary Erosion & Sediment Control	$13,500	1	ls	$13,500
3	4-inch PVC C900 Force Main	$76	5,557	lf	$422,332
4	HMA Trench Patch	$200	1,266	tn	$253,152
5	Dewatering	$13,500	1	ls	$13,500
6	Traffic Control	$13,500	1	ls	$13,500
7	General Restoration	$13,500	1	ls	$13,500
	Subtotal				$796,984
	Sales Tax	8.6%			$68,541
	ESTIMATED CONSTRUCTION COST				$865,525
	Construction Contingency	35%			$302,934
	TOTAL ESTIMATED CONSTRUCTION COST				**$1,168,000**
	Planning	5%			$58,000
	Construction and Construction Management	10%			$117,000
	Design and Permitting	15%			$175,000
	TOTAL ESTIMATED PROJECT COST				**$1,518,000**

PRIVATE COSTS

Bid Item No.	Bid Item Description	Unit Bid Price	Quantity	Unit	Total
1	IPS Structure	$3,000	72	ea	$216,000
2	IPS	$5,000	72	ea	$360,000
3	Electrical House Connect	$1,000	72	ea	$72,000
4	Decommission Septic Tank	$1,000	72	ea	$72,000
5	Side Sewer Connection	$1,500	72	ea	$108,000
6	Private Property Restoration	$1,000	72	ea	$72,000
7	Planning, Design and Construction Assistance	$3,000	72	ea	$216,000
	Subtotal				$1,116,000
	Sales Tax	8.6%			$95,976
	ESTIMATED CONSTRUCTION COST				$1,211,976
	Construction Contingency	35%			$424,192
	TOTAL ESTIMATED CONSTRUCTION COST				**$1,636,000**
	Sewer Connection Fee	$4,460	72	ea	$321,120
	TOTAL ESTIMATED PROJECT COST				**$1,957,120**

Notes
1. Import backfill assumed to be 100%
2. Foundation Gravel assumed to be 100%
3. Gen. Restoration, Dewatering, Erosion and Traffic Control each at 2% Construction Costs
4. Mobilization is assumed to be 10% of Construction Costs
5. Pipe costs includes all fittings, pipe, bedding, excavation, haul, and pavement restoration
6. Sewer Connection Fee found: http://www.kitsapgov.com/ww/sewerrates.htm
7. Trench Patch assumes 6' width and 6" depth

Kitsap County Wastewater Division
Colchester Sewer Alternatives Evaluation
Colchester Drive 1B: 72 Parcels using IPS
Preliminary Engineer's Opinion of Probable Construction Cost
Prepared by: P. Cunningham/J. Beall/E. Schuyler
Reviewed by: A. Schuyler/J. Gross
26 August 2013

ASSESSABLE COSTS

Bid Item No.	Bid Item Description	Unit Bid Price	Quantity	Unit	Total
1	Mobilization	$166,500	1	ls	$166,500
2	Temporary Erosion & Sediment Control	$33,300	1	ls	$33,300
3	4-inch PVC C900 Force Main	$76	1,045	lf	$79,420
4	6-inch PVC C900 Force Main	$83	3,100	lf	$257,300
5	8-inch PVC Sewer Pipe, SDR 35	$110	2,700	lf	$297,000
6	12-inch PVC Sewer Pipe, SDR 35	$125	1,850	lf	$231,250
7	48-inch Manhole	$5,000	17	ea	$85,000
8	HMA Trench Patch	$200	1,981	tn	$396,106
9	Pump Station PS-F1	$319,000	1	ea	$319,000
10	Dewatering	$33,300	1	ls	$33,300
11	Traffic Control	$33,300	1	ls	$33,300
12	General Restoration	$33,300	1	ls	$33,300
	Subtotal				$1,964,776
	Sales Tax	8.6%			$168,971
	ESTIMATED CONSTRUCTION COST				$2,133,746
	Construction Contingency	35%			$746,811
	TOTAL ESTIMATED CONSTRUCTION COST				**$2,881,000**
	Planning	5%			$144,000
	Construction and Construction Management	10%			$288,000
	Design and Permitting	15%			$432,000
	TOTAL ESTIMATED PROJECT COST				**$3,745,000**

Notes
1. Import backfill assumed to be 100%
2. Foundation Gravel assumed to be 100%
3. Gen. Restoration, Dewatering, Erosion and Traffic Control each at 2% Construction Costs
4. Mobilization is assumed to be 10% of Construction Costs
5. Pipe costs includes all fittings, pipe, bedding, excavation, haul, and pavement restoration
6. Pump Station PS-F1 is a submersible package Flygt system Pump Station
7. Sewer Connection Fee found: http://www.kitsapgov.com/ww/sewerrates.htm
8. Trench Patch assumes 6' width and 6" depth

The estimate 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.

PRIVATE COSTS

Bid Item No.	Bid Item Description	Unit Bid Price	Quantity	Unit	Total
1	IPS Structure	$3,000	72	ea	$216,000
2	IPS	$5,000	72	ea	$360,000
3	Electrical Connection to House	$1,000	72	ea	$72,000
4	Decommission Septic Tank	$1,000	72	ea	$72,000
5	Side Sewer Connection	$1,500	72	ea	$108,000
6	Private Property Restoration	$1,000	72	ea	$72,000
7	Planning, Design and Construction Assistance	$3,000	72	ea	$216,000
	Subtotal				$1,116,000
	Sales Tax	8.6%			$95,976
	ESTIMATED CONSTRUCTION COST				$1,211,976
	Construction Contingency	35%			$424,192
	TOTAL ESTIMATED CONSTRUCTION COST				**$1,636,000**
	Sewer Connection Fee	$4,460	72	ea	$321,120
	TOTAL ESTIMATED PROJECT COST				**$1,957,120**

Kitsap County Wastewater Division
Colchester Sewer Alternatives Evaluation
Colchester Drive Option 2A: 121 Parcels using IPS
Preliminary Engineer's Opinion of Probable Construction Cost
Prepared by: P. Cunningham/J. Beall/E. Schuyler
Reviewed by: A. Schuyler/J. Gross
26 August 2013

ASSESSABLE COSTS

Bid Item No.	Bid Item Description	Unit Bid Price	Quantity	Unit	Total
1	Mobilization	$67,500	1	ls	$67,500
2	Temporary Erosion & Sediment Control	$13,500	1	ls	$13,500
3	4-inch PVC C900 Force Main	$76	5,557	lf	$422,332
4	HMA Trench Patch	$200	1,266	tn	$253,152
5	Dewatering	$13,500	1	ls	$13,500
6	Traffic Control	$13,500	1	ls	$13,500
7	General Restoration	$13,500	1	ls	$13,500
	Subtotal				$796,984
	Sales Tax	8.6%			$68,541
	ESTIMATED CONSTRUCTION COST				$865,525
	Construction Contingency	35%			$302,934
	TOTAL ESTIMATED CONSTRUCTION COST				**$1,168,000**

Planning	5%	$58,000
Construction and Construction Management	10%	$117,000
Design and Permitting	15%	$175,000
TOTAL ESTIMATED PROJECT COST		**$1,518,000**

Notes
1. Import backfill assumed to be 100%
2. Foundation Gravel assumed to be 100%
3. Gen. Restoration, Dewatering, Erosion and Traffic Control each at 2% Construction Costs
4. Mobilization is assumed to be 10% of Construction Costs
5. Pipe costs includes all fittings, pipe, bedding, excavation, haul, and pavement restoration
6. Sewer Connection Fee found: http://www.kitsapgov.com/ww/sewerrates.htm
7. Trench Patch assumes 6' width and 6" depth

The estimate 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.

Kitsap County Wastewater Division
Colchester Sewer Alternatives Evaluation
Colchester Drive Option 2B: 79 Parcels using IPS, 42 Parcels using Gravity
Preliminary Engineer's Opinion of Probable Construction Cost
Prepared by: P. Cunningham/J. Beall/E. Schuyler
Reviewed by: A. Schuyler/J. Gross
26 August 2013

ASSESSABLE COSTS

Bid Item No.	Bid Item Description	Unit Bid Price	Quantity	Unit	Total
1	Mobilization	$166,500	1	ls	$166,500
2	Temporary Erosion & Sediment Control	$33,300	1	ls	$33,300
3	4-inch PVC C900 Force Main	$76	1,045	lf	$79,420
4	6-inch PVC C900 Force Main	$83	3,100	lf	$257,300
5	8-inch PVC Sewer Pipe, SDR 35	$110	2,700	lf	$297,000
6	12-inch PVC Sewer Pipe, SDR 35	$125	1,850	lf	$231,250
7	48-inch Manhole	$5,000	17	ea	$85,000
8	HMA Trench Patch	$200	1,981	tn	$396,106
9	Pump Station PS-F1	$319,000	1	ea	$319,000
10	Dewatering	$33,300	1	ls	$33,300
11	Traffic Control	$33,300	1	ls	$33,300
12	General Restoration	$33,300	1	ls	$33,300
	Subtotal				$1,964,776
	Sales Tax	8.6%			$168,971
	ESTIMATED CONSTRUCTION COST				$2,133,746
	Construction Contingency	35%			$746,811
	TOTAL ESTIMATED CONSTRUCTION COST				**$2,881,000**

Planning	5%	$144,000
Construction and Construction Management	10%	$288,000
Design and Permitting	15%	$432,000
TOTAL ESTIMATED PROJECT COST		**$3,745,000**

Notes
1. Import backfill assumed to be 100%
2. Foundation Gravel assumed to be 100%
3. Gen. Restoration, Dewatering, Erosion and Traffic Control each at 2% Construction Costs
4. Mobilization is assumed to be 10% of Construction Costs
5. Pipe costs includes all fittings, pipe, bedding, excavation, haul, and pavement restoration
6. Pump Station PS-F1 is a submersible package Flygt system Pump Station
7. Sewer Connection Fee found: http://www.kitsapgov.com/ww/sewerrates.htm
8. Trench Patch assumes 6' width and 6" depth

The estimate 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.

PRIVATE COSTS

Bid Item No.	Bid Item Description	Unit Bid Price	Quantity	Unit	Total
1	IPS Structure	$3,000	79	ea	$237,000
2	IPS	$5,000	79	ea	$395,000
3	Electrical Connection to House	$1,000	79	ea	$79,000
4	Decommission Septic Tank	$1,000	121	ea	$121,000
5	Side Sewer Connection	$1,500	121	ea	$181,500
6	Private Property Restoration	$1,000	121	ea	$121,000
7	Planning, Design and Construction Assistance	$3,000	121	ea	$363,000
	Subtotal				$1,497,500
	Sales Tax	8.6%			$128,785
	ESTIMATED CONSTRUCTION COST				$1,626,285
	Construction Contingency	35%			$569,200
	TOTAL ESTIMATED CONSTRUCTION COST				**$2,195,000**
	Sewer Connection Fee	$4,460	121	ea	$539,660
	TOTAL ESTIMATED PROJECT COST				**$2,734,660**

PRIVATE COSTS - IPS

Bid Item No.	Bid Item Description	Unit Bid Price	Quantity	Unit	Total
1	IPS Structure	$3,000	79	ea	$237,000
2	IPS	$5,000	79	ea	$395,000
3	Electrical Connection to House	$1,000	79	ea	$79,000
4	Decommission Septic Tank	$1,000	79	ea	$79,000
5	Side Sewer Connection	$1,500	79	ea	$118,500
6	Private Property Restoration	$1,000	79	ea	$79,000
7	Planning, Design and Construction Assistance	$3,000	79	ea	$237,000
	Subtotal				$1,224,500
	Sales Tax	8.6%			$105,307
	ESTIMATED CONSTRUCTION COST				$1,329,807
	Construction Contingency	35%			$465,432
	TOTAL ESTIMATED CONSTRUCTION COST				**$1,795,000**
	Sewer Connection Fee	$4,460	79	ea	$352,340
	TOTAL ESTIMATED PROJECT COST				**$2,147,340**

PRIVATE COSTS - Gravity

Bid Item No.	Bid Item Description	Unit Bid Price	Quantity	Unit	Total
1	IPS Structure	$3,000	0	ea	$0
2	IPS	$5,000	0	ea	$0
3	Electrical Connection to House	$1,000	0	ea	$0
4	Decommission Septic Tank	$1,000	42	ea	$42,000
5	Side Sewer Connection	$1,500	42	ea	$63,000
6	Private Property Restoration	$1,000	42	ea	$42,000
7	Planning, Design and Construction Assistance	$3,000	42	ea	$126,000
	Subtotal				$273,000
	Sales Tax	8.6%			$23,478
	ESTIMATED CONSTRUCTION COST				$296,478
	Construction Contingency	35%			$103,767
	TOTAL ESTIMATED CONSTRUCTION COST				**$400,000**
	Sewer Connection Fee	$4,460	42	ea	$187,320
	TOTAL ESTIMATED PROJECT COST				**$587,320**

Kitsap County Wastewater Division
Colchester Sewer Alternatives Evaluation
Colchester Drive Option 3: 82 Parcels using IPS, 157 Parcels using Gravity
Preliminary Engineer's Opinion of Probable Construction Cost
Prepared by: P. Cunningham/J. Beall/E. Schuyler
Reviewed by: A. Schuyler/J. Gross
26 August 2013

ASSESSABLE COSTS

Bid Item No.	Bid Item Description	Unit Bid Price	Quantity	Unit	Total
1	Mobilization	$321,300	1	ls	$321,300
2	Temporary Erosion & Sediment Control	$64,300	1	ls	$64,300
3	4-inch PVC C900 Force Main	$76	1,045	lf	$79,420
4	6-inch PVC C900 Force Main	$83	3,100	lf	$257,300
5	8-inch PVC Sewer Pipe, SDR 35	$110	9,984	lf	$1,098,240
6	12-inch PVC Sewer Pipe, SDR 35	$125	3,400	lf	$425,000
7	48-inch Manhole	$5,000	47	ea	$235,000
8	HMA Trench Patch	$200	3,993	tn	$798,543
9	Pump Station PS-F1	$319,000	1	ea	$319,000
10	Dewatering	$64,300	1	ls	$64,300
11	Traffic Control	$64,300	1	ls	$64,300
12	General Restoration	$64,300	1	ls	$64,300
	Subtotal				$3,791,003
	Sales Tax	8.6%			$326,026
	ESTIMATED CONSTRUCTION COST				$4,117,030
	Construction Contingency	35%			$1,440,960
	TOTAL ESTIMATED CONSTRUCTION COST				**$5,558,000**

Planning	5%	$278,000
Construction and Construction Management	10%	$556,000
Design and Permitting	15%	$834,000
TOTAL ESTIMATED PROJECT COST		**$7,226,000**

Notes
1. Import backfill assumed to be 100%
2. Foundation Gravel assumed to be 100%
3. Gen. Restoration, Dewatering, Erosion and Traffic Control each at 2% Construction Costs
4. Mobilization is assumed to be 10% of Construction Costs
5. Pipe costs includes all fittings, pipe, bedding, excavation, haul, and pavement restoration
6. Pump Station PS-F1 is a submersible package Flygt system Pump Station
7. Latecomer Sewer Connection Fee found: http://www.kitsapgov.com/ww/sewerrates.htm
8. Trench Patch assumes 6' width and 6" depth

The estimate 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.

PRIVATE COSTS

Bid Item No.	Bid Item Description	Unit Bid Price	Quantity	Unit	Total
1	IPS Structure	$3,000	82	ea	$246,000
2	IPS	$5,000	82	ea	$410,000
3	Electrical Connection to House	$1,000	82	ea	$82,000
4	Decommission Septic Tank	$1,000	239	ea	$239,000
5	Side Sewer Connection	$1,500	239	ea	$358,500
6	Private Property Restoration	$1,000	239	ea	$239,000
7	Planning, Design and Construction Assistance	$3,000	239	ea	$717,000
	Subtotal				$2,291,500
	Sales Tax	8.6%			$197,069
	ESTIMATED CONSTRUCTION COST				$2,488,569
	Construction Contingency	35%			$870,999
	TOTAL ESTIMATED CONSTRUCTION COST				**$3,360,000**
	Sewer Connection Fee	$4,460	239	ea	$1,065,940
	TOTAL ESTIMATED PROJECT COST				**$4,425,940**

PRIVATE COSTS - IPS

Bid Item No.	Bid Item Description	Unit Bid Price	Quantity	Unit	Total
1	IPS Structure	$3,000	82	ea	$246,000
2	IPS	$5,000	82	ea	$410,000
3	Electrical Connection to House	$1,000	82	ea	$82,000
4	Decommission Septic Tank	$1,000	82	ea	$82,000
5	Side Sewer Connection	$1,500	82	ea	$123,000
6	Private Property Restoration	$1,000	82	ea	$82,000
7	Planning, Design and Construction Assistance	$3,000	82	ea	$246,000
	Subtotal				$1,271,000
	Sales Tax	8.6%			$109,306
	ESTIMATED CONSTRUCTION COST				$1,380,306
	Construction Contingency	35%			$483,107
	TOTAL ESTIMATED CONSTRUCTION COST				**$1,863,000**
	Sewer Connection Fee	$4,460	82	ea	$365,720
	TOTAL ESTIMATED PROJECT COST				**$2,228,720**

PRIVATE COSTS - Gravity

Bid Item No.	Bid Item Description	Unit Bid Price	Quantity	Unit	Total
1	IPS Structure	$3,000	0	ea	$0
2	IPS	$5,000	0	ea	$0
3	Electrical Connection to House	$1,000	0	ea	$0
4	Decommission Septic Tank	$1,000	157	ea	$157,000
5	Side Sewer Connection	$1,500	157	ea	$235,500
6	Private Property Restoration	$1,000	157	ea	$157,000
7	Planning, Design and Construction Assistance	$3,000	157	ea	$471,000
	Subtotal				$1,020,500
	Sales Tax	8.6%			$87,763
	ESTIMATED CONSTRUCTION COST				$1,108,263
	Construction Contingency	35%			$387,892
	TOTAL ESTIMATED CONSTRUCTION COST				**$1,496,000**
	Sewer Connection Fee	$4,460	157	ea	$700,220
	TOTAL ESTIMATED PROJECT COST				**$2,196,220**

Appendix E

DOE GMA Consistency Statement

KITSAP COUNTY DEPARTMENT OF COMMUNITY DEVELOPMENT
614 DIVISION STREET MS-36, PORT ORCHARD WASHINGTON 98366-4682 **Larry Keeton, Director**
(360) 337-5777 FAX (360) 337-4925 HOME PAGE - www.kitsapgov.com/dcd/

August 8, 2014

Adam Schuyler, PE, PMP
BHC Consultants
1601 5th Avenue, Suite 500
Seattle, WA 98101

Subject: Manchester Sewer Facility Comprehensive Plan

Dear Mr. Schuyler:

The Kitsap County Department of Community Development (DCD) appreciates the opportunity to review and comment on the Manchester Sewer Facility Comprehensive Plan, dated May 2014. The plan is consistent with the Kitsap County Comprehensive Plan and adopted development regulations, including the established Limited Area of More Intense Rural Development (LAMIRD) development area.

Specifically, Kitsap County DCD notes the proposed sewer service area (6-Year Capital Improvement Projects, Figure 6-1) falls completely within the Manchester LAMIRD boundaries. Therefore, the proposed sewer service area shown in Figure 6-1 is consistent with the County's Comprehensive Plan.

If you have any questions, please feel free to contact me at (360) 337-5777, or by email at kknutson@co.kitsap.wa.us.

Sincerely,

Katrina N. Knutson
Senior Planner
Department of Community Development

Cc: Larry Keeton, DCD Director
Dan Kranenburg, PE, Sewer Utility Division
David Greetham, Planning Supervisor

Appendix F

SEPA Checklist

KITSAP COUNTY DEPARTMENT OF COMMUNITY DEVELOPMENT
619 DIVISION STREET MS-36, PORT ORCHARD WASHINGTON 98366-4682 LARRY KEETON, DIRECTOR
(360) 337-5777 FAX (360) 337-4925 HOME PAGE - www.kitsapgov.com/dcd/

DETERMINATION OF NONSIGNIFICANCE

Description of Proposal: **Kitsap County Public Works, Manchester Sewer Facilities Strategy Plan-Programmatic SEPA review.** Pursuant to WAC 197-11-060(5), this DNS is a non-project phased SEPA review for the 2014 Facility Strategy Plan. The plan provides guidance for the systematic and cost-effective development of wastewater facilities required to meet the stated goals for projected growth levels for the next 24 year planning period. This plan includes specific recommendations for improvements; between 2014 through 2019.

Proponent: Kitsap County Public Works, Stella Vakarcs

Lead Agency: KITSAP COUNTY

Location of proposal, including street address, if any: the overall project area of the Facility Strategy Plan includes the Manchester service areas, described as the Manchester LAMIRD (Limited Area for More Intensive Rural Development).

The lead agency for this proposal has determined that it does not have a probable significant adverse impact on the environment. An environmental impact statement (EIS) is not required under RCW 43.21C.030(2)(c). This decision was made after review of a completed environmental checklist and other information on file with the lead agency. This information is available to the public on request.

This DNS is issued under 197-11-340(2); the lead agency will not act on this proposal for 14 days from the date below. Comments must be submitted by: 10/20/2014.

COMMENTS:

1. Pursuant to 197-11-060(5), this is a phased SEPA review. The Kitsap County Public Works, Manchester Sewer Facilities 2014 Strategy Plan is a programmatic review for the 24 year Facility Plan. As project level design plans become available, individual projects will be subject to additional site-specific SEPA review and mitigation. All applicable local, state and federal permits will be obtained for individual projects. To review the complete project list for the Facility Strategy Plan, or the SEPA checklist, please contact the Department of Public Works at (360) 337-5777, or visit the Kitsap County Public Works Wastewater Division website at www.kitsapgov.com/ww/

Responsible Official / Contact Person: Steve Heacock
Position/Title: SEPA Administrator, Dept. of Community Dev. Phone: (360) 337-5777
Address: 614 Division Street, Port Orchard, WA 98366

DATE: 10/06/2014 Signature: Steve Heacock

DETERMINATION OF NONSIGNIFICANCE Description of Proposal: **Kitsap County Public Works, Manchester Sewer Facilities Strategy Plan-Programmatic SEPA review.** Pursuant to WAC 197-11-060(5), this DNS is a non-project phased SEPA review for the 2014 Facility Strategy Plan. The plan provides guidance for the systematic and cost-effective development of wastewater facilities required to meet the stated goals for projected growth levels for the next 24 year planning period. This plan includes specific recommendations for improvements; between 2014 through 2019. Proponent: Kitsap County Public Works, Stella Vakarcs Lead Agency: KITSAP COUNTY Location of proposal, including street address, if any: the overall project area of the Facility Strategy Plan includes the Manchester service areas, described as the Manchester LAMIRD (Limited Area for More Intensive Rural Development). The lead agency for this proposal has determined that it does not have a probable significant adverse impact on the environment. An environmental impact statement (EIS) is not required under RCW 43.21C.030(2)(c). This decision was made after review of a completed environmental checklist and other information on file with the lead agency. This information is available to the public on request. This DNS is issued under 197-11-340(2); the lead agency will not act on this proposal for 14 days from the date below. Comments must be submitted by: 10/20/2014. COMMENTS: 1. Pursuant to 197-11-060(5), this is a phased SEPA review. The Kitsap County Public Works, Manchester Sewer Facilities 2014 Strategy Plan is a programmatic review for the 24 year Facility Plan. As project level design plans become available, individual projects will be subject to additional site-specific SEPA review and mitigation. All applicable local, state and federal permits will be obtained for individual projects. To review the complete project list for the Facility Strategy Plan, or the SEPA checklist, please contact the Department of Public Works at (360) 337-5777, or visit the Kitsap County Public Works Wastewater Division website at www.kitsapgov.com/ww/ Responsible Official / Contact Person: Steve Heacock Position/Title: SEPA Administrator, Dept. of Community Dev. Phone:(360) 337-5777 Address: 614 Division Street, Port Orchard, WA 98366 DATE: 10/06/2014 Signature: /s/ AD#20143771 **Publish Dates:** 10/6/2014 - 10/20/2014

SEPA ENVIRONMENTAL CHECKLIST
UPDATED 2014

Purpose of checklist:

Governmental agencies use this checklist to help determine whether the environmental impacts of your proposal are significant. This information is also helpful to determine if available avoidance, minimization or compensatory mitigation measures will address the probable significant impacts or if an environmental impact statement will be prepared to further analyze the proposal.

***Instructions for applicants*: [help]**

This environmental checklist asks you to describe some basic information about your proposal. Please answer each question accurately and carefully, to the best of your knowledge. You may need to consult with an agency specialist or private consultant for some questions. You may use "not applicable" or "does not apply" only when you can explain why it does not apply and not when the answer is unknown. You may also attach or incorporate by reference additional studies reports. Complete and accurate answers to these questions often avoid delays with the SEPA process as well as later in the decision-making process.

The checklist questions apply to all parts of your proposal, even if you plan to do them over a period of time or on different parcels of land. Attach any additional information that will help describe your proposal or its environmental effects. The agency to which you submit this checklist may ask you to explain your answers or provide additional information reasonably related to determining if there may be significant adverse impact.

Instructions for Lead Agencies:

Please adjust the format of this template as needed. Additional information may be necessary to evaluate the existing environment, all interrelated aspects of the proposal and an analysis of adverse impacts. The checklist is considered the first but not necessarily the only source of information needed to make an adequate threshold determination. Once a threshold determination is made, the lead agency is responsible for the completeness and accuracy of the checklist and other supporting documents.

Use of checklist for nonproject proposals: [help]

For nonproject proposals (such as ordinances, regulations, plans and programs), complete the applicable parts of sections A and B plus the SUPPLEMENTAL SHEET FOR NONPROJECT ACTIONS (part D). Please completely answer all questions that apply and note that the words "project," "applicant," and "property or site" should be read as "proposal," "proponent," and "affected geographic area," respectively. The lead agency may exclude (for non-projects) questions in Part B - Environmental Elements –that do not contribute meaningfully to the analysis of the proposal.

A. background [help]

1. Name of proposed project, if applicable: [help]

   Kitsap County Manchester Sewer Facilities Strategy Plan (Plan)

2. Name of applicant: [help]

   Kitsap County, Washington

3. Address and phone number of applicant and contact person: [help]

   Kitsap County Department of Public Works
   c/o Stella Vakarcs
   614 Division Street, MS-27
   Port Orchard, WA 98366
   (360) 966-3411

4. Date checklist prepared: [help]

   September 2014

5. Agency requesting checklist: [help]

   Kitsap County
   Washington State Department of Ecology

6. Proposed timing or schedule (including phasing, if applicable): [help]

   The Plan identifies future facilities required to accommodate the wastewater demand of the County's Manchester Limited Area of More Intense Rural Development (LAMIRD), for the next 24 years, with recommendations for specific improvements between 2014 and 2018 and other improvements that may be needed after 2018. This environmental review does not include assessment of impacts for implementation projects.

7. Do you have any plans for future additions, expansion, or further activity related to or connected with this proposal? If yes, explain. [help]

   The Plan includes both immediate capital improvement needs to be implemented between 2014 and 2018 and long term improvements anticipated to be needed after 2018. These improvements will be subjected to environmental review prior to construction.

8. List any environmental information you know about that has been prepared, or will be prepared, directly related to this proposal. [help]

- *Central Kitsap County Wastewater Plan,* Brown and Caldwell and BHC Consultants, March 2011
- *Manchester Subarea Plan,* Kitsap County, adopted December 17, 2007.

9. Do you know whether applications are pending for governmental approvals of other proposals directly affecting the property covered by your proposal? If yes, explain. [help]

None known

10. List any government approvals or permits that will be needed for your proposal, if known. [help]

Washington State Department of Ecology approval.

11. Give brief, complete description of your proposal, including the proposed uses and the size of the project and site. There are several questions later in this checklist that ask you to describe certain aspects of your proposal. You do not need to repeat those answers on this page. (Lead agencies may modify this form to include additional specific information on project description.) [help]

The proposal includes short-, and long-term capital facility needs to ensure that adequate sanitary sewer service is available to serve the anticipated growth of the Manchester LAMIRD. The Plan includes:

- Projection of population and related residential sewer demand through the build-out population;
- Analysis of current and projected capacity of the wastewater collection system Manchester LAMIRD; and
- Estimates of facility needs, related projects and their costs.

12. Location of the proposal. Give sufficient information for a person to understand the precise location of your proposed project, including a street address, if any, and section, township, and range, if known. If a proposal would occur over a range of area, provide the range or boundaries of the site(s). Provide a legal description, site plan, vicinity map, and topographic map, if reasonably available. While you should submit any plans required by the agency, you are not required to duplicate maps or detailed plans submitted with any permit applications related to this checklist. [help]

The plan covers the Manchester LAMIRD in Kitsap County. Figures 1-1 and 2-1, Vicinity Map and Topography Map, respectively, are attached to the end of this document.

B. ENVIRONMENTAL ELEMENTS [help]

1. Earth

a. General description of the site [help]
(circle one): Flat, rolling, hilly, steep slopes, mountainous,
other _____________

Manchester is located in the central part of Kitsap County, directly adjacent to the Puget Sound. Generally, slopes are flat or very gradual. Some limited areas of steeper slopes occur, generally along the Puget Sound shoreline.

b. What is the steepest slope on the site (approximate percent slope)? [help]

The topography of the Manchester LAMIRD generally slopes downhill from west to east approximately 5 to 10 percent. The eastern side of the LAMIRD is bounded by the Puget Sound, and the high point on the west side is approximately 350 feet.

c. What general types of soils are found on the site (for example, clay, sand, gravel, peat, muck)? If you know the classification of agricultural soils, specify them and note any agricultural land of long-term commercial significance and whether the proposal results in removing any of these soils. [help]

Soils vary within the LAMIRD. Site specific soils will be determined at the project level review for the projects listed in Chapter 6 of the Plan

d. Are there surface indications or history of unstable soils in the immediate vicinity? If so, describe. [help]

None known.

e. Describe the purpose, type, total area, and approximate quantities and total affected area of any filling, excavation, and grading proposed. Indicate source of fill. [help]

Does not apply because project is a Sewer Plan; to be determined at the project level review for projects listed in Chapter 6 of the Plan.

f. Could erosion occur as a result of clearing, construction, or use? If so, generally describe. [help]

Does not apply because project is a Sewer Plan; to be determined at the project level review for projects listed in Chapter 6 of the Plan.

g. About what percent of the site will be covered with impervious surfaces after project construction (for example, asphalt or buildings)? [help]

Does not apply because project is a Sewer Plan; to be determined at the project level review for projects listed in Chapter 6 of the Plan.

h. Proposed measures to reduce or control erosion, or other impacts to the earth, if any: [help]

All construction will be designed to comply with adopted County standards for erosion and sedimentation control.

2. Air

a. What types of emissions to the air would result from the proposal during construction, operation, and maintenance when the project is completed? If any, generally describe and give approximate quantities if known. [help]

Does not apply because project is a Sewer Plan; to be determined at the project level review for projects listed in Chapter 6 of the Plan.

b. Are there any off-site sources of emissions or odor that may affect your proposal? If so, generally describe. [help]

None known.

c. Proposed measures to reduce or control emissions or other impacts to air, if any: [help]

Does not apply because project is a Sewer Plan; to be determined at the project level review for projects listed in Chapter 6 of the Plan.

3. **Water**

a. Surface Water: [help]

1) Is there any surface water body on or in the immediate vicinity of the site (including year-round and seasonal streams, saltwater, lakes, ponds, wetlands)? If yes, describe type and provide names. If appropriate, state what stream or river it flows into. [help]

Immediately west of Manchester, Beaver Creek flows north and discharges into Clam Bay. Beaver Creek appears on Washington Department of Ecology's Category 5 Water Quality Assessment list [303(d)] for impaired water bodies. Also, Puget Sound, immediately east of downtown Manchester, appears on the Category 5 DOE listing.

2) Will the project require any work over, in, or adjacent to (within 200 feet) the described waters? If yes, please describe and attach available plans. [help]

All work over, in, or adjacent to the described waters will be determined at project level review for the projects listed in Chapter 6 of the Plan.

3) Estimate the amount of fill and dredge material that would be placed in or removed from surface water or wetlands and indicate the area of the site that would be affected. Indicate the source of fill material. [help]

Does not apply because project is a Sewer Plan; to be determined at the project level review for projects listed in Chapter 6 of the Plan.

4) Will the proposal require surface water withdrawals or diversions? Give general description, purpose, and approximate quantities if known. [help]

Does not apply because project is a Sewer Plan; to be determined at the project level review for projects listed in Chapter 6 of the Plan.

5) Does the proposal lie within a 100-year floodplain? If so, note location on the site plan. [help]

Portions of the planning area are located in the 100-year floodplain. The 100-year floodplain elevation will be located on the individual project site plans as the projects occur.

6) Does the proposal involve any discharges of waste materials to surface waters? If so, describe the type of waste and anticipated volume of discharge. [help]

Discharge of treated effluent to receiving waters (Puget Sound) will increase as growth and related wastewater system performance increases. The total wastewater flow between 2009 and build-out population is projected to increase from a daily average of 274,000 gallons per day to about 1,027,000 gallons per day.

b. Ground Water:

1) Will groundwater be withdrawn from a well for drinking water or other purposes? If so, give a general description of the well, proposed uses and approximate quantities withdrawn from the well. Will water be discharged to groundwater? Give general description, purpose, and approximate quantities if known. [help]

Groundwater withdrawal will be determined at the project level review for the projects listed in Chapter 6 of the Plan. Discharge to groundwater is not anticipated.

2) Describe waste material that will be discharged into the ground from septic tanks or other sources, if any (for example: Domestic sewage; industrial, containing the following chemicals. . . ; agricultural; etc.). Describe the general size of the ystem, the number of such systems, the number of houses to be served (if applicable), or the number of animals or humans the system(s) are expected to serve. [help]

No waste material will be discharged into the ground.

c. Water runoff (including stormwater):

1) Describe the source of runoff (including storm water) and method of collection and disposal, if any (include quantities, if known). Where will this water flow? Will this water flow into other waters? If so, describe. [help]

Does not apply because project is a Sewer Plan; to be determined at the project level review for projects listed in Chapter 6 of the Plan.

2) Could waste materials enter ground or surface waters? If so, generally describe. [help]

Does not apply because project is a Sewer Plan; to be determined at the project level review for projects listed in Chapter 6 of the Plan.

3) Does the proposal alter or otherwise affect drainage patterns in the vicinity of the site? If so, describe.

Does not apply because project is a Sewer Plan; to be determined at the project level review for projects listed in Chapter 6 of the Plan.

d. Proposed measures to reduce or control surface, ground, and runoff water, and drainage pattern impacts, if any:

Does not apply because project is a Sewer Plan; to be determined at the project level review for projects listed in Chapter 6 of the Plan.

4. **Plants** [help]

a. Check the types of vegetation found on the site: [help]

_x___deciduous tree: alder, maple, aspen, other
_x___evergreen tree: fir, cedar, pine, other
_x___shrubs
_x___grass
____pasture
____crop or grain
____ Orchards, vineyards or other permanent crops.
_x___ wet soil plants: cattail, buttercup, bullrush, skunk cabbage, other
_x___water plants: water lily, eelgrass, milfoil, other
_x___other types of vegetation

b. What kind and amount of vegetation will be removed or altered? [help]

Does not apply because project is a Sewer Plan; to be determined at the project level review for projects listed in Chapter 6 of the Plan.

c. List threatened and endangered species known to be on or near the site. [help]

Does not apply because project is a Sewer Plan; to be determined at the project level review for projects listed in Chapter 6 of the Plan.

d. Proposed landscaping, use of native plants, or other measures to preserve or enhance vegetation on the site, if any: [help]

Does not apply because project is a Sewer Plan; to be determined at the project level review for projects listed in Chapter 6 of the Plan.

e. List all noxious weeds and invasive species known to be on or near the site.

Does not apply because project is a Sewer Plan; to be determined at the project level review for projects listed in Chapter 6 of the Plan.

5. **Animals**

a. List any birds and other animals which have been observed on or near the site or are known to be on or near the site. Examples include: [help]

birds: hawk, heron, eagle, songbirds, other:
mammals: deer, bear, elk, beaver, other:
fish: bass, salmon, trout, herring, shellfish, other ________

Birds, mammals, and fish to be determined on an individual project basis; projects are listed in Chapter 6 of the Plan.

b. List any threatened and endangered species known to be on or near the site. [help]

Does not apply because project is a Sewer Plan; to be determined at the project level review for projects listed in Chapter 6 of the Plan.

c. Is the site part of a migration route? If so, explain. [help]

Does not apply because project is a Sewer Plan; to be determined at the project level review for projects listed in Chapter 6 of the Plan.

d. Proposed measures to preserve or enhance wildlife, if any: [help]

Does not apply because project is a Sewer Plan; to be determined at the project level review for projects listed in Chapter 6 of the Plan.

e. List any invasive animal species known to be on or near the site.

Does not apply because project is a Sewer Plan; to be determined at the project level review for projects listed in Chapter 6 of the Plan.

6. **Energy and natural resources**

a. What kinds of energy (electric, natural gas, oil, wood stove, solar) will be used to meet the completed project's energy needs? Describe whether it will be used for heating, manufacturing, etc. [help]

Does not apply because project is a Sewer Plan; to be determined at the project level review for projects listed in Chapter 6 of the Plan.

b. Would your project affect the potential use of solar energy by adjacent properties? If so, generally describe. [help]

No.

c. What kinds of energy conservation features are included in the plans of this proposal? List other proposed measures to reduce or control energy impacts, if any: [help]

Does not apply because project is a Sewer Plan; to be determined at the project level review for projects listed in Chapter 6 of the Plan.

7. **Environmental health**

a. Are there any environmental health hazards, including exposure to toxic chemicals, risk of fire and explosion, spill, or hazardous waste, that could occur as a result of this proposal? If so, describe. [help]

No.

1) Describe any known or possible contamination at the site from present or past uses.

Does not apply because project is a Sewer Plan; to be determined at the project level review for projects listed in Chapter 6 of the Plan.

2) Describe existing hazardous chemicals/conditions that might affect project development and design. This includes underground hazardous liquid and gas transmission pipelines located within the project area and in the vicinity.

Does not apply because project is a Sewer Plan; to be determined at the project level review for projects listed in Chapter 6 of the Plan.

3) Describe any toxic or hazardous chemicals that might be stored, used, or produced during the project's development or construction, or at any time during the operating life of the project.

Does not apply because project is a Sewer Plan; to be determined at the project level review for projects listed in Chapter 6 of the Plan.

4) Describe special emergency services that might be required.

None anticipated.

5) Proposed measures to reduce or control environmental health hazards, if any:

Adoption and implementation of the Plan will reduce environmental health hazards related to the management of sanitary wastes.

b. **Noise**

1) What types of noise exist in the area which may affect your project (for example: traffic, equipment, operation, other)? [help]

Does not apply because project is a Sewer Plan; to be determined at the project level review for projects listed in Chapter 6 of the Plan.

2) What types and levels of noise would be created by or associated with the project on a short-term or a long-term basis (for example: traffic, construction, operation, other)? Indicate what hours noise would come from the site. [help]

Does not apply because project is a Sewer Plan; to be determined at the project level review for projects listed in Chapter 6 of the Plan.

3) Proposed measures to reduce or control noise impacts, if any: [help]

Does not apply because project is a Sewer Plan; to be determined at the project level review for projects listed in Chapter 6 of the Plan. Facility design and construction will comply with local adopted noise regulations.

8. **Land and shoreline use**

a. What is the current use of the site and adjacent properties? Will the proposal affect current land uses on nearby or adjacent properties? If so, describe. [help]

Residential, commercial, industrial, agricultural, open space, and recreation. The project will not affect current land uses.

b. Has the project site been used as working farmlands or working forest lands? If so, describe. How much agricultural or forest land of long-term commercial significance will be converted to other uses as a result of the proposal, if any? If resource lands have not been designated, how many acres in farmland or forest land tax status will be converted to nonfarm or nonforest use? [help]

No

1) Will the proposal affect or be affected by surrounding working farm or forest land normal business operations, such as oversize equipment access, the application of pesticides, tilling, and harvesting? If so, how:

Does not apply because project is a Sewer Plan; to be determined at the project level review for projects listed in Chapter 6 of the Plan.

c. Describe any structures on the site. [help]

Buildings and other structures associated with the land uses listed above. Specific sites and building footprints will be developed during the design phases. Projects are listed in Chapter 6 of the Plan

d. Will any structures be demolished? If so, what? [help]

Does not apply because project is a Sewer Plan; to be determined at the project level review for projects listed in Chapter 6 of the Plan.

e. What is the current zoning classification of the site? [help]

Manchester Village Commercial, Manchester Village Low Residential, and Manchester Village Residential.

f. What is the current comprehensive plan designation of the site? [help]

Manchester Village Commercial, Manchester Village Low Residential, and Manchester Village Residential.

g. If applicable, what is the current shoreline master program designation of the site? [help]

Does not apply because project is a Sewer Plan; to be determined at the project level review for projects listed in Chapter 6 of the Plan.

h. Has any part of the site been classified as a critical area by the city or county? If so, specify. [help]

Yes, the County has identified and mapped wetlands, frequently flooded areas, geologically hazardous areas, and shorelines of Puget Sound within the LAMIRD.

i. Approximately how many people would reside or work in the completed project? [help]

The Plan projects the build-out resident population will be 8,333.

j. Approximately how many people would the completed project displace? [help]

Does not apply because project is a Sewer Plan; to be determined at the project level review for projects listed in Chapter 6 of the Plan.

k. Proposed measures to avoid or reduce displacement impacts, if any: [help]

Does not apply because project is a Sewer Plan; to be determined at the project level review for projects listed in Chapter 6 of the Plan.

L. Proposed measures to ensure the proposal is compatible with existing and projected land uses and plans, if any: [help]

Does not apply because project is a Sewer Plan; to be determined at the project level review for projects listed in Chapter 6 of the Plan.

m. Proposed measures to ensure the proposal is compatible with nearby agricultural and forest lands of long-term commercial significance, if any:

Does not apply because project is a Sewer Plan; to be determined at the project level review for projects listed in Chapter 6 of the Plan.

9. **Housing**

a. Approximately how many units would be provided, if any? Indicate whether high, middle, or low-income housing. [help]

Not applicable to this Plan or subsequent projects.

b. Approximately how many units, if any, would be eliminated? Indicate whether high, middle, or low-income housing. [help]

Does not apply because project is a Sewer Plan; to be determined at the project level review for projects listed in Chapter 6 of the Plan.

c. Proposed measures to reduce or control housing impacts, if any: [help]

Does not apply because project is a Sewer Plan; to be determined at the project level review for projects listed in Chapter 6 of the Plan.

10. **Aesthetics**

a. What is the tallest height of any proposed structure(s), not including antennas; what is the principal exterior building material(s) proposed? [help]

Does not apply because project is a Sewer Plan; to be determined at the project level review for projects listed in Chapter 6 of the Plan.

b. What views in the immediate vicinity would be altered or obstructed? [help]

Does not apply because project is a Sewer Plan; to be determined at the project level review for projects listed in Chapter 6 of the Plan.

c. Proposed measures to reduce or control aesthetic impacts, if any: [help]

Does not apply because project is a Sewer Plan; to be determined at the project level review for projects listed in Chapter 6 of the Plan.

11. **Light and glare**

a. What type of light or glare will the proposal produce? What time of day would it mainly occur? [help]

Does not apply because project is a Sewer Plan; to be determined at the project level review for projects listed in Chapter 6 of the Plan.

b. Could light or glare from the finished project be a safety hazard or interfere with views? [help]

Does not apply because project is a Sewer Plan; to be determined at the project level review for projects listed in Chapter 6 of the Plan.

c. What existing off-site sources of light or glare may affect your proposal? [help]

Does not apply because project is a Sewer Plan; to be determined at the project level review for projects listed in Chapter 6 of the Plan.

d. Proposed measures to reduce or control light and glare impacts, if any: [help]

Does not apply because project is a Sewer Plan; to be determined at the project level review for projects listed in Chapter 6 of the Plan.

12. **Recreation**

a. What designated and informal recreational opportunities are in the immediate vicinity? [help]

Does not apply because project is a Sewer Plan; to be determined at the project level review for projects listed in Chapter 6 of the Plan.

b. Would the proposed project displace any existing recreational uses? If so, describe. [help]

Does not apply because project is a Sewer Plan; to be determined at the project level review for projects listed in Chapter 6 of the Plan.

c. Proposed measures to reduce or control impacts on recreation, including recreation opportunities to be provided by the project or applicant, if any: [help]

To be determined at project level review.

13. **Historic and cultural preservation**

a. Are there any buildings, structures, or sites, located on or near the site that are over 45 years old listed in or eligible for listing in national, state, or local preservation registers located on or near the site? If so, specifically describe. [help]

Does not apply because project is a Sewer Plan; to be determined at the project level review for projects listed in Chapter 6 of the Plan.

b. Are there any landmarks, features, or other evidence of Indian or historic use or occupation? This may include human burials or old cemeteries. Are there any material evidence, artifacts, or areas of cultural importance on or near the site? Please list any professional studies conducted at the site to identify such resources. [help]

Does not apply because project is a Sewer Plan; to be determined at the project level review for projects listed in Chapter 6 of the Plan.

c. Describe the methods used to assess the potential impacts to cultural and historic resources on or near the project site. Examples include consultation with tribes and the department of archeology and historic preservation, archaeological surveys, historic maps, GIS data, etc. [help]

Does not apply because project is a Sewer Plan; to be determined at the project level review for projects listed in Chapter 6 of the Plan.

d. Proposed measures to avoid, minimize, or compensate for loss, changes to, and disturbance to resources. Please include plans for the above and any permits that may be required.

Does not apply because project is a Sewer Plan; to be determined at the project level review for projects listed in Chapter 6 of the Plan.

14. **Transportation**

a. Identify public streets and highways serving the site or affected geographic area and describe proposed access to the existing street system. Show on site plans, if any. [help]

Local roads serve the LAMIRD. Existing streets are shown in figures in the Plan.

b. Is the site or affected geographic area currently served by public transit? If so, generally describe. If not, what is the approximate distance to the nearest transit stop? [help]

Kitsap Transit serves the LAMIRD.

c. How many additional parking spaces would the completed project or non-project proposal have? How many would the project or proposal eliminate? [help]

Does not apply because project is a Sewer Plan; to be determined at the project level review for projects listed in Chapter 6 of the Plan.

d. Will the proposal require any new or improvements to existing roads, streets, pedestrian, bicycle or state transportation facilities, not including driveways? If so, generally describe (indicate whether public or private). [help]

Does not apply because project is a Sewer Plan; to be determined at the project level review for projects listed in Chapter 6 of the Plan.

e. Will the project or proposal use (or occur in the immediate vicinity of) water, rail, or air transportation? If so, generally describe. [help]

Does not apply because project is a Sewer Plan; to be determined at the project level review for projects listed in Chapter 6 of the Plan.

f. How many vehicular trips per day would be generated by the completed project or proposal? If known, indicate when peak volumes would occur and what percentage of the volume would be trucks (such as commercial and nonpassenger vehicles). What data or transportation models were used to make these estimates? [help]

Does not apply because project is a Sewer Plan; to be determined at the project level review for projects listed in Chapter 6 of the Plan.

g. Will the proposal interfere with, affect or be affected by the movement of agricultural and forest products on roads or streets in the area? If so, generally describe.

Does not apply because project is a Sewer Plan; to be determined at the project level review for projects listed in Chapter 6 of the Plan.

h. Proposed measures to reduce or control transportation impacts, if any: [help]

Does not apply because project is a Sewer Plan; to be determined at the project level review for projects listed in Chapter 6 of the Plan.

15. **Public services**

a. Would the project result in an increased need for public services (for example: fire protection, police protection, public transit, health care, schools, other)? If so, generally describe. [help]

Does not apply because project is a Sewer Plan; to be determined at the project level review for projects listed in Chapter 6 of the Plan.

b. Proposed measures to reduce or control direct impacts on public services, if any. [help]

Does not apply because project is a Sewer Plan; to be determined at the project level review for projects listed in Chapter 6 of the Plan.

16. **Utilities**

a. Circle utilities currently available at the site: [help]
electricity, natural gas, water, refuse service, telephone, sanitary sewer, septic system, other ___________

Most utilities are available in the planning area, although not completely throughout. There are septic systems in the LAMIRD.

b. Describe the utilities that are proposed for the project, the utility providing the service, and the general construction activities on the site or in the immediate vicinity which might be needed. [help]

Does not apply because project is a Sewer Plan; to be determined at the project level review for projects listed in Chapter 6 of the Plan.

C. Signature [HELP]

The above answers are true and complete to the best of my knowledge. I understand that the lead agency is relying on them to make its decision.

Signature: Adam Schuyler

Name of signee ADAM SCHUYLER

Position and Agency/Organization PROJECT MANAGER / BHC CONSULTANTS

Date Submitted: 9/11/2014

D. supplemental sheet for nonproject actions [help]

(**IT IS NOT NECESSARY** to use this sheet for project actions)

Because these questions are very general, it may be helpful to read them in conjunction with the list of the elements of the environment.

When answering these questions, be aware of the extent the proposal, or the types of activities likely to result from the proposal, would affect the item at a greater intensity or at a faster rate than if the proposal were not implemented. Respond briefly and in general terms.

1. How would the proposal be likely to increase discharge to water; emissions to air; production, storage, or release of toxic or hazardous substances; or production of noise?

Increased sanitary sewer collection as a result of the projects listed in the Plan may increase discharges of treated effluent to receiving water of the Puget Sound, emissions to air, release of hazardous substances, and/or noise.

Proposed measures to avoid or reduce such increases are:

All improvement projects recommended in the Plan will be subject to federal, state, and local regulations and standards requiring mitigation of these impacts.

2. How would the proposal be likely to affect plants, animals, fish, or marine life?

Projects recommended by the Plan could result in loss of habitat.

Proposed measures to protect or conserve plants, animals, fish, or marine life are:

Necessary mitigation measures of impacts will be determined at project level review. Projects are listed in Chapter 6 of the Plan.

3. How would the proposal be likely to deplete energy or natural resources?

Very nominal depletion of energy or natural resources may result from recommended projects.

Proposed measures to protect or conserve energy and natural resources are:

Does not apply because project is a Sewer Plan; to be determined at the project level review for projects listed in Chapter 6 of the Plan.

4. How would the proposal be likely to use or affect environmentally sensitive areas or areas designated (or eligible or under study) for governmental protection; such as

parks, wilderness, wild and scenic rivers, threatened or endangered species habitat, historic or cultural sites, wetlands, floodplains, or prime farmlands?

Does not apply because project is a Sewer Plan; to be determined at the project level review for projects listed in Chapter 6 of the Plan.

Proposed measures to protect such resources or to avoid or reduce impacts are:

Does not apply because project is a Sewer Plan; to be determined at the project level review for projects listed in Chapter 6 of the Plan.

5. How would the proposal be likely to affect land and shoreline use, including whether it would allow or encourage land or shoreline uses incompatible with existing plans?

Does not apply because project is a Sewer Plan; to be determined at the project level review for projects listed in Chapter 6 of the Plan.

Proposed measures to avoid or reduce shoreline and land use impacts are:

Does not apply because project is a Sewer Plan; to be determined at the project level review for projects listed in Chapter 6 of the Plan.

6. How would the proposal be likely to increase demands on transportation or public services and utilities?

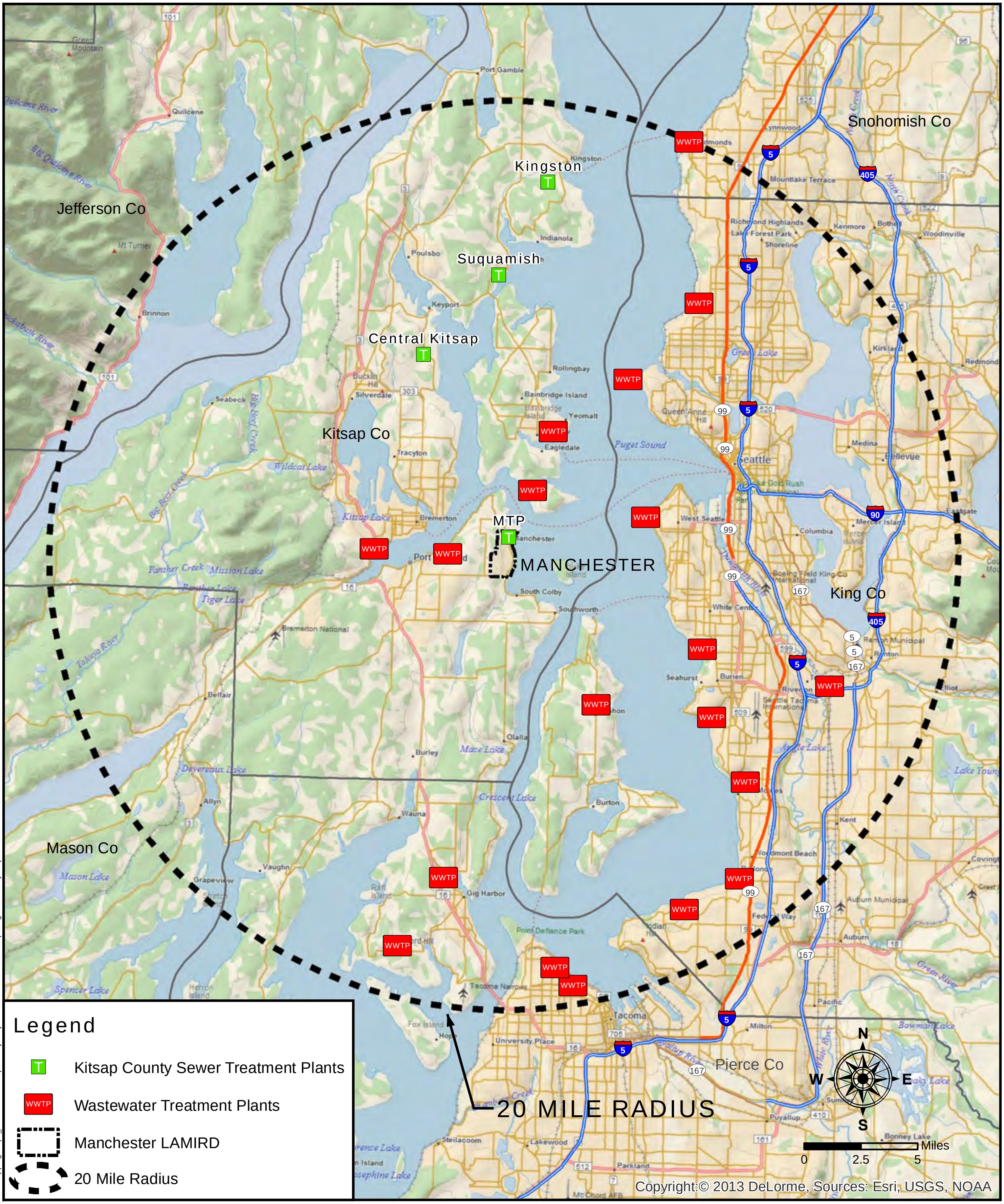
Does not apply because project is a Sewer Plan; to be determined at the project level review for projects listed in Chapter 6 of the Plan.

Proposed measures to reduce or respond to such demand(s) are:

Does not apply because project is a Sewer Plan; to be determined at the project level review for projects listed in Chapter 6 of the Plan.

7. Identify, if possible, whether the proposal may conflict with local, state, or federal laws or requirements for the protection of the environment.

The Plan is written to comply with applicable federal, state, and local regulations.



P:\Mapping\Maps_Generated\KitsapCounty\Projects\12-10274.001009\maps\Fig 1-1 Vicinity Map 8.5x11.mxd 7/31/2014 ctolentino

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

VICINITY MAP

MANCHESTER SEWER FACILITIES STRATEGY PLAN

Kitsap County

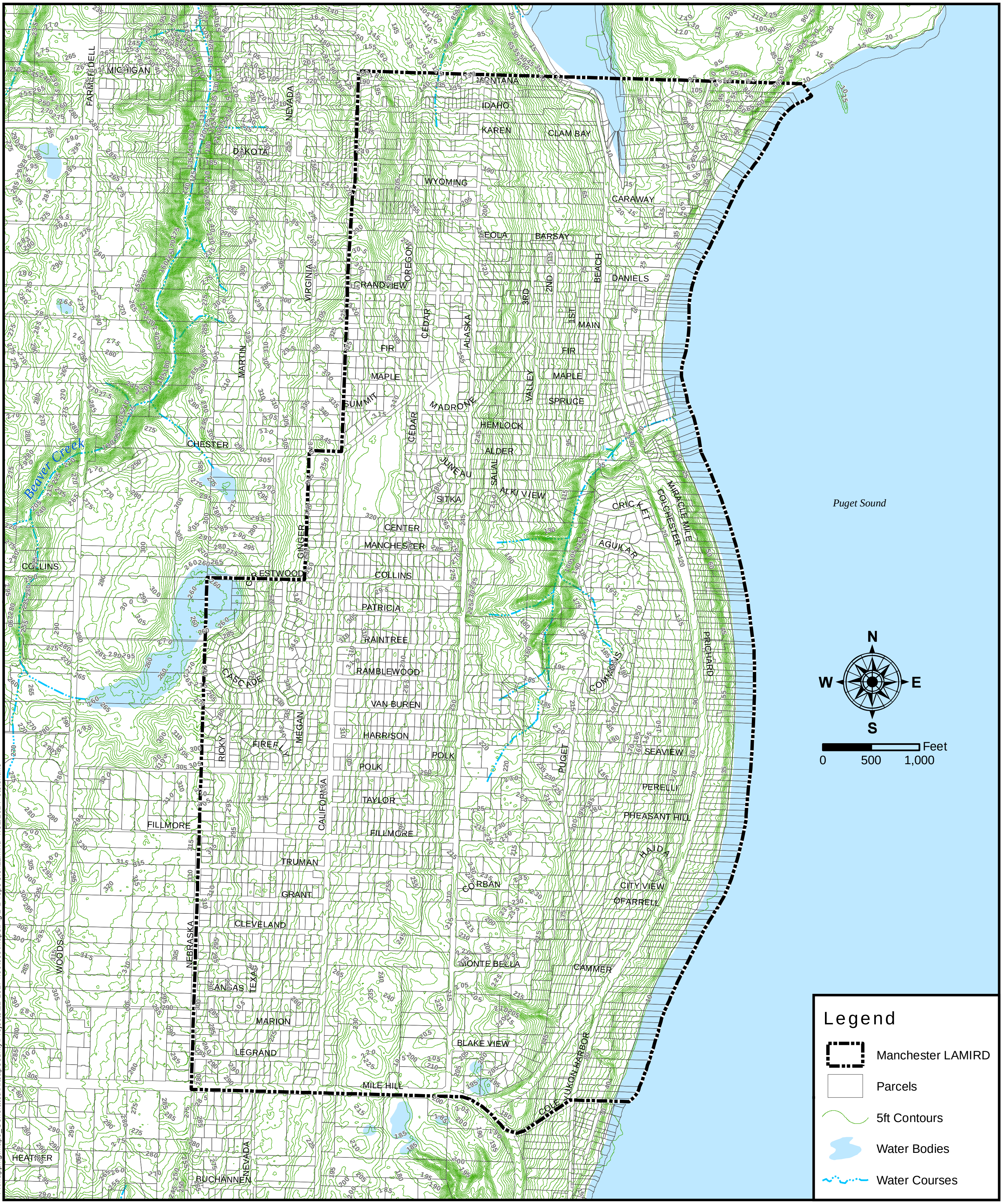
September 2014

Figure

1-1

BHC Consultants, LLC
1601 Fifth Avenue, Suite 500
Seattle, Washington 98101

206.505.3400
206.505.3406 (fax)
www.bhcconsultants.com



P:\Mapping\Maps_Generated\KitsapCounty\Projects\12-10274.00\009\maps\Fig 2-1 Topo 8.5x11.mxd 7/31/2014 ctolentino

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

TOPOGRAPHY MAP

MANCHESTER SEWER FACILITIES STRATEGY PLAN

Kitsap County

September 2014

Figure 2-1

BHC Consultants, LLC
1601 Fifth Avenue, Suite 500
Seattle, Washington 98101

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Appendix G

Public Participation Information

Manchester Citizen Advisory Committee
Tuesday October 2, 2012
6:30-8:00
Manchester Library

I. **OPENING ITEMS**

A. Opening comments

B. Introduction of guests—Public Works Presentation—
RE: Pollution Identification and Correction Project in Manchester
1. Kitsap Co. Public Health District, Pollution Identification
2. Kitsap Co. Public Works, Manchester Sewer Planning
3. Kitsap Co. DCD, Updates on Land Use Projects

C. Review and approval of August minutes

II. **MEETING CORE**

A. Committee reports—MCA, Crime Prevention, FOL, Historical, Port Advisory Committee, Kiwanis, Business Community, School, Neighborhoods

B. Storm water Subcommittee Report

C. Neighborhood Representation update

III. **OPEN AGENDA/PUBLIC COMMENTS**

A. Open comment period

B. General Announcements

C. Community Calendar

D. Next meeting date—October 2, 2012

IV. **ADJOURNMENT**

Mission Statement

The mission of the Manchester Citizen Advisory Council (MCAC) is to:
Actively facilitate communication within the Manchester community.
Mutually develop and promote a sense of community vision and pride.
Communicate to Kitsap County and other government entities the desires and concerns of the Manchester community.
Bring issues and projects of the County to the Manchester Community.
Provide a means for receiving and conveying to the County the community's responses.

Manchester Citizens Advisory Council
October 2 2012 – Manchester Library

Ann Giantvalley, Manchester Elementary
Mary-Cathern Edwards, Secretary – Manchester Historical Society
Carol Malmquist, Chair, Northern Neighborhood
Eric Cisney, Friends of the Manchester Library
Jim Derry, Manchester Community Association
Carole Leininger, Alaska Neighborhood
Janice Gilligan, Manchester Port Advisory Committee
Tom Saunders, Co-Chair, South Kitsap Kiwanis Club
Bud Larsen, Crime Prevention and Public Safety Group
Bob Cairns, Business Community,
Carrilu Thompson, Colchester Neighborhood
Janice Shaw

Neighbors: Bart and Michelle Lovely
Larry and Gail Grohn
Denny Christman
Paul Gilligan

Intro of Guests – Kitsap County Public Works Presentation re: Pollution Identification and Correction Project in Manchester

1. Kitsap Public Health District, Pollution Identification
2. Kitsap County Public Works, Manchester Sewer Planning
3. Kitsap County Department of Community Development, Updates on Land Use Projects

Discussion: The groups discussed the recent Kitsap Public Health District survey of septic systems, as a follow up to the 2005 study. After Neighbor questions and input, it was determined the County does not have a ULID process in place, impeding residents to meet the May 13 2013 deadline to connect to sewer up , imposed by the KHD. KHD is willing to give the community group a "chance to organize a ULID rolling" prior to May 13th, 2013. The KHD is looking "a stong commitment from the community". If the group can provide a good faith effort to organize a majority of affected residents, the KHD will be flexible with a deadline for homeowners. A meeting

The meeting was called to order at 6:35 PM by President Carol Malmquist. Approval of the August and September Minutes were tables Minutes for August and September were tabled to the November meeting, due to technical difficulties (unable to print out before the meeting).

Ma**nchester Community Association (MCA)**
Dennis Oost will be the speaker at the October 23rd MCA Meeting. Topic is Trails and Pedestrian Walkways in Kitsap County.

Crime Prevention/Public Safety- Bud Larsen
KCSO Sgt Jon Van Gesen met with the MCPPS to discuss recent crime and traffic issues.

Friends of the Manchester Library, (FOML) Eric Cisney
The "takeover" of Amy's on the Bay brought in approximately $3100. The staff was most accommodating to the MFOL.

Port Advisory Committee Janice Gilligan
The Port Commissioners approved the use of an electronic ticketing machine for launch fees. The machine will accept both credit cards and cash.

-

Old Business:

Ongoing: MCAC Work Plan and Work Accomplishments document (previously distributed to MCAC members)
Goal 1. Continue to address Storm Water Issues
Goal 2. Continue to work on community identity
Goal 3. Continue ongoing public safety and crime prevention efforts.

New Business: An All CAC meeting is scheduled for October 25, 2012 at the Manchester Library, 6:30 to 8:30

Meeting was adjourned at 8:58 PM

The next scheduled meeting is November 6, 2012 -- 6:30 PM at the Manchester Library.

MINUTES APPROVED:
MCAC October 2, 2012
Mary-Cathern Edwards, Secretary

Chairperson's signature)   (Date)

Manchester, Washington

…. it's a great place to live!

<u>Mission Statement</u>

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Provide a means for receiving and conveying to the County the community's responses.

Manchester Citizens Advisory Council
February 5 2013 – Manchester Library

At our last MCAC meeting, co-sponsored with MCA and KRL, we heard a presentation by the manager (Stella Vakarcs) and staff from Kitsap Sewer Utility and the engineering firm of BHC. The map of the proposed sewer extensions will be posted to our website (www.manchesterfoundation.org) within a day or two. The procedures for forming a ULID have not been approved as of today. The Board of Commissioners asked for revisions that would be less troublesome and meet certain legal tests. The revision is expected within the next month.

MINUTES APPROVED:

______________________________ ____________________

Chairperson's signature) (Date)

Manchester Citizen Advisory Committee
Tuesday October 1, 2013
6:30-8:00
Manchester Library

I. OPENING ITEMS

A. Introduction of guests—Tim Beechy and Stella Vakarcs
   Tim—update on storm water
   Stella will update on sewer facility plan

B. Review of the minutes for September

II. MEETING CORE

A. Committee reports—MCA, Crime Prevention, FOL, Port, Business Community, School, Neighborhoods, ULID

B. Storm water Subcommittee Report

C. Neighborhood Representation update

III. OPEN AGENDA/PUBLIC COMMENTS

A. Open comment period

B. General Announcements

C. Community Calendar

D. Next meeting November 5, 2013

IV. ADJOURNMENT

Mission Statement

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Manchester Citizens Advisory Council
October 1, 2013 – Manchester Library

Carol Malmquist, Chairperson
Carole Leininger , Alaska Neighborhood, Co-Chair;
Mary-Cathern Edwards, Manchester Historical Society, Secretary
Ann Giantvalley, Manchester Elementary
Jim Derry, Manchester Community Association
Mary-Cathern Edwards, Crime Prevention and Public Safety Group (temp rep)
Carrilu Thompson, Colchester Neighborhood
Bob Cairns , Business Community,
Patrick Quain, At-Large Representative
Eric Cisney, Friends of the Manchester Library
Jim Derry, MCA

Manchester Neighbors and Guests: Bart Lovely, Corny Kucius, Denny Christman, Donna Bragg, et al.

Call to Order – Carol Malmquist

The meeting was called to order at 6:35 PM

Speaker: Stella Vakars, Kitsap County Public Works – Update on Manchester SSWM Project
http://www.kitsapgov.com/sswm/Manchester_SW_Retrofit.htm

Speaker: Tim Beachy, Manchester SWWM Project Manager:
Chris May and Department of Ecology met 9/6/2013 re: the "basis of design" for the water quality facility. Ecology is providing grant money.
Chris May and Phil (of Parametrix) met with the Port of Manchester on September 9, 2013 to discuss Manchester SSWM and Stormwater Park progress.
October 9, 2013: The Manchester SWWM Committee met to discuss design, concept and style.
Colchester paving is scheduled for October 3 and 4.
Ricky Court project has been competed.

Committee Reports:
Manchester Community Association – Carrilu Thompson

The MCA, KRL, Manchester Branch and Kitsap County SSWM will host a presentation re: design of the Stormwater Park , on October 22, 2013 at the Manchester Library.24, at the Manchester Library, 6:30 PM. The discussion will include "what do we want to put in that Park?"
There will not be a meeting in November and the election of officers will be held in December. A brief discussion of the annual Community Tree Lighting December event occurred.
Jim Derry's letter re non motorized trails to the County Commissioner 's:
Ann Haines made a motion to accept the letter; the motion was seconded by Carole Leininger – the Motion passed unanimously. The letter is as follows:

1 October 2013
Board of Commissioners
Josh Brown, Charlotte Garrido, Rob Gelder
Kitsap County

Dear Commissioners

With the concurrence of the Manchester Citizens Advisory Committee (MCAC), I am writing again to thank you for giving us time to work with County staff regarding routes for future trails and walkways in and around Manchester . We especially commend Dennis Oost for his efforts to incorporate our suggestions into the County's Non-Motorized Trails plan (see attached map).
As you can see from the detail of our suggestions, members of the Manchester community, particularly Ray Pardo and John Winslow, have been working to refine these suggestions for several years. They have walked the routes and looked at the challenges. It remains now to request that the County preserve the rights of way along these routes, and this we respectfully do now.
We believe these trails will serve important recreational needs of the future, and will link Manchester with the new communities developing to the west of our LAMIRD, along Nevada and Dakota streets. We understand the need to set priorities for the development of trails and we are following closely the efforts of Public Works to improve walkways along Main and Madrone and along Alaska . As planning goes forward, we hope to see the walkways along Alaska extended north to Montana , providing a needed linkage with future trails along Washington and Michigan to the west of Manchester .
Cordially,
Carol Malmquist President MCAC

Note: Click on the link for the County Updated Non Motorized Trail Plan:
http://www.kitsapgov.com/boc/Special_Projects_Division/specialprojects.htm

Crime Prevention and Public Safety Group – Mary-Cathern Edwards
The Group meeting date has changed from Tuesday to Friday. The location of the Manchester Inn and the time remains the same, starting at 6:45 AM. The Group discusses assorted community issues re: crime prevention and Block Watch programs.

Business Community – Bob Cairns
Bob briefly addressed on going economy concerns of the local business community to include future sequestration and the impact on Kitsap families. The Fuel Depot is still in business!

Port of Manchester – Janice Gilligan
Chris May met with the Port of Manchester on September 9, 2013 to discuss Manchester SSWM and Stormwater Park progress.
$16,294 in 2013 launch fees has been collected through September 1, 2013.

Manchester Elementary School – Ann Giantvalley
Early dismissal is scheduled October 21 – 25. The School Fall Fair is scheduled for October 25.

Zoning Committee
The MCAC Zoning Committee met with Scott Denier early this fall. The Notes from Scott re: that meeting are below:
All: Thank you for coming to DCD. We ran out of time, but we could have used another hour or so, just to go over a few more things and the website. Here are a couple items:
Extensions
I wanted to explain that it may seem like the extensions that we give are a bit (or perhaps a lot) too generous, which I can understand from the public's perspective. However, the costs of development are so extreme (over time we can't seem to get away with not imposing more regulations and conditions on the public— which some would call a necessary evil) and site conditions unpredictable that we need to be as reasonable as possible (and many of the extensions require a demonstration by the applicant that they need it). It is also hard to distinguish what extensions should be given to the average homeowner vs the bigger developers. In any case, we did not have or enforce much of our timeframe code until very recently (it became an issue of people expecting quick reviews by DCD of their permits, DCD noting that performance was a requirement on both sides, and we adopted and began to enforce application timeframes as well). Finally, it is perhaps worthwhile noting that the initial application review has a very tight timeframe (recall that during Type 3 first application review we give 6 months extension and only additional extension if it is decision-ready or has some extremely unusual circumstances); so there is a leaning toward a quicker initial approval, which weeds out projects, and then a leaning toward greater timeframes (eg, SDAPs, construction timeframes) to build or flip a project that has gotten its most important land use approval.

Useful sites
DCD's Home Page -- http://www.kitsapgov.com/dcd/default.htm

County Code -- http://www.codepublishing.com/WA/kitsapcounty/
Use Table – 17.381.040.D   Footnotes – 17.381.050   Aggregation footnote – 17.382.110.A.12
Density and Dimensions Table – 17.382.090   Footnotes – 17.382.110
Administrative code, Title 21:
Permit types/review – 21.04.050 - .090
Permit review extensions – 21.04.200
Approved permit extensions – 21.04.270
Site Development Activity Permit (SDAP) processes – 12.10.055

Permit Search, Permitting & Inspections –
http://permits.kitsapgov.com/PermittingPublic/PermittingHome

Permit Search, Public Notices (Type 3 and some Type 2) –
http://permits.kitsapgov.com/PublicNotice/PublicNoticeHome

Parcel Search (for parcel attributes, maps) –
http://kcwppub3.co.kitsap.wa.us/ParcelSearch/

Searching on our website
The above portals should work well if you have some basic ID info (keying in info provides a dropdown of potential hits). However, we are working on refining this first version. Our goal is also to provide a mapping feature which may for some be an easier search tool, but which can show a graphic display of permit activity. I do not have a timeframe for this, and since it involves our land information software supplier (and is not an internal GIS exercise), I do not know when this will go live, though I am hoping by the end of the year.

Legacy lots
I have asked the right supervisor to pause all review for any unissued permits for any res lot less than 8712 sf in the LAMIRD. We will be making sure we are asking the right questions before we proceed to review and potential permit issuance. This should make sure we catch any issues that are in the queue now.

Spring street res Q
We are going to do a postmortem on the Spring St res. Thank you for the info.

Contacts—360-337-5777
It is important to have an address, tax ID or permit # available when contacting DCD

Commercial / Land Use: Scott Diener sdiener@co.kitsap.wa.us

SDAP: Doug Frick dfrick@co.kitsap.wa.us

Residential: Kitsap 1, help@kitsap1.com

I hope this helps you help us help you… I commend you all for pushing on our processes for such important issues. In a way it is like the good old days of 2007!

Do not hesitate to contact us—even though we do not attend regularly, we should speak (and certainly show up for DCD-initiated proposals).

ULID - Patrick Quain
The ULID Committee is waiting for a cost evaluation from SSWM for the ULID. The last meeting with SSWM was in August 2013.

Neighborhood Representation
Currently the MCAC has four openings for representation
The Nebraska Neighborhood, The California Neighborhood and two At-Large representatives.

Minutes: July, August and September Minutes were accepted.

Old Business:

I. Continue work on community identification by creating a community outreach committee.

2. Continue to address the storm water issues

3. Refine and expand trails and walkways with emphasis on safety and recreation in Manchester .

4. Education of Manchester Community regarding sewer master plan.

    1. Encourage community education regarding ULID process.

Jim moved to adjourn the meeting. Ann seconded the motion. The vote was unanimous. The Meeting was adjourned.

The next scheduled meeting is November 5, 6:30 PM at the Manchester Library.

MINUTES APPROVED:

______________________________ ____________________

Appendix H

Pump Stations 45, 46, and 47 and Associated Beach Lines Cost Effectiveness Analysis

MEMORANDUM

Date: **5 November 2014**

To: Dave Tucker/Stella Vakarcs/Dan Kranenburg
(Kitsap County Wastewater Division)

From: Adam Schuyler, PE

CC: File

Subject: **Pump Stations 45, 46, 47 and Associated Beach Lines Cost Effectiveness Analysis**

Introduction

The cost-effectiveness analysis for the Pump Stations 45, 46 and 47 and Associated Beach Lines Project (Project) is based in detailed analyses presented in the Manchester Sewer Facilities Strategy Plan (Plan) and supporting documents developed during Plan development. This analysis addresses the requirements of WAC 173-98-730 to support an application to the Department of Ecology for Project funding.

The Project involves the replacement of three pump stations located in the shoreline along the Manchester community that convey collected sewage to the Manchester Sewage Treatment Plant (MTP). The beach lines collecting and conveying the sewage to the pump stations are buried in the shoreline. The hydraulic capacities of the pump stations and beach lines are adequate for existing and projected future growth in the Manchester LAMIRD. However, these pump stations have reached their service lives and all facilities are subject to leakage of salt water, which creates increased wear of pumps and other mechanical equipment in the pump stations and at the sewage treatment plant. The alternatives and factors considered in the cost-effectiveness analysis are presented in Table 1.

Alternatives Analysis

Three alternatives are considered in the cost-effectiveness analysis:

1) Relocation of the pump stations and rehabilitation of the beach lines.
2) Rehabilitation of the pump stations including new structures, and beach lines.
3) No action.

The relocation of the pump stations consists of moving the pump station out of the beach where they are presently submerged by wave action and during extreme high tides to upland sites, near the existing sites, where the pump stations may be protected from wave action and high tides. The rehabilitation of the pump stations consists of constructing new facilities in the existing locations within the Puget Sound.

The relocation of the pump stations to more distant sites upland from the immediate shoreline area is not considered feasible due to topographic constraints. The beach lines would have to be extended to the upland pump station sites, requiring very deep construction for the beach lines and pump stations. This deep construction would likely have significant neighborhood impacts as well as substantially increasing project costs.

Cost Comparison of Alternatives

The cost comparison analysis consists of a comparison of capital costs and life cycle costs for the three alternatives. Alternative 1 includes all new facilities in a new location; Alternative 2 includes replacement of the pump station structures in their current location because the existing pump stations are approximately 45 years old. Manhole structure cost opinions for Alternative 2 are estimated at twice the cost of Alternative 1 due to difficulty of construction.

The capital costs for the alternatives range from no costs for the No Action alternative to $4,900,000 million for Alternative 2. The 50-year life cycle cost opinions for Alternatives 1 and 2 are approximately $16,800,000 and $20,100,000, respectively. The 50-year life cycle cost opinion is much lower for Alternative 3 at $1,350,000 because the costs are only for operations and maintenance of the facilities. The life cycle cost opinions are presented graphically as Figure 1.

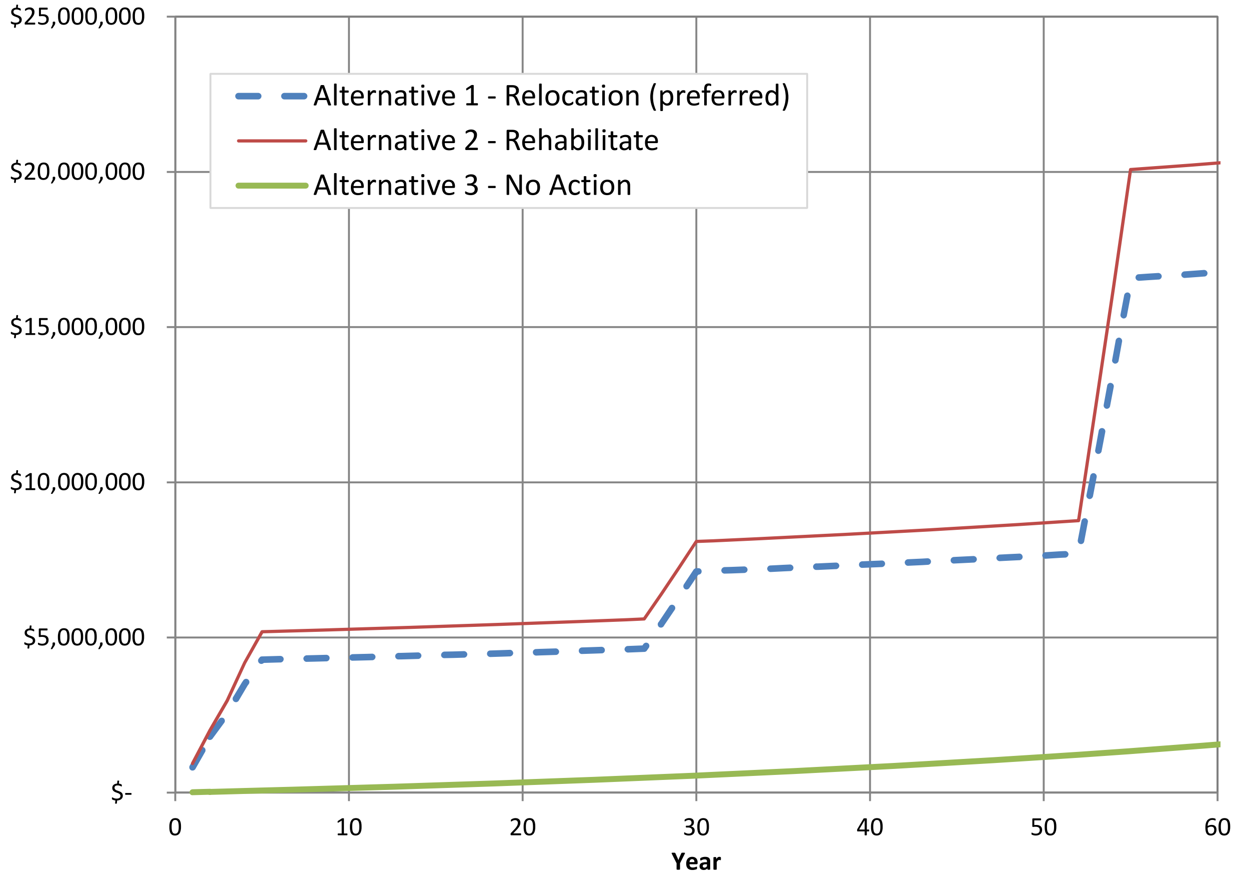


Figure 1 Life Cycle Cost Opinion

Monetary Benefit – Cost Analysis

Alternative 1 operations and maintenance (O&M) costs are slightly less than Alternative 2 due to due to the adverse environmental conditions caused by the rehabilitated pump stations sited in salt water. The capital cost for Alternative 3 No Action is obviously the lowest, but because the pump stations are approaching the end of their useful lives, significant potential exists for the pumps or other equipment to fail causing the County to incur fines.

Rehabilitation of the beach lines has a lower capital cost than replacement of the lines. Replacement of the lines would involve construction of new lines within the shoreline area during extreme low tides. The limited construction times during these low tidal conditions, and within acceptable timeframes to address fisheries issues, would likely increase construction costs further.

Non-Monetary Benefit – Cost Analysis

The major non-monetary benefits of Alternative 1 Relocate Pump Stations are the direct result of all new infrastructure being built out of the Puget Sound. These benefits include improved access for O&M activities, increased redundancy by on-site emergency power generation and improved aesthetics. In addition, relocation of the pump stations to sites not subject to wave action and high tides will essentially eliminate the potential for salt water seepage into the new structures, reducing wear on pumps and other mechanical equipment at the MTP. While not as beneficial as for Alternative 1, the non-monetary benefits associated with Alternative 2 Rehabilitate Pumps Stations will still be significant, including improved O&M due to new equipment, and increased redundancy due to emergency power generation. There are no non-monetary benefits associated with the No Action Alternative. The major non-monetary benefit associated with rehabilitation of the beach lines in Alternatives 1 and 2 is the elimination of salt water seepage in the submerged pipes, resulting in reduced wear of pumps and mechanical equipment in the pump stations and at the MTP.

The non-monetary costs associated with Alternative 1: Relocate Pump Stations and Rehabilitate Beach Lines are considered to be negligible. There may be some potential short-term minor adverse environmental impacts during construction that will be mitigated through the implementation of best management practices and the scheduling of construction activity in compliance with permitting requirements. The most significant non-monetary cost associated with Alternative 2: Rehabilitate Pump Stations and Beach Lines is associated with the continued location of the pump stations in the beach area. The potential would still exist for submergence during severe wave action and high tidal events. The No Action Alternative has the greatest non-monetary costs due to the potential failures caused by equipment reaching its design life as well as being located in the marine environment. There are significant potential non-monetary costs associated with degraded water quality conditions as well as adverse aesthetic and recreational impacts.

Table 1
Pump Stations 45, 46, 47 and Associated Beach Lines Cost Effectiveness Analysis Summary

Alternative	Description[1]	Capital Costs[2]	50-Year Life Cycle Costs[4]	Monetary Benefit	Monetary Cost	Non-Monetary Benefit	Non-Monetary Cost
1	Relocate Pump Station 45	$1,220,000	$16,600,000	▪ Lower O&M cost due to new location outside of Puget Sound, new equipment, more efficient equipment, and County standardized design ▪ Entire pump station replaced	▪ Capital cost due to total replacement of the pump station	▪ New infrastructure ▪ Reduced impact to the environment as wet well is no longer in Puget Sound ▪ Better aesthetics for community ▪ Improved O&M due to new equipment and standardized design ▪ Increased redundancy due to onsite generator ▪ Minimized noise impacts during emergency	▪ Negligible
	Relocate Pump Station 46	$1,024,000					
	Relocate Pump Station 47	$1,024,000					
	Beach Line CIPP Repair in Basins 45, 46, and 47[3]	$798,000		▪ Less expensive than replacement ▪ Minimizes disruption to shoreline ▪ Minimizes saltwater intrusion extending the life of mechanical equipment at the pump stations and at the Manchester Treatment Plant (MTP); reduces required treatment volume at MTP	▪ Capital costs involved	▪ CIPP repair construction minimizes disruption to shoreline ▪ Minimizes saltwater intrusion extending the life of mechanical equipment at the pump stations and at the Manchester Treatment Plant (MTP); reduces required treatment volume at MTP	▪ Negligible
2	Rehabilitate Pump Station 45	$1,503,000	$20,100,000	▪ More expensive option in regards to monetary cost than relocation ▪ Lower O&M cost due to new equipment, more efficient equipment, and County standardized design	▪ Highest capital cost due to total replacement of the pump station in the Puget Sount	▪ New infrastructure ▪ Improved O&M due to new equipment and standardized design ▪ Increased redundancy due to onsite generator ▪ Minimized noise impacts during emergency events	▪ Pump stations still located in Puget Sound ▪ Recreational impacts to public
	Rehabilitate Pump Station 46	$1,307,000					
	Rehabilitate Pump Station 47	$1,307,000					
	Beach Line CIPP Repair in Basins 45, 46, and 47[3]	$798,000		▪ Less expensive than replacement ▪ Minimizes disruption to shoreline ▪ Minimizes saltwater intrusion extending the life of mechanical equipment at the pump stations and at the Manchester Treatment Plant (MTP); reduces required treatment volume at MTP	▪ Capital costs involved	▪ CIPP repair construction minimizes disruption to shoreline ▪ Minimizes saltwater intrusion extending the life of mechanical equipment at the pump stations and at the Manchester Treatment Plant (MTP); reduces required treatment volume at MTP	▪ Negligible

Table 1
Pump Stations 45, 46, 47 and Associated Beach Lines Cost Effectiveness Analysis Summary

Alternative	Description[1]	Capital Costs[2]	50-Year Life Cycle Costs[4]	Monetary Benefit	Monetary Cost	Non-Monetary Benefit	Non-Monetary Cost
3	No Action	N/A	$1,350,000	▪ No capital cost	▪ Stations nearing end of design life and failure may lead to spills and subsequent fines	▪ No construction impacts	▪ Existing infrastructure nearing end of design life ▪ Potential habitat and aquatic loss of life due to spill ▪ Wet well is undersized ▪ Pump stations still located in Puget Sound ▪ Recreational impacts to public ▪ Public outcry and dissatisfaction with County

Notes:
(1) For a detailed description of the project see Chapter 6 of the Plan.
(2) A life cycle cost analysis was not performed because the life cycle cost per alternative is essentially the same in each case.
(3) Based on existing information, it appears that the beach line can be repaired in place with CIPP that will limit the impact to the beach and reduce design and construction costs. If replacement is required, approximate costs are $1,849,000.
(4) Life cycle costs include the costs for replacement, operations, and maintenance of all three pump stations and associated piping.

Appendix I

Colchester Area Sewage Conveyance Cost Effectiveness Analysis

MEMORANDUM

Date: **5 November 2014**
To: Dave Tucker/Stella Vakarcs/Dan Kranenburg
(Kitsap County Wastewater Division)
From: Martin Harper, PE, PhD and Adam Schuyler, PE
CC: File
Subject: **Colchester Area Sewage Conveyance Cost Effectiveness Analysis**

Introduction

Several alternatives for providing sewer service in the Colchester area of the Manchester LAMIRD were evaluated to address Yukon Harbor public health water quality concerns raised by Kitsap Public Health District.

The cost-effectiveness analysis for the Colchester Area Sewage Conveyance Project (Project) is based on detailed analyses presented in the Manchester Sewer Facilities Strategy Plan (Plan) and supporting documents developed during Plan development. This analysis addresses the requirements of WAC 173-98-730 to support an application to the Department of Ecology for Project funding.

The Project involves septic to sewer conversions in the Colchester area of the Manchester LAMIRD along Yukon Harbor. Six alternatives were considered to address health concerns in the Colchester area, with Alternative 2B being the preferred alternative. Alternative 2B includes a combination of Individual Pump Stations (IPS) and associated force mains, gravity sewers, and a regional pump station. Alternative 2B provides the best balance of improving the health concerns in the Colchester area, improving sewer service in Manchester, and providing for infrastructure to meet future growth demands. The capital costs for Alternative 2B is $6.48 million.

All six alternatives involve the construction of upland infrastructure improvements. Alternatives involving construction in the shoreline or underwater were considered infeasible due to significant permitting requirements and much higher probable construction costs. Vacuum sewers were also eliminated from consideration because the required lift from shoreline homes exceeded the lift capabilities of vacuum systems.

Alternatives Analysis

The following six alternatives were evaluated in the cost-effectiveness analysis with detailed costs for each alternative presented in Table 1, with a summary of the monetary and non-monetary benefits and costs summarized in Table 2. The capital costs for the alternatives range from no costs for the No Action alternative to $11.63 million for Alternative 3. The operations and maintenance costs for all of the alternatives, less the No Action alternative, have increased operations and maintenance costs due to the installation of additional infrastructure. 50-year life cycle costs ranged from $0 for the No Action alternative to $13,120,000 for Alternative 3. The life cycle cost opinions are summarized in Table 3 and presented graphically as Graph 1.

1) Alternative 1A – Alternative 1A consists of serving 72 parcels along the shoreline (east) side of Colchester Drive and Yukon Harbor Drive north of SE Cole Street to Miracle Mile

Drive as shown on Figure 1. The parcels will be served by IPSs that pump sewage to a 4-inch diameter, approximately 5,560 lineal foot (lf) force main that discharges into the gravity sewer system at the south end of Miracle Mile Drive.

2) Alternative 1B – Alternative 1B consists of serving 72 parcels along the shoreline (east) side of Colchester Drive and Yukon Harbor Drive north of SE Cole Street to Miracle Mile Drive as shown on Figure 2. Alternative 1B consists of approximately 1,045 lf of 4-inch diameter force main along Yukon Harbor Drive from SE Cole Street to Colchester Drive and approximately 3,100 lf of 6-inch diameter force main along Colchester Drive from the new 200-gpm Pump Station F1 (PS-F1) on the east side of Colchester Drive near Haida Drive to the south end of Miracle Mile Drive.

   PS-F1 costs included in this memorandum consider Phase 1 of a two-phased pump station installation. Phase 1 includes a wet well, duplex submersible pumps and controls, a valve vault, a temporary generator connection, miscellaneous yard piping, site fencing and restoration, and site parking. The Phase 2 (ultimate) configuration will include a third pump, and a permanent, on-site generator housed in a building. Phase 1 costs are approximately $608,000 (2013 dollars); Phase 2 costs are approximately $1,025,000 (2013 dollars), in addition to Phase 1 costs. Payment for Phase 2 is not accounted for in the cost analysis and will be considered in the future when additional parcels connect to the sewer system.

   Alternative 1B also includes approximately 1,850 lf of 12-inch diameter gravity sewer along Colchester Drive from Yukon Harbor Drive to PS-F1, and approximately 2,700 lf of 8-inch diameter gravity sewer along Colchester Drive from Miracle Mile Drive south to PS-F1. The gravity sewer will convey flow to PS-F1, and sewage will then be pumped north through the force main. The force main will provide service to the parcels on the shoreline side of these roads. Each parcel will be connected to the gravity sewer or force main by an IPS.

3) Alternative 2A – Alternative 2A consists of serving 121 parcels along the shoreline (east) and west sides of Colchester Drive and Yukon Harbor Drive north of SE Cole Street to Miracle Mile Drive as shown on Figure 3. The parcels will be served by IPSs that pump sewage to a 4-inch diameter, approximately 5,560 lf force main that discharges into the gravity sewer system at the south end of Miracle Mile Drive.

4) Alternative 2B – Alternative 2B consists of serving 121 parcels along the shoreline (east) and west sides of Colchester Drive and Yukon Harbor Drive north of SE Cole Street to Miracle Mile Drive as shown on Figure 4. Alternative 2B consists of approximately 1,045 lf of 4-inch diameter force main along Yukon Harbor Drive from SE Cole Street to Colchester Drive and approximately 3,100 lf of 6-inch diameter force main along Colchester Drive from a new 200 gpm pump station on the east side of Colchester Drive near SE Haida Drive (PS-F1) to the south end Miracle Mile Drive.

   Alternative 2B also includes approximately 1,850 lf of 12-inch gravity sewer along Colchester Drive from Yukon Harbor Drive to PS-F1, and approximately 2,700 lf of 8-inch gravity sewer along Colchester Drive from Miracle Mile Drive south to PS-F1. The gravity sewer will convey flow to PS-F1, and sewage will then be pumped north through the force main. The force main and gravity sewer will provide service to the parcels on the shoreline side of these roads and parcels adjacent to the pipe on its west side. Each parcel will be connected to the gravity sewer or force main by an IPS on the east/shoreline side of Colchester Drive. Homes on the west side of Colchester Drive will tie into the gravity sewer via a gravity side sewer.

5) Alternative 3 – Alternative 3 consists of serving 239 parcels along the shoreline (east) and west sides of Colchester Drive and Yukon Harbor Drive north of SE Cole Street to Miracle Mile Drive. Parcels located along the side streets west of Colchester Drive are also included. The alternative is shown on Figure 5. Alternative 3 consists of approximately 1,045 lf of 4-inch force main along Yukon Harbor Drive from SE Cole Street to Colchester Drive and approximately 3,100 lf of 6-inch force main along Colchester Drive from the new 200 gpm PS-F1 located on the east side of Colchester Drive near SE Haida Drive to the south end of Miracle Mile Drive.

   Alternative 3 also includes approximately 3,400 lf of 12-inch gravity sewer along Colchester Drive from Southworth Drive to PS-F1, and approximately 2,700 lf of 8-inch gravity sewer along Colchester Drive from Miracle Mile Drive south to PS-F1, and approximately 7,300 lf of 8-inch gravity sewers west of Colchester Drive. The gravity sewer will convey flow to PS-F1, and sewage will then be pumped north through the force main. The force main and gravity sewer will provide service to the parcels on both sides of Colchester Drive. The sewers in the side streets west of Colchester Drive will collect sewage from parcels not adjacent to the gravity main in Colchester Drive and convey the flow to the sewer main in Colchester Drive. The parcels on the shoreline (east) side of Colchester Drive will be served by IPSs. Homes directly on the west side of Colchester Drive will tie into the gravity sewer via gravity side sewers.

6) No Action.

Monetary Benefit – Cost Analysis

While Alternative 1A and 1B have lower capital costs compared to the other alternatives, only 72 parcels are served and there is no ability to provide sewer service to the area located west of Colchester Drive. Alternative 2A is rejected because it requires IPS for all parcels. Alternative 3 is rejected because it has the highest capital cost. Alternative 2B is the preferred alternative because it balances a large number of customers served with a moderate capital cost.

The capital cost for the No Action alternative is obviously the lowest, but because the septic systems are aging, significant potential exists for the equipment to fail with subsequent fines and adverse environmental impact.

The Operation and Maintenance (O&M) costs for the alternatives vary based on the number of connections for each alternative and the alternatives that include PS-F1. The life cycle cost opinion of the preferred Alternative 2B is in the middle of the range at $7,900,000. The life cycle cost opinion for each alternative is summarized in Table 3 and presented graphically as Graph 1.

Non-Monetary Benefit – Cost Analysis

The major non-monetary benefits of Alternatives 1A through 3 are the direct result of all new infrastructure being built and septic systems being removed. These benefits include the reduced impact to the environment due to the removal of the aging septic systems and therefore, greatly reduced potential for spills and seepage into the surrounding waters of the state. Water quality benefits from Alternatives 2A, 2B, and 3 are greater because more onsite systems are being taken out of service and would no longer pose as potential sources of pollutants discharging to Yukon Harbor. Alternatives 1B, 2B, and 3 have non-monetary benefits during power outages, as the gravity sewer components of those Alternatives are unaffected by power outages, whereas IPS systems rely on power to effectively transport sewage offsite. There are no non-monetary benefits associated with the No Action alternative.

Impacts to the Manchester Treatment Plant (MTP) are the same for all alternatives. The MTP has the capacity to treat the flows generated by any of the alternatives.

The non-monetary costs associated with Alternatives 1A through 3 are considered to be negligible. There may be some potential short-term minor adverse environmental impacts during construction that will be mitigated through the implementation of best management practices and the scheduling of construction activity in compliance with permitting requirements. Non-monetary costs for Alternatives 1A and 2A may occur during power outages, as those alternatives involve only IPS systems and IPS systems do not function without power. Additionally, the use of IPS systems may cause some concern with homeowners; however, through proper education and operation and maintenance, these systems are reliable and easy to maintain.

The No Action alternative has the greatest non-monetary costs due to the potential failures caused by existing septic system equipment reaching the end of their design life as well as being located in the marine environment. There are significant potential non-monetary costs associated with degraded water quality conditions as well as adverse aesthetic and recreational impacts.

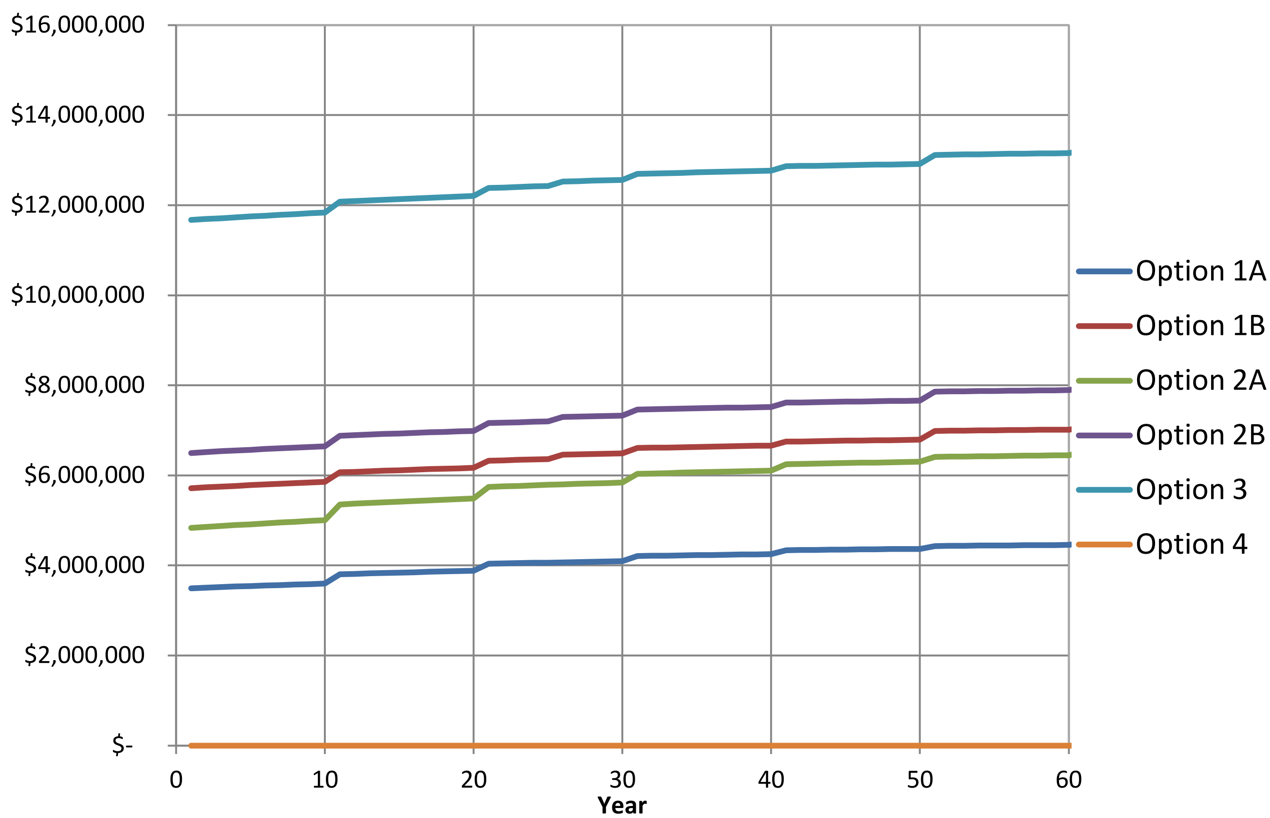
Table 1 Colchester Area Sewage Conveyance Summary of Alternatives																
Alt	**Description**	**Number of Parcels – IPS**	**Number of Parcels – Gravity**	**Area Covered (Sq Ft)**	**Area Covered (Sq Ft) – IPS**	**Area Covered (Sq Ft) Gravity**	**Total Opinion of Probable Cost[1]**	**Assessable Costs**	**Private Costs – IPS**	**Private Costs – Gravity**	**Assessable Costs per Parcel**	**Private Costs per Parcel – IPS**	**Private Costs per Parcel – Gravity**	**Assessable Costs per Sq Ft**	**Private Costs per Sq Ft – IPS**	**Private Costs per Sq Ft – Gravity**
1A[2]	4" Force Main, East Side Parcels	72	N/A	2,169,000	2,169,000	0	$3,475,100	$1,518,000	$1,957,100	N/A	$21,100	$27,200	N/A	$0.70	$0.90	N/A
1B[2]	4" and 6" Force Mains, 8" and 12" Gravity Sewers, Pump Station[5], East Side Parcels	72	N/A	2,169,000	2,169,000	0	$5,702,100	$3,745,000	$1,957,100	N/A	$52,000	$27,200	N/A	$1.73	$0.90	N/A
2A[3]	4" Force Main, East and Adjacent West Side Parcels	121	N/A	3,266,000	3,266,000	0	$4,807,700	$1,518,000	$3,289,700	N/A	$12,600	$27,200	N/A	$0.46	$1.01	N/A
2B[3]	4" and 6" Force Mains, 8" and 12" Gravity Sewers, Pump Station[5], East and Adjacent West Side	79	42	3,266,000	2,360,000	906,000	$6,479,700	$3,745,000	$2,147,300	$587,300	$31,000	$27,200	$14,000	$1.15	$0.91	$0.65
3[4]	4" and 6" Force Mains, 8" and 12" Gravity Sewers, Pump Stations[5], East and West Side Parcels	82	157	5,632,000	2,523,000	3,108,000	$11,652,000	$7,226,000	$2,228,700	$2,196,200	$30,200	$27,200	$14,000	$1.28	$0.88	$0.71
No Action	No Action	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

Notes:
1) Opinion of Probable Project Costs includes construction, surveying, inspection, engineering services during construction, planning, design, permitting, sales tax, and 35% contingency at present value in 2013 dollars.
2) Alternative 1 covers the east side of Colchester Drive from Cole Street to Miracle Mile.
3) Alternative 2 covers the east side and most of the parcels adjacent to Colchester Drive on its west side from Cole Street to Miracle Mile.
4) Alternative 3 covers an expanded area of parcels on the west side in addition to the east side of Colchester Drive, for a total of 239 Parcels.
5) Alternatives 1B, 2B, and 3 employ a Flygt submersible pump package.
6) All Parcels include costs for decommissioning the septic tank and installing a side sewer connection.
7) Assessable costs include sewer mains, side sewers to property lines and appurtenances.
8) Private costs include individual pump stations, sewer to right-of-way, septic tank decommissioning, and Kitsap County Sewer Connection Fee.

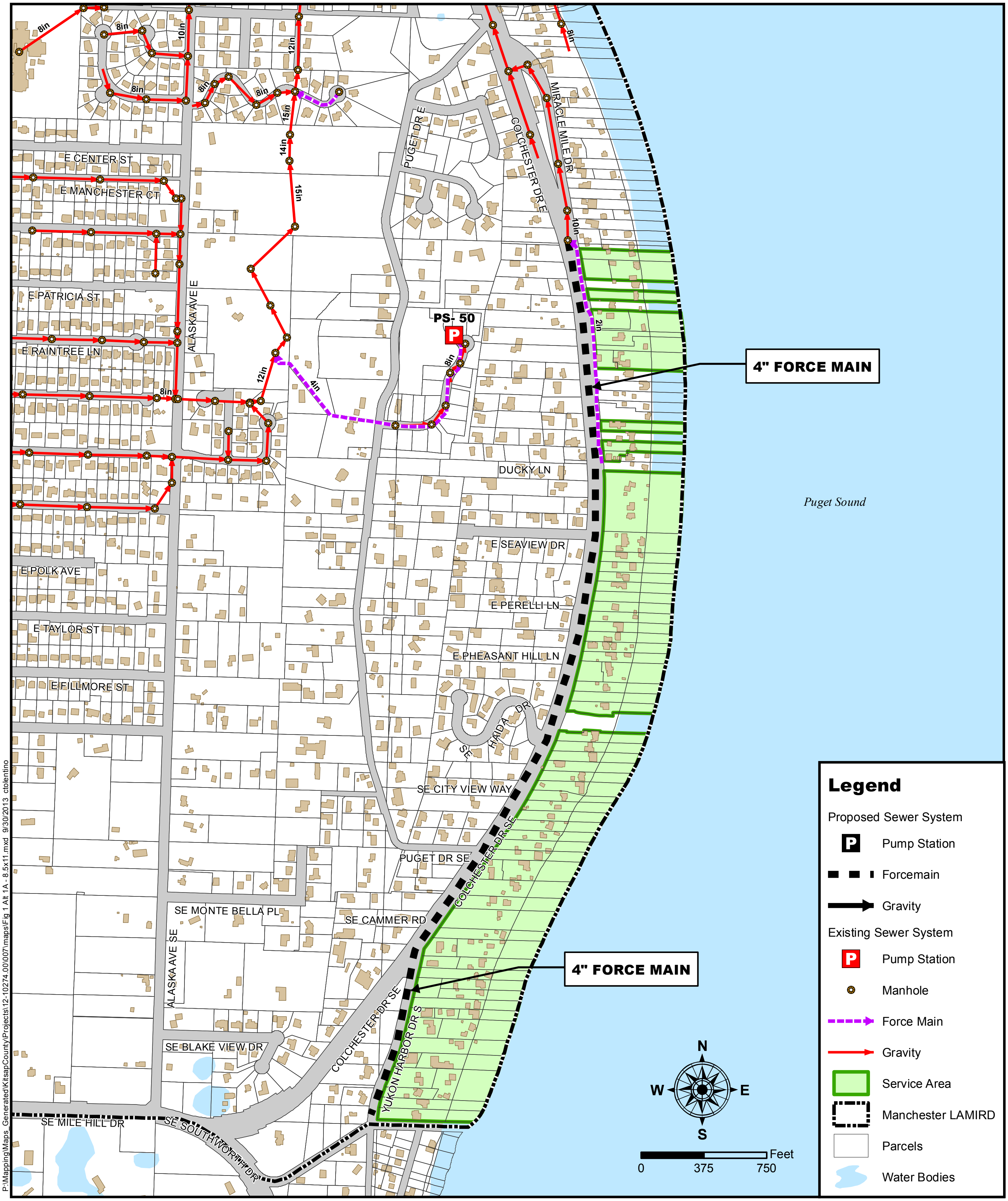
Table 2
Colchester Area Sewage Conveyance Summary of Monetary and Non-Monetary Costs and Benefits

Alternative	Monetary Benefit	Monetary Cost	Non-Monetary Benefit	Non-Monetary Cost
1A	▪ Less expensive than gravity sewers and pump station	▪ Least capital costs involved ▪ Lack of gravity sewers increases lifetime maintenance costs	▪ New infrastructure ▪ Least benefit to the environment as septic systems are replaced ▪ Small diameter force main minimizes disruption to shoreline	▪ Negligible ▪ Involves IPS which can have public resistance ▪ Short-term loss of service during power outages
1B	▪ Gravity sewers lower lifetime maintenance for future connections	▪ Higher capital costs involved ▪ Pump station costs increase total capital cost	▪ New infrastructure ▪ Least benefit to the environment as septic systems are replaced	▪ Negligible ▪ Involves IPS which can have public resistance ▪ Short-term loss of service during power outages
2A	▪ Less expensive than gravity sewers and pump station ▪ Small diameter force main minimizes disruption to shoreline	▪ Higher capital costs involved ▪ Lack of gravity sewers increases lifetime maintenance costs	▪ New infrastructure ▪ Greater benefit to the environment as septic systems are replaced	▪ Negligible ▪ Involves IPS which can have public resistance ▪ Short-term loss of service during power outages
2B	▪ Gravity sewers lower lifetime maintenance for future connections	▪ Higher capital costs involved ▪ Pump station costs increase total capital cost	▪ New infrastructure ▪ Greater benefit to the environment as septic systems are replaced ▪ Greater number of parcels served	▪ Negligible ▪ Involves IPS which can have public resistance ▪ Less loss of service during power outages due to parcels served by gravity sewers.
3	▪ Gravity sewers lower lifetime maintenance for future connections	▪ Highest capital cost ▪ Pump station costs increase total capital cost	▪ New infrastructure ▪ Greater benefit to the environment as septic systems are replaced; greatest number of septic systems replaced with sewers. ▪ Serves the most parcels of all Alternatives ▪ Highest service during power outages	▪ Negligible ▪ Involves IPS which can have public resistance
No Action	▪ No capital cost	▪ Septic tanks are nearing end of design life that may lead to pollution that is costly to clean up ▪ Septic tank failure impacts shellfish beds in Yukon Harbor ▪ Costs to mitigate pollution far exceeds costs of replacement before failure	▪ No construction impacts	▪ Septic tanks are nearing end of design life that may lead to pollution and loss of aquatic life in Yukon Harbor.

Table 3 Colchester Area Sewage Conveyance Life Cycle Cost Summary	
Alternative	**50-year Life Cycle Cost Opinion**
1A	$4,400,000
1B	$7,000,000
2A	$6,400,000
2B	$7,900,000
3	$13,100,000
No Action	$0



Graph 1 Life Cycle Cost Opinions



GIS Data: Kitsap County
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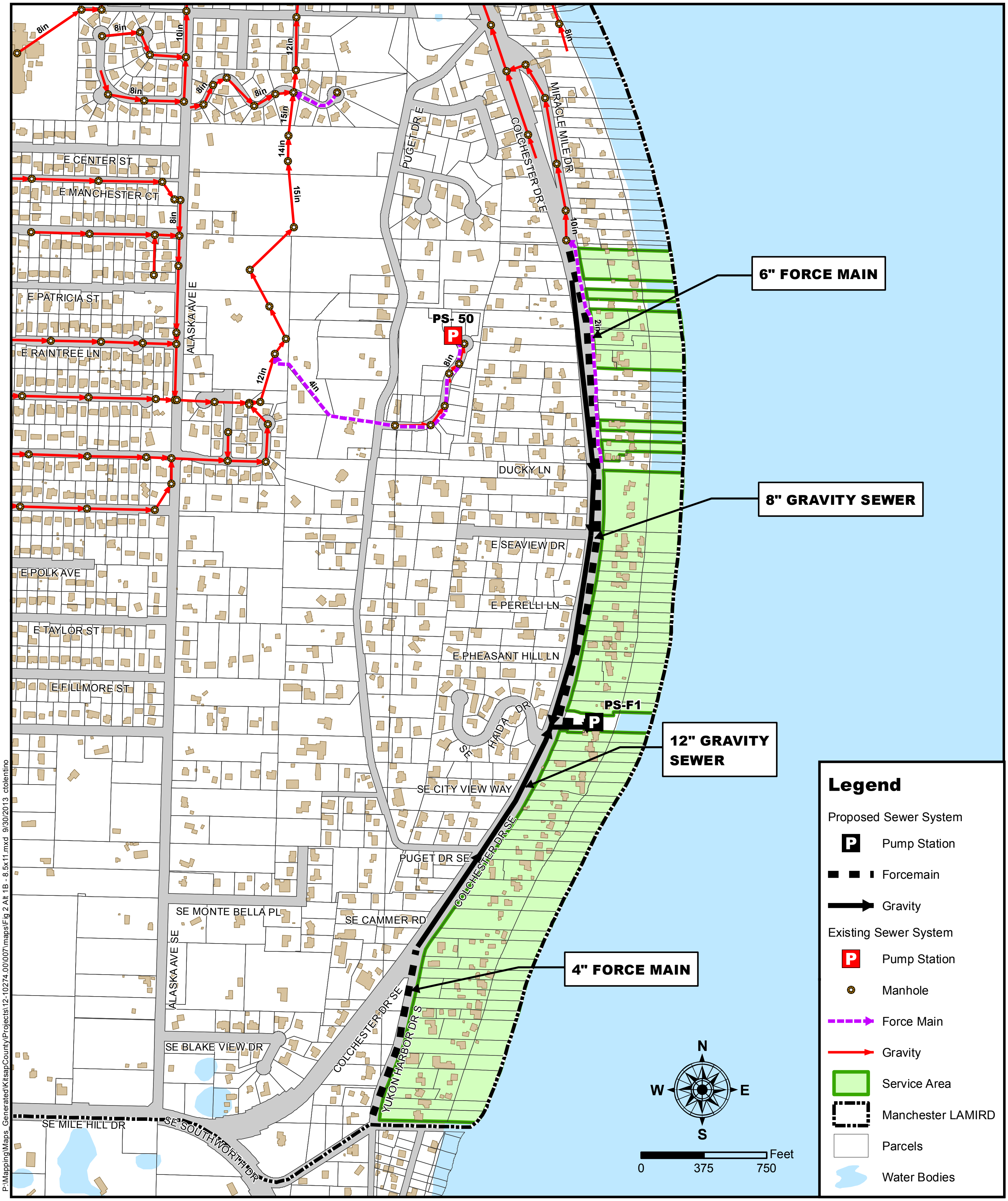
ALTERNATIVE 1A

COLCHESTER SEWER
ALTERNATIVES EVALUATION
Kitsap County
October 2013

Figure
1



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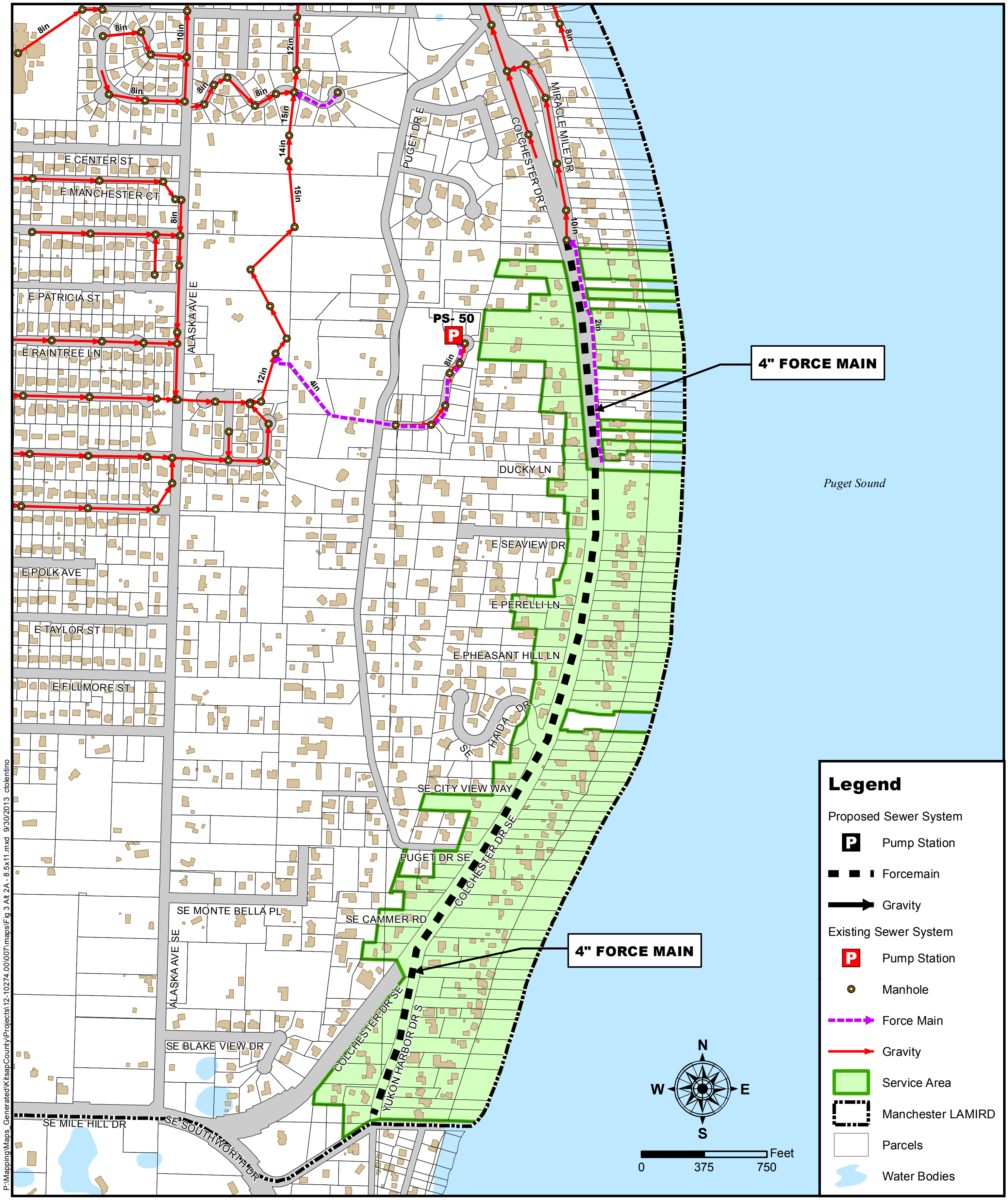
ALTERNATIVE 1B

COLCHESTER SEWER
ALTERNATIVES EVALUATION
Kitsap County
October 2013

Figure
2



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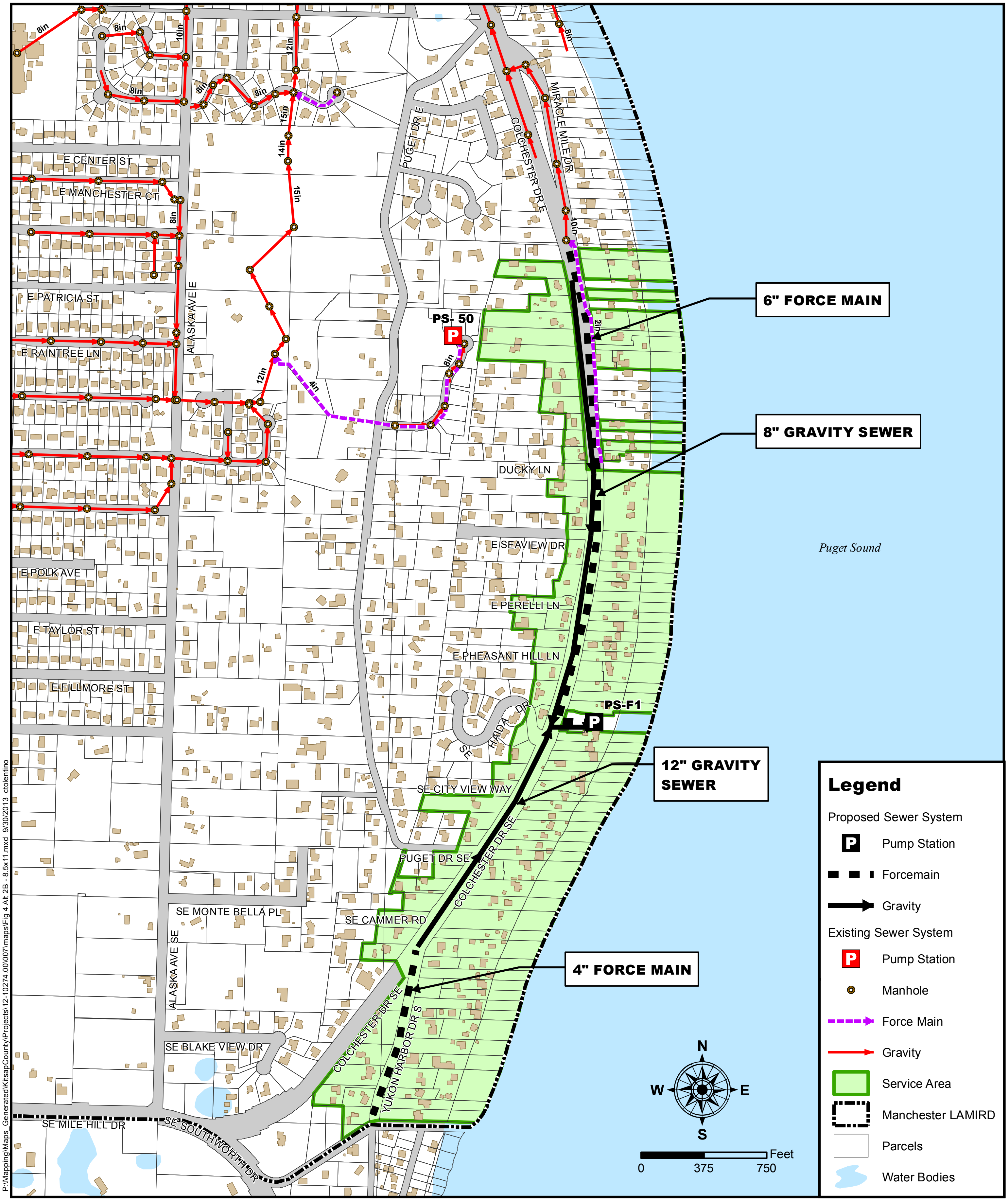
ALTERNATIVE 2A

COLCHESTER SEWER
ALTERNATIVES EVALUATION
Kitsap County
October 2013

Figure

3



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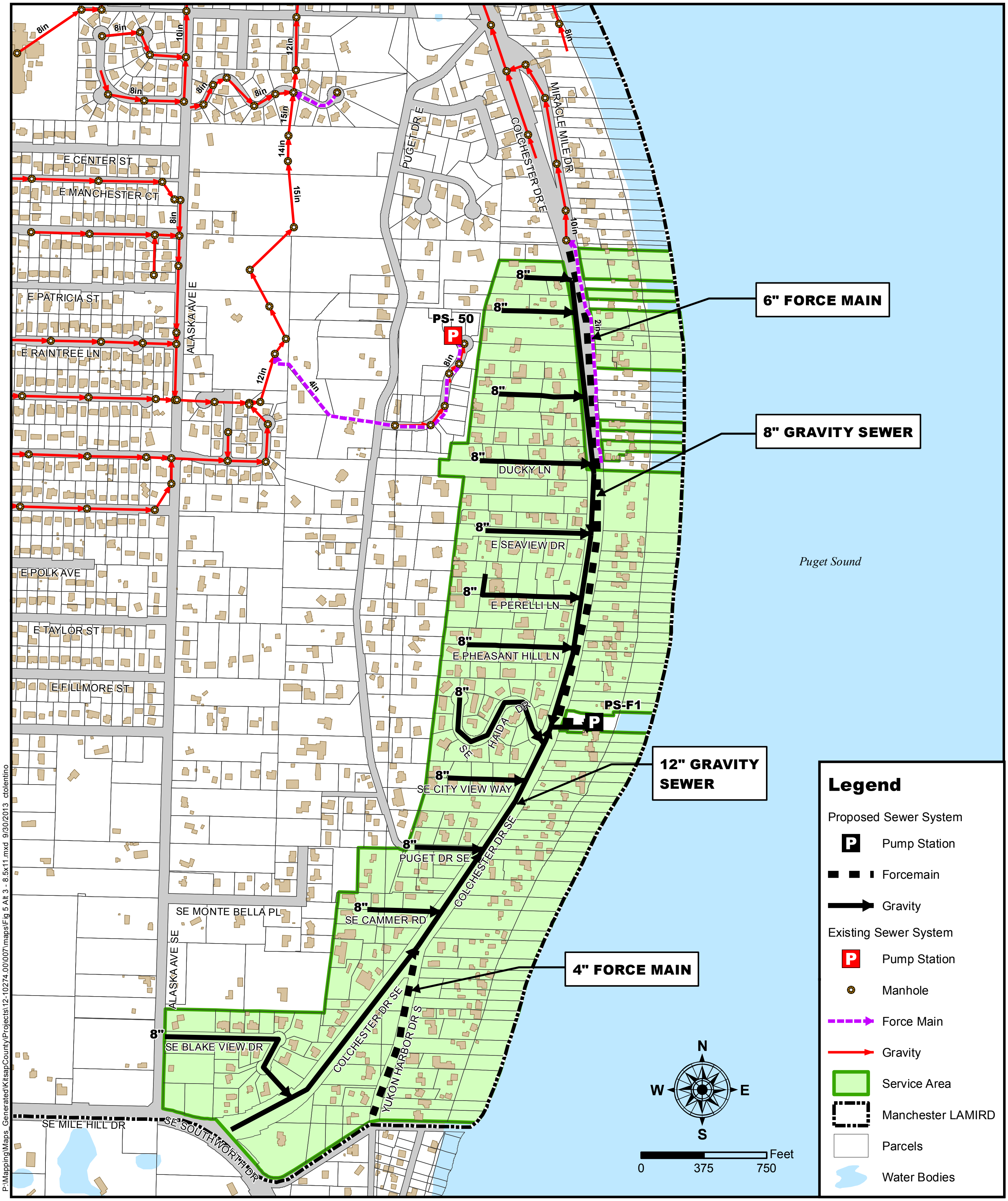
ALTERNATIVE 2B

COLCHESTER SEWER
ALTERNATIVES EVALUATION
Kitsap County
October 2013

Figure

4



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KITSAP COUNTY 18 57 WASHINGTON

ALTERNATIVE 3

COLCHESTER SEWER
ALTERNATIVES EVALUATION
Kitsap County
October 2013

Figure

5