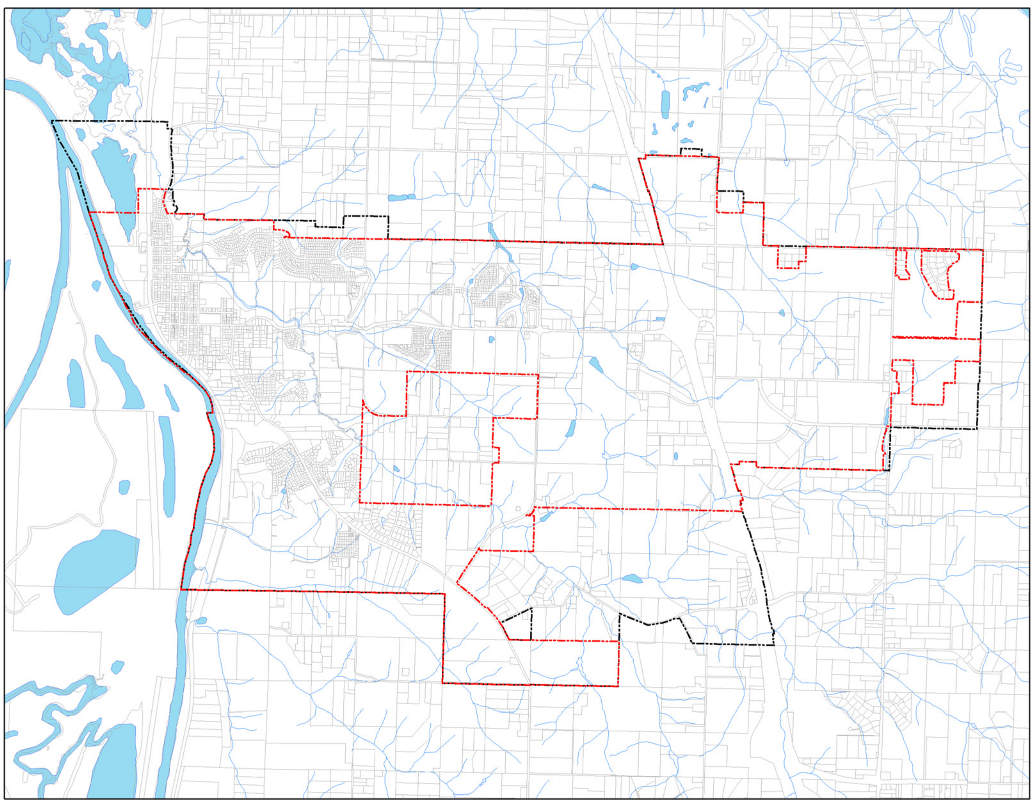
CITY OF RIDGEFIELD

CLARK COUNTY, WASHINGTON

GENERAL SEWER PLAN
VOLUME 1



G&O No. 13214
March 2013

Gray & Osborne, Inc.
CONSULTING ENGINEERS

CITY OF RIDGEFIELD

CLARK COUNTY **WASHINGTON**

GENERAL SEWER PLAN

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3/29/13

G&O #13214
MARCH 2013

Gray & Osborne, Inc.
CONSULTING ENGINEERS

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EXECUTIVE SUMMARY

OVERVIEW

This plan is an update to the previous City of Ridgefield General Sewer and Wastewater Facility Plan (2007). The purpose of this update is to make the Plan consistent with the most recent planning projections and to document the City's evaluation of regional alternatives for wastewater collection, conveyance, treatment and disposal. The Plan addresses the City's collection, conveyance, treatment, and disposal needs through 2033 and satisfies the requirements for a General Sewer Plan in accordance with WAC 173-240-050.

The City of Ridgefield has grown substantially over the last decade, and is the home of the majority of Clark County's large undeveloped commercial and industrial sites, in addition to a healthy number of residential growth areas. Depending upon how development proceeds, additional treatment capacity could be needed as early as 2014. Given the lead-time required to finance and construct major wastewater improvements, the City needs to proceed rapidly to construct the improvements necessary to accommodate the growth assigned to the City's Urban Growth Area (UGA). Improvements to components of the City's collection system will also be needed.

Projections of wastewater flows through 2033 are identified in this plan. The projections have been made under low, medium, and high growth rate scenarios to fully encompass the range of growth dependent flows over the planning period. Actual flows may vary depending on the pace of growth and/or contributions from a large single customer. A more detailed basin-by-basin projection of buildout flows based on zoning is also provided in Chapter 7 of this plan. These flows are used to size new collection system infrastructure.

Due to the issues and costs associated with long term expansion of the City's WWTP, the City will either need to construct significant expansions to its existing treatment facilities (including a new outfall to the Columbia River), or the City can join and transfer ownership of its WWTP to a regional entity formed specifically to provide regional wastewater conveyance and treatment services. Joining the regional entity provides a more cost effective approach by taking advantage of existing, lower cost treatment capacity.

Although joining the regional entity solves the long term treatment capacity challenges, that option requires construction of a significant conveyance system to connect the City to the Salmon Creek Wastewater Management System (SCWWMS). The City would either need to construct this conveyance system on its own, or the City could transfer its collection system to the Clark Regional Wastewater District (the District). The District would then construct the conveyance system needed to connect the City to the SCWWMS. Transferring the system to the District provides a more cost effective solution by utilizing existing facilities and already planned infrastructure to achieve the connection while maintaining stable customer rates for the City.

Chapter 8 provides a detailed evaluation of the alternatives. Regionalization of the treatment plant coupled with transferring the local collection system to the District is described in Chapter 8 as Alternative 2B and is the preferred alternative for the City of Ridgefield to provide long term sewer collection and treatment needs.

The City and their partners have been working to develop agreements necessary to make the preferred alternative a reality. The September 2012 Interlocal Agreement outlining the structure of the newly formed Discovery Clean Water Alliance (DCWA) allowing Ridgefield access to the SCWWMS is included as Appendix K. Additionally, the May 2012 Memorandum of Understanding with the District stating the City's intent to transfer its collection system to the District and the March 2013 final draft of the *City of Ridgefield and CRWWD Collection System Transfer and Franchise Agreement* are included as Appendix L. The approval of the transfer agreement between the City and the District is scheduled to be executed in June 2013, with asset and operation transfer effective December 31, 2013.

This General Sewer Plan update evaluates Ridgefield's options as the current owner and operator of its collection system and wastewater treatment plant. Assuming transfer of the Ridgefield treatment and collection systems occur as currently envisioned by all partner agencies, future planning responsibilities will be completed by the DCWA and the District; respectively.

THE EXISTING COLLECTION SYSTEM

The City's original sewer system was constructed in the 1950s and primarily serves the downtown core area. The system is currently in good condition and does not exhibit excessive infiltration and inflow (I/I). However, the downtown system does not have the hydraulic capacity to convey the projected flows that will be generated by the UGA to the existing Lake River Wastewater Treatment Plant (WWTP). Given this constraint, plus the natural topography within the UGA, the City currently uses pump stations and force mains to bypass the downtown collection system and transmit new flows from the south and east portions of the UGA directly to the treatment plant.

COLLECTION SYSTEM IMPROVEMENTS

The City of Ridgefield's wastewater collection system will require substantial expansion by 2033 to serve projected growth. Based on topography and natural drainages, a series of additional trunk lines and wastewater pumping stations have been identified as necessary to accommodate community growth. Chapter 7 (Wastewater Collection System) describes the recommendations for improvements that will be required to maintain regulatory compliance and accommodate growth projections within the Ridgefield UGA. Figure 7-3 in that chapter depicts the Future Sewer System. Table E-1 below summarizes the recommended projects and estimated project costs of the collection system expansion identified in this report. The costs of the improvements are divided between City costs and developer costs, according to City code provisions for oversizing to accommodate the drainage basin. The division of costs is based on an assessment of the percentage of the improvement that will serve the existing customer base versus the percentage of the improvements required to accommodate new growth.

TABLE E-1

Recommended Collection System Expansion Projects

Project	Estimated Cost (Millions $)	Developer Share %	Developer Contribution (Millions $)	City Share %	City Contribution (Millions $)
T-9E	0.45	70	0.32	30	0.14
T-9W	0.75	70	0.53	30	0.23
T-9N	0.63	70	0.44	30	0.19
T-9S	0.51	70	0.35	30	0.15
T-10	1.82	70	1.27	30	0.54
T-11	0.99	70	0.69	30	0.30
T-12E	0.78	70	0.55	30	0.24
T-12W	1.03	70	0.72	30	0.31
T-12WB	1.16	70	0.81	30	0.35
T-15	0.86	70	0.60	30	0.26
T-16E	0.52	70	0.36	30	0.16
T-16W	0.46	70	0.32	30	0.14
T-17	0.61	70	0.43	30	0.18
T-18	0.57	70	0.40	30	0.17
T-19	0.62	70	0.44	30	0.19
T-21S	0.64	70	0.45	30	0.19
T-22	1.20	70	0.84	30	0.36
T-23N	1.37	70	0.96	30	0.41
T-23S	0.53	70	0.37	30	0.16
T-24N	0.74	70	0.51	30	0.22
T-24S	0.40	70	0.28	30	0.12
T-25E	1.59	70	1.11	30	0.48
T-25S	0.60	70	0.42	30	0.18

TABLE E-1 – (continued)

Recommended Collection System Expansion Projects

Project	Estimated Cost (Millions $)	Developer Share %	Developer Contribution (Millions $)	City Share %	City Contribution (Millions $)
T-25W	0.89	70	0.62	30	0.27
T-26E	0.34	70	0.24	30	0.10
T-26W	0.82	70	0.57	30	0.25
T-27	0.51	70	0.35	30	0.15
T-27W	0.50	70	0.35	30	0.15
T-28W	0.14	70	0.10	30	0.04
T-28E	0.24	70	0.17	30	0.07
FM-1	0.68	50	0.34	50	0.34
FM-2	1.27	50	0.63	50	0.63
FM-3	0.65	50	0.32	50	0.32
FM-4	2.38	50	1.19	50	1.19
FM-5	1.49	50	0.74	50	0.74
FM-6	1.70	50	0.85	50	0.85
FM-7	3.15	50	1.58	50	1.58
FM-9	0.87	50	0.44	50	0.44
FM-10	0.79	50	0.40	50	0.40
FM-12	1.04	50	0.52	50	0.52
FM-14	0.64	50	0.32	50	0.32
Total	**36.89**		**22.89**		**13.99**

WASTEWATER TREATMENT AND DISPOSAL

The City of Ridgefield's existing wastewater treatment plant provides secondary treatment using an activated sludge system and UV disinfection of the effluent. The facility is currently operating at about 70 percent of its 0.7 MGD permitted capacity. The WWTP has typically been able to comply with NPDES permit limitations at current loadings. The plant has limited solids management capabilities and contracts with the Clark County Salmon Creek WWTP for sludge hauling and treatment. The Ridgefield WWTP also has limited laboratory facilities.

The City is expecting significant growth in wastewater flows over the next 20 years. To provide adequate wastewater treatment capacity the City will either need to construct significant expansions to its existing treatment facilities (including a new outfall to the Columbia River), or the City transfer ownership of its WWTP to a regional entity formed specifically to provide regional wastewater conveyance and treatment services.

WASTEWATER TREATMENT ALTERNATIVES

Ridgefield Wastewater Treatment Plant Expansion

This plan describes an alternative for the City to expand its own treatment facilities to meet capacity needs. To meet future treatment capacity needs without excessive rate impacts, this Plan identifies four phases of expansion at the existing plant location. The first phase (Phase 1) is an expansion to 1.0 mgd that would provide required capacity until 2014 to 2020, depending upon growth. The Phase 1 upgrade to 1.0 mgd is able to be constructed on the existing treatment plant site area and is included in the City's current NPDES Permit. Additionally, the Phase 1 upgrade will utilize the entire 1.0 mgd permitted capacity of the Lake River outfall, which based on mixing zone studies completed for the outfall is the maximum effluent flow rate able to be assimilated by Lake River.

As noted above, three additional phased expansions would be needed to serve the City through the planning horizon. The second phase (Phase 2) would expand the WWTP to 1.8 mgd to serve the City until 2017 to 2028, depending upon growth, and includes the construction of an outfall to the Columbia River. The third (Phase 3) is an expansion to 2.7 mgd to meet needs until 2024 to beyond 2033, depending upon growth. The fourth phase (Phase 4) would be an expansion to 4.7 mgd to meet the projected demand to 2036 according to a high growth rate scenario. These improvements are estimated to cost $63,000,000.

Table E-2 summarizes the estimated costs for the recommended alternative for each project phase.

TABLE E-2

Estimated Costs of Treatment Plant Expansion

	Phase 1	**Phase 2**	**Phase 3**	**Phase 4**
Year Needed(1)	2014-2020	2017-2028	2024 – NR(4)	2036 – NR(4)
Maximum Month Flow (mgd)	1.0	1.8	2.7	4.7
Estimated Cost(2)	$4,000,000	$23,000,000(3)	$10,000,000	$26,000,000

(1) Year needed with the endpoints of the range corresponding to high and low growth scenarios.
(2) Estimated cost includes engineering, construction, and sales tax.
(3) Includes the Columbia River outfall and Class A biosolids management system.
(4) Phase 3 and Phase 4 upgrades are not required during the planning period according to a low growth rate scenario.

Regional Treatment Alternative

Under the regional treatment alternative, the City will become a partner in a regional consortium that includes the City of Ridgefield, Clark Regional Wastewater District, Clark County, and the City of Battleground. The partners in the regional consortium will share costs of construction and operation of regional conveyance and treatment facilities in accordance with the provisions of the *Discovery Clean Water Alliance (DCWA) Interlocal Formation Agreement, Sept. 2012* (Appendix K). The City's WWTP will become an asset of DCWA and the City will have access to large blocks of available capacity in the SCWWMS, which will also become an asset of the DCWA. The City will participate in decisions related to the regional conveyance and treatment facilities by having one elected official serve on the four-member board of directors for DCWA.

To fully utilize the benefits of the DCWA and access to capacity in the SCWWMS, the City is also partnering with CRWWD to help fund and construct the Discovery Corridor Wastewater Transmission System (DCWTS). The DCWTS is a series of force mains, pump stations, and gravity mains that will convey wastewater from the City's Pioneer Canyon Pump Station to the District's Legacy Pump Station, and ultimately to the Salmon Creek WWTP. The City and District are currently partnering in the engineering design of Phases 1 through 5 of this project. Table E-3 summarizes the estimated costs for each phase of the DCWTS in accordance with the *DCWTS Engineering Report*. The schedule for each phase will be dependent upon growth.

TABLE E-3

Estimated Costs for DCWTS

DCWTS Project Phase	Cost
Phase 1	$21,100,000
Phase 2	$2,500,000
Phase 3	$3,100,000
Phase 4	$11,100,000
Phase 5	$3,000,000

PREFERRED ALTERNATIVE

As is discussed in detail in Chapter 8, the City's preferred alternative for meeting treatment capacity needs is transferring its treatment plant ownership and operation to the DCWA, and transferring its collection system to the District.

FINANCING

A financial model prepared by the District was used to assess the rate impact to Ridgefield sewer customers associated with partnership in DCWA, construction of the DCWTS, and transferring ownership and maintenance responsibilities of the Ridgefield collection system to the District. This model predicts relatively stable rates trending from $54.00 to $60.74 per month over the planning period, according to a low growth rate scenario. Under a moderate growth scenario, monthly sewer rates approach the amount currently paid by District customers (less than $40.00/month).

CHAPTER 1

INTRODUCTION

PURPOSE

In January 2013, the City of Ridgefield retained the services of Gray & Osborne Inc., to complete an update of the General Sewer Plan for the City of Ridgefield. This update was necessary to make the Plan consistent with the most recent planning projections and to present an evaluation of regional alternatives for wastewater treatment and disposal. The Plan addresses the City's comprehensive planning needs for wastewater collection, transmission, treatment, and disposal through 2033. The Plan has been prepared in accordance with the provisions of the following regulations:

- Revised Code of Washington (RCW), Section 90.48, Water Pollution Control.
- Washington Administrative Code (WAC), Section 173-240-050, General Sewer Plan.

Development of the Plan has been coordinated with the City's development regulations and Capital Facility Plan (as updated in 2010), the Washington State Growth Management Act, Clark County planning efforts, and the City of Ridgefield Water System Plan. This Plan updates the previous General Sewer and Wastewater Facility Plan completed in 2007 and is consistent with updates to the Capital Facility Plan that were completed in 2010.

This Plan has the following major objectives:

- Ensure that the City remains in compliance with applicable regulations governing the discharge of treated wastewater into the environment.
- Define the City's future growth needs and identify wastewater system improvements necessary to support this growth.
- Evaluate alternatives for long-term disposal and treatment of wastewater generated by the City.
- Clearly identify a plan for treatment and disposal of the City's wastewater for the next 20 years.
- Modify the previous General Sewer and Wastewater Facility Plan so that it meets the requirements for a General Sewer Plan without the project specific detail required for a Wastewater Facility Plan.

The Plan is intended to be feasible in terms of engineering, economic, regulatory, and political frameworks. The Plan includes conceptual designs and cost estimates for recommended facility system improvements, as well as a proposed construction schedule and financing plan for the preferred alternative.

The City's existing NPDES permit, the permit fact sheet, and regulatory correspondence relating to this Plan is provided in Appendix A. A State Environmental Policy Act (SEPA) checklist has been included in Appendix B.

EXISTING SYSTEM

OVERVIEW OF EXISTING CONDITIONS

The City of Ridgefield is located within Clark County in southwestern Washington, about 160 miles south of Seattle and 20 miles north of Portland, Oregon. Figure 1-1, Vicinity Map, shows the location of the City relative to the rest of the State of Washington. The current City limits constitute an area of approximately 4,600 acres. The majority of the City's 2012 estimated population of 5,210 is connected to sewer service with the exception of a few homes in the more rural eastern area of the City.

The topography of the City Ridgefield and its Urban Growth Area (UGA) slopes from the eastern boundary of the City west to Lake River. The City encompasses land on either side of Interstate 5. Figure 1-2 shows the City limits and the Urban Growth Area Boundary that is designated for Ridgefield in the Clark County Urban Growth Plan. The environment in and around the City, as well as the growth anticipated for the City, is discussed in more detail in Chapters 2 and 3 of this Plan.

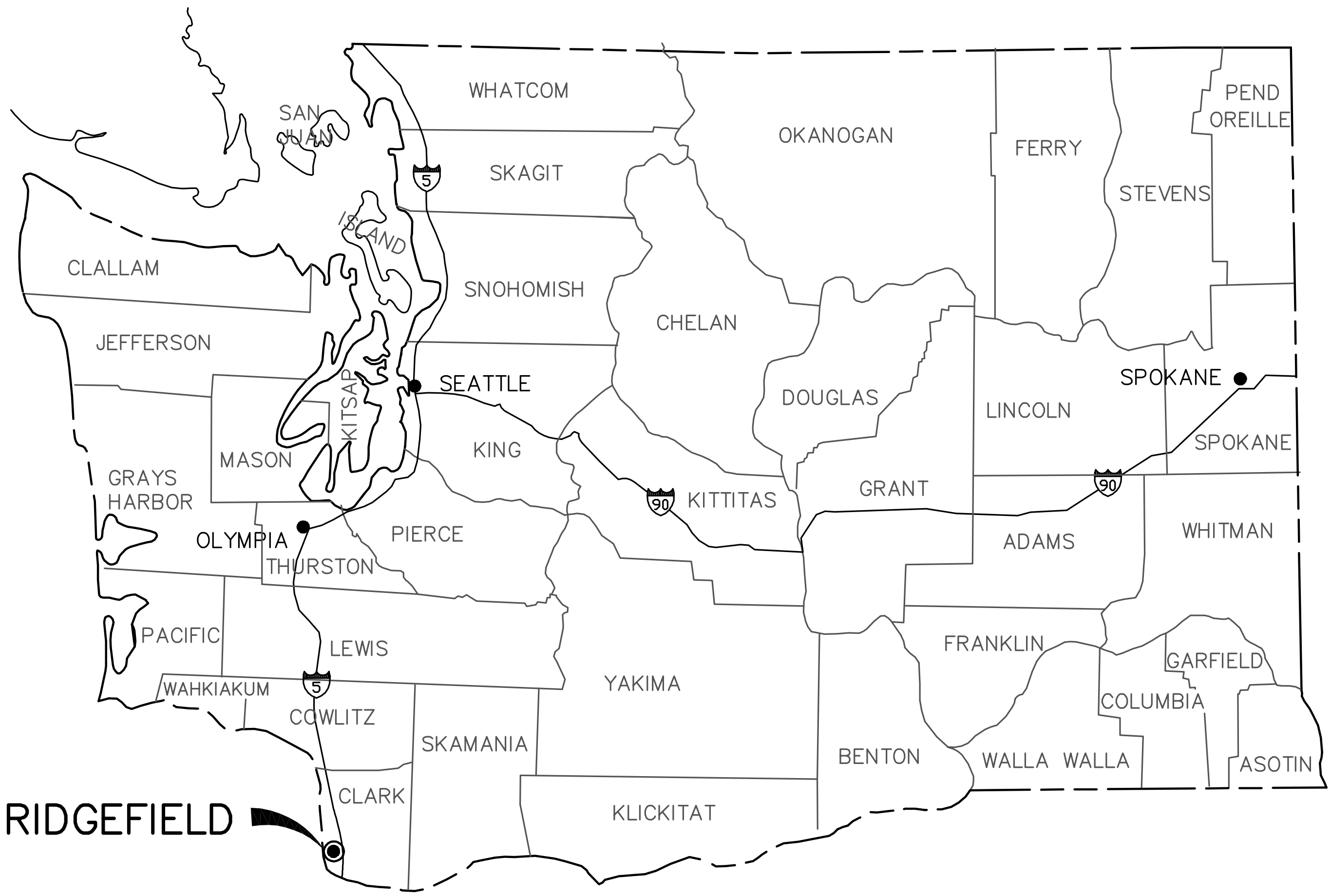
The City is governed by a City Council/City Manager form of government. The Public Works Department manages the sewer, water, road, and storm sewer systems. The City's contact information is listed as follows:

Steve Wall, P.E.	E-mail address:
Public Works Director	steve.wall@ci.ridgefield.wa.us
City of Ridgefield	
P.O. Box 608	Phone: (360) 887-3557
230 Pioneer Street	Fax: (360) 887-2507
Ridgefield, Washington 98642	

Existing Reports and Documents

The existing documents and reports that were reviewed in the preparation of this Plan include:

- *Wastewater Treatment Plant Operation and Maintenance Manual*, Gray & Osborne, Inc., March 2006.
- *City of Ridgefield Comprehensive Plan*, E2 Land Use Services, December 2010.



VICINITY MAP

NOT TO SCALE

CITY OF RIDGEFIELD

GENERAL SEWER PLAN

FIGURE 1–1

VICINITY MAP

Gray & Osborne, Inc.

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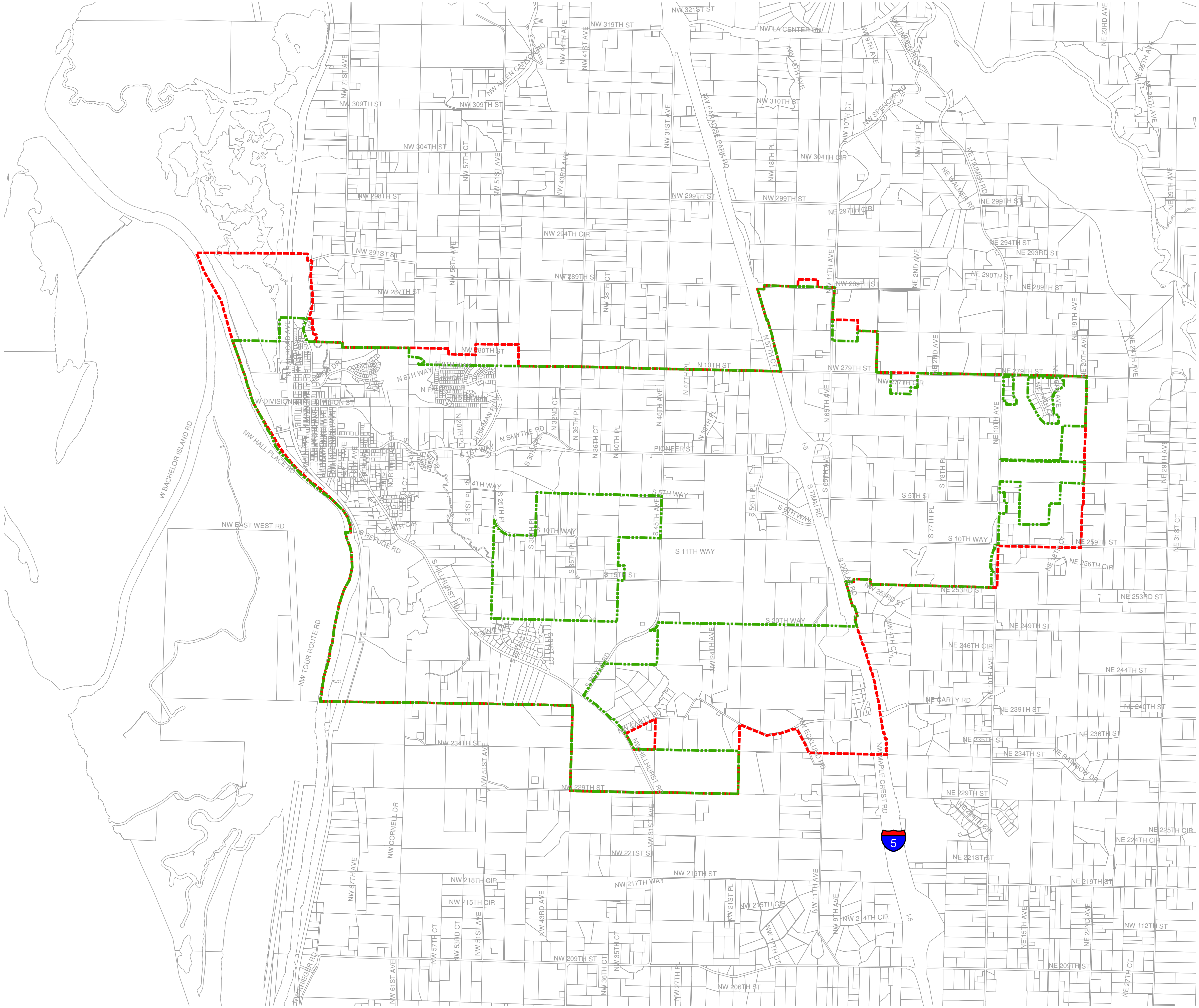

LEGEND:

CITY_LIMITS

UGA LIMITS

SOURCE: CLARK COUNTY GIS.

CITY OF RIDGEFIELD

GENERAL SEWER PLAN
FIGURE 1-2
RIDGEFIELD CITY AND UGA LIMITS

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- *2010 Capital Facility Plan Update, Sewer and Water Appendices*, Gray & Osborne, Inc., December 2010.
- *Memorandum of Understanding (MOU) Regarding Ridgefield Wastewater Collection System Transfer, May 2012.*
- *Amendment to MOU Ridgefield Wastewater Collection System Transfer, December 2012.*
- *Discovery Clean Water Alliance (DCWA) Interlocal Formation Agreement*, September 2012 and supporting documents.
- *Final Draft, City of Ridgefield and Clark Regional Wastewater District Collection System Transfer and Franchise Agreement, March 2013.*
- *DRAFT Discovery Corridor Wastewater Transmission System Engineering Report*, Otak, Inc., January 2013.

In addition, planning data such as urban growth maps, zoning maps, billing records, wastewater treatment plant (WWTP) discharge monitoring reports, and pertinent correspondence from the City of Ridgefield and Clark County were reviewed and incorporated in this Plan.

Existing System

The City owns and operates a municipal sewer system and wastewater treatment plant, with an outfall to Lake River. The sewer system serves residents, institutions, and businesses within City limits. The existing system consists of a sewage collection system and a secondary wastewater treatment plant. The collection system includes an older (1950s era) gravity system located in the Downtown core of the City plus a network of newer gravity lines, force mains, and pump stations expanding to the north, south, and east of the gravity system.

The original treatment plant was built in 1959. The most recent upgrade of the plant was completed in 2007. Secondary treatment is provided by an activated sludge plant with ultraviolet disinfection. Solids generated in the treatment process are disposed of by hauling to the Clark County Salmon Creek Wastewater Treatment Plant. Most of the laboratory analysis that is required for NPDES reporting is also performed at the Salmon Creek Plant.

The condition and capabilities of the City's collection and treatment system are discussed in greater detail in Chapters 5 and 7 of this Plan.

CRITICAL ISSUES AND PROBLEM AREAS

A number of critical issues and problem areas were identified in the development of this Plan. These issues and problem areas are summarized below.

TREATMENT AND DISPOSAL

Projected wastewater flows will exceed the capacity of the City's existing wastewater treatment plant in the near future. The City's WWTP is located on the western edge of Ridgefield. The WWTP is projected to exceed its design capacity within the next few years depending on the pace of development. The WWTP NPDES permit currently limits discharge to 0.7 mgd. However, the existing NPDES permit also contains provisions to increase capacity to 1.0 mgd following construction of additional improvements at the treatment plant.

The WWTP discharges into Lake River, a tributary of the Columbia River. Lake River is currently water quality listed by EPA on the 303 (d) list for temperature and fecal coliform water quality deficiencies. The sampling locations for this listing are upstream of the WWTP discharge into Lake River, however the Department of Ecology (Ecology) required the City to conduct receiving water quality and mixing zone studies in Lake River during the last 5-year NPDES permit cycle. Based on the results of these studies, an ammonia limit was added to the City's NPDES permit.

The 2010 Sewer Capital Facility Plan describes a potential phased expansion of the wastewater treatment plant, with the first phase designed for 1.0 MGD utilizing the existing outfall to Lake River. Subsequent phases would utilize an outfall to the Columbia River. The Capital Facility Plan identified the following potential phased expansion:

1. An upgrade to 1.0 mgd capacity utilizing Lake River as an outfall location.

2. An upgrade to 1.8 mgd capacity and construction of a new outfall to the Columbia River.

3. An upgrade to 2.7 mgd capacity.

4. An upgrade to 4.7 mgd capacity.

The maximum capacity of Lake River to receive WWTP effluent without violations of water quality standards affects the rated capacity of the treatment plant. A receiving water study conducted as part of the 2007 Wastewater Facility Plan demonstrated that Lake River can assimilate up to 1.0 mgd of nitrified effluent. To dispose of wastewater effluent beyond 1.0 mgd, the City of Ridgefield would need to extend an outfall to the Columbia River.

The Ridgefield National Wildlife Refuge is located between the City's WWTP and the Columbia River. The U.S. Fish and Wildlife Service has indicated that construction of an effluent pipe across the Refuge is not feasible because the pipeline is not a compatible use with the Refuge. To extend an outfall around the Refuge would require a pump station and 5-mile long pipeline. This project would be expensive and potentially have a long permitting timeframe.

The existing WWTP is adjacent to the Pacific Wood Treating hazardous waste cleanup site. Soil tests have identified industrial levels of wood preservative chemical contamination in the treatment plant soils. This soil condition is not a significant problem for the current site use, but this contamination will increase both the costs and regulatory complexity of expansion at the existing site.

Expansion of the existing WWTP beyond a capacity of approximately 1.8 mgd would require acquisition of additional property from the Port of Ridgefield. The Port of Ridgefield has indicated that expansion of the City's WWTP is not consistent with the Port's plans for the area.

Due to the issues and costs associated with long term expansion of the WWTP, the City has signed on as a founding member of the Discovery Corridor Wastewater Alliance (DCWA), and plans to transfer the ownership and operation of its treatment facility to this new regional wastewater treatment organization. This Plan documents the treatment and disposal alternatives evaluated by the City and provides a framework for moving forward with the preferred alternative.

COLLECTION SYSTEM

In previous plans, the downtown gravity collection system was identified as being in good condition. However, development to the east and north of downtown raised capacity concerns regarding the ability to transmit flow through the downtown collection system to the WWTP. This problem has been solved in part by adding pump stations and force mains that bypass the downtown collection system. As growth continues through the City and its urban growth area, additional sewers will need to be extended and additional lift stations and force mains brought on-line.

SYSTEM GROWTH AND FINANCIAL ISSUES

The City has experienced some significant fluctuations in the pace of development. In 2006, the City issued 188 building permits for new homes while the five year period from 2007 to 2011 only saw 276 new applications. In 2012, the City issued building permits for 122 new equivalent dwelling units. To account for this wide fluctuation in annual growth rates, growth projections in this plan have been made under Low, Medium, and High growth scenarios. In addition, the City has reevaluated and updated the System Development Charges (SDC) for utility hookups. Currently, the Sewer SDC is $7,700. An SDC of $10,090 has been adopted but has not yet been enacted.

At the end of 2010, the City had an outstanding debt of approximately $4.4 million from the 2002 and 2006 wastewater treatment plant upgrades and the T-7 Force main. Ridgefield will need to use a combination of additional debt, SDC revenues, increased customer rates, developer-constructed improvements and potential partnerships with other regional agencies to construct the improvements identified in this Plan that are necessary to accommodate projected growth in the Ridgefield area.

CHAPTER 2

SEWER SERVICE AREA

SEWER SERVICE AREA LOCATION

The sewer service area is located entirely within the current City limits in Clark County, Washington, as shown on Figure 2-1. Background information on the service area is presented below.

CLARK COUNTY

Clark County was established in 1849 and is situated in southwestern Washington. The County consists of 657 square miles and is ranked 35 smallest out of 39 counties for land area. The County boundaries are located about 130 miles southwest of Seattle, 100 miles south of Tacoma, 70 miles south of Olympia, and 1 mile north of Portland, Oregon. The County is bordered on the north by Cowlitz County, on the east by Skamania County and on the south and west by the Columbia River and the State of Oregon (as shown in Figure 1-1). Clark County is becoming increasingly urbanized, sharing rapid growth with the City of Portland. With an estimated year 2010 population of 435,600, Clark County is ranked 5th most populous out of the 39 Washington counties. The Washington State Office of Financial Management estimates the County's population will increase to between 493,000 to 674,000 by the year 2030. The largest City in the County is Vancouver, which also serves as County seat. The County also includes the incorporated Cities of La Center, Yacolt, Battle Ground, Camas, Washougal, and Ridgefield.

Clark County is located at the head of the navigable portion of the Columbia River, approximately 70 miles from the Pacific Ocean. The Columbia River forms the western and southern boundaries of the county and provides over 41 miles of river frontage. Urban Clark County is part of the northeast quadrant of the Portland, Oregon, metropolitan area. From an urban hub on the Columbia, the County spreads through a rapidly growing suburban band, across agricultural lands and a network of towns, to the slopes of the Cascade Mountain Range. It is compact, measuring approximately 25 miles across in either direction. The Columbia River and the Pacific Ocean exert a strong influence on the climate, economy, and recreational activities of the County. The Columbia is the only fresh-water harbor for ocean-going commerce on the entire West Coast of North America and the only water-grade route through the Cascade Range between Canada and California. The County has served deep-sea commerce since 1906.

Clark County lies within a geographic basin known as the Willamette-Puget Trough, formed by the Cascade and Pacific Coast Mountain Ranges. It is bounded on the south and west by the Columbia River, on the north by the Lewis River, and on the east by the foothills of the Cascades. Along the Columbia are low-lying bottomlands, from which a series of alluvial plains and terraces extend north and northeast. Land elevations rise from less than 10 feet on the south and west floodplains to over 3,000 feet above mean sea level (msl) in the eastern portion. The western half of Clark County lies at the junction of the Columbia River and Willamette Valleys and is comparatively level over the southern portion. While progressing northward and eastward, the terrain develops into rolling hills, culminating in the Cascade Range.

CITY OF RIDGEFIELD

The City of Ridgefield is located in southwestern Washington approximately 2 miles east of the Columbia River and 25 miles north of Portland, Oregon. Rolling hills and ravines surround the City. Lake River borders Ridgefield to the west and the existing City limits extend past I-5 to the east. Gee Creek is the main water body in the City service area. Elevations range from a maximum of approximately 300 feet msl on the west side of I-5 to a minimum of 0 feet msl at Lake River within the City limits.

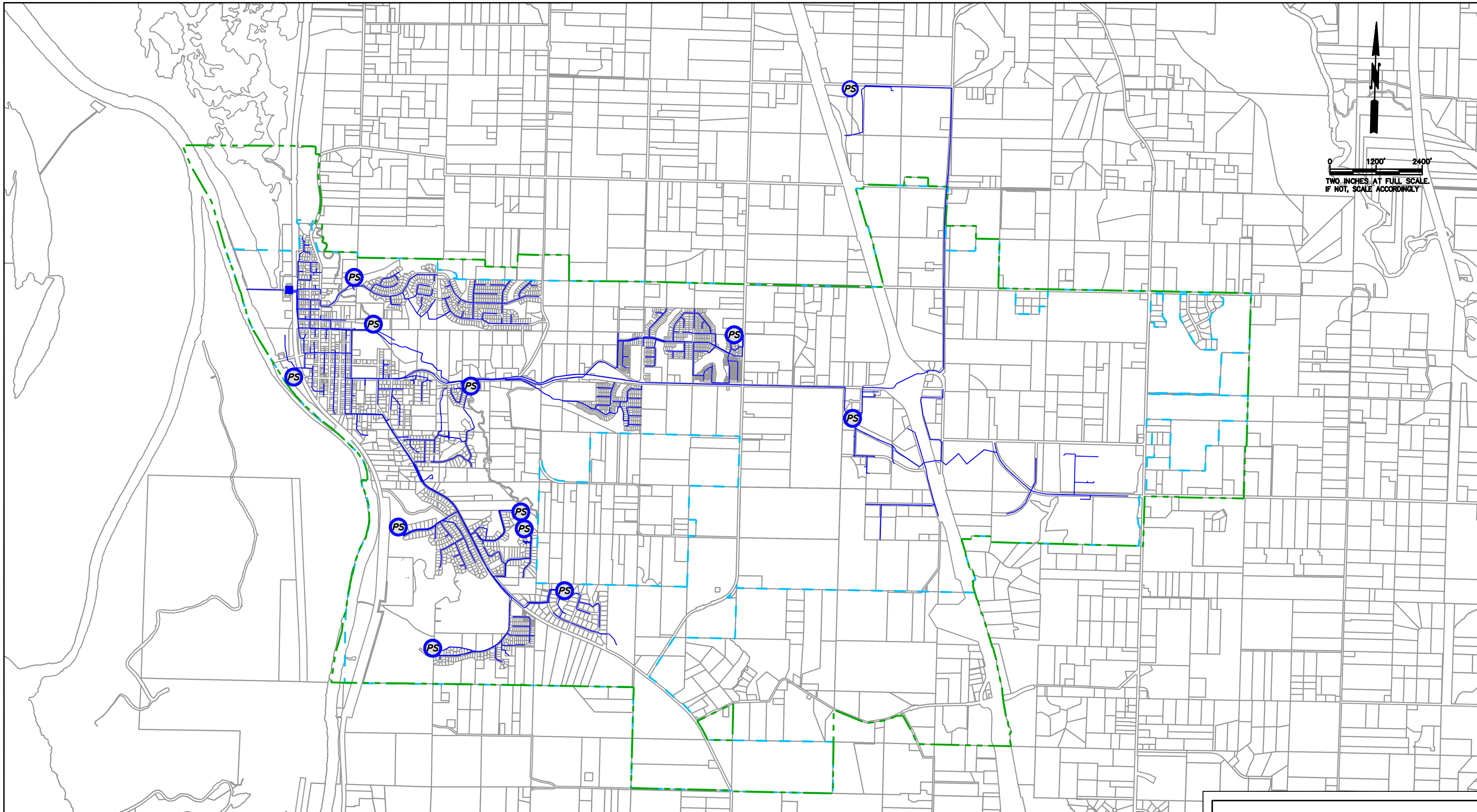
NATURAL FEATURES OF THE SEWER SERVICE AREA

Various natural features of the study area are discussed below, including climate and precipitation, geology, soils, topography, and site sensitive areas, such as floodplains, wetlands, surface and groundwater resources, and fish and wildlife habitat. The public utilities available in the area are also discussed.

CLIMATE AND PRECIPITATION

The climate of the City of Ridgefield is typical of that of the Pacific Northwest region between the Cascade Mountains and the Pacific Ocean. Winters are wet and mild and summers are relatively warm and dry. The mean annual temperatures range from 40.4 to 62 degrees Fahrenheit (F), with a minimum day temperature of -11 degrees F and a maximum day temperature of 107 degrees F. From June to September, temperatures typically range from 49.2 to 76.3 degrees F. Winter temperatures typically range from 32.7 to 47.4 degrees F.

Based on data from the NOAA weather station located in nearby Battle Ground, the City receives an average of 52.9 inches of rain per year. December is historically the wettest month, and July the driest. Table 2-1 shows precipitation data that were measured at the NOAA Battle Ground weather station for the years 1948 through 2003.



EXISTING URBAN GROWTH BOUNDARY
EXISTING RIDGEFIELD CITY LIMITS
EXISTING SEWER LINE
EXISTING SEWAGE TREATMENT PLANT
PS EXISTING PUMP STATION

CITY OF RIDGEFIELD

GENERAL SEWER PLAN
FIGURE 2-1
EXISTING SEWER SYSTEM

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TABLE 2-1

Monthly Average Precipitation in the Ridgefield Area, 1948 through 2003

Month	Average Monthly Precipitation (inches)
January	7.32
February	5.66
March	5.31
April	3.99
May	2.97
June	2.34
July	0.84
August	1.25
September	2.28
October	4.50
November	7.48
December	8.05
Average Annual Total[(1)]	**51.98**

(1) From averages of annual data, not the sum of the months in this table.

SOILS AND GEOLOGY

Geologic Areas

The underlying geology of Clark County is predominantly sedimentary and igneous rock approximately 10,000 feet deep from the Miocece-Pliocene period. The base soils were placed by the Columbia River Flood that resulted from the Lake Missoula ice dam flood that occurred in the late Pleistocene. The area has also been subject to more recent deposits of alluvium soils along stream courses such as Gee Creek and other streams in the area.

There are six soil series identified within the City of Ridgefield's sewer service area. These soils, shown on Figure 2-2, include Gee silt loams, Hillsboro silt loam, Sara silt loam, Sauvie silt loam, Cove silt clay loam, and Odne silt loam, and are further described below.

Gee Soil Series

Gee silt loam is the predominate soil series located throughout the City. Slopes are generally level or undulating ranging from 0 to 60 percent. The Gee series consists of deep, moderately well drained soils formed in old alluvium on dissected high terraces and terrace escarpments.

From 0 to 9 inches the soil is very dark grayish brown silt loam, grayish brown with a dry moderate coarse and medium granular structure. From 9 to 14 inches the soil is dark grayish brown silt loam with many coarse, medium, and fine pores. From 14 to 22 inches the soil is a mottled dark grayish brown and dark brown silt loam, light brownish gray. From 22 to 72 inches the soil is dark brown silty clay loam. These soils are usually moist but are dry for 45 to 60 consecutive days following summer solstice.

The soils are moderately well drained with slow runoff, moderate permeability in the upper horizons, and moderately slow grading to very slow in the lower horizon. The soil is used for woodland and cropland. Hay, pasture, and small grain are common crops. Native vegetation is Douglas fir, grand fir, western red cedar, and red alder with an understory of western swordfern, salal, Oregon grape, vine maple, and western brackenfern.

Hillsboro Soil Series

Hillsboro soils are found primarily in the older part of Ridgefield and appear to be associated largely with the drainages within the City. The soil slopes range from 0 to 65 percent. The series consists of deep, well drained soils that formed in mixed alluvium.

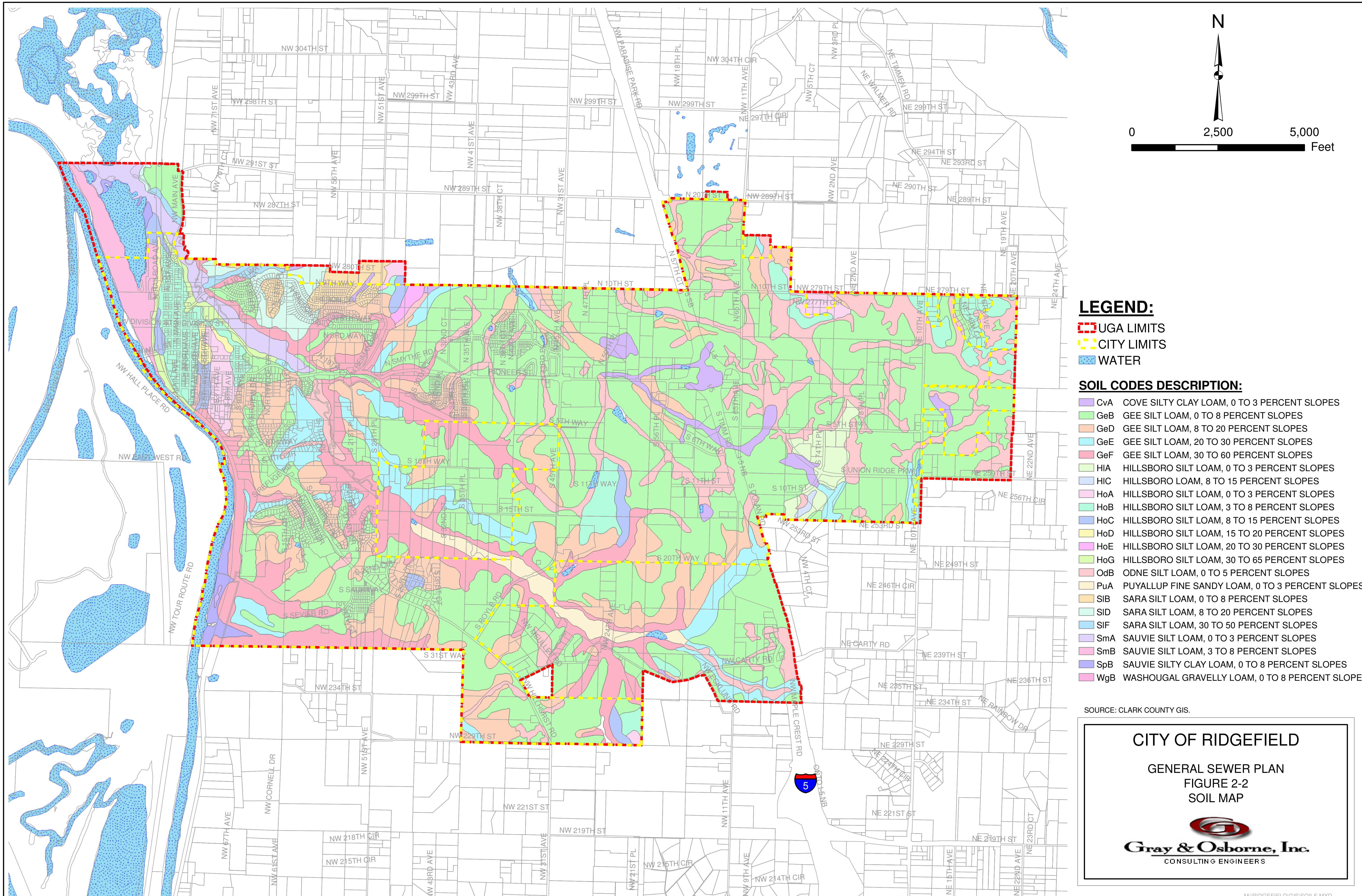
From 0 to 4 inches the soil is dark brown loam, with a fine subangular blocky structure and a slightly hard, friable, nonsticky, and nonplastic texture. From 4 to 11 inches the soil is dark brown loam with a moderate medium subangular blocky structure. From 11 to 81 inches the soil is a yellowish brown loam with a weak medium prismatic and weak medium subangular blocky structure.

The soils are usually moist but are dry throughout between depths of 4 and 12 inches for more than 45 consecutive days during the summer. Clay films are few to many and thin to moderately thick. Stratified lenses of loamy and sandy material occur below a depth of 40 inches.

The Hillsboro soils are on nearly level to gently undulating broad valley terraces with moderate to strongly sloping fronts at elevations of 160 to 240 feet. The soils formed in mixed, silty, and loamy old alluvium. The soils are well drained with slow to medium runoff and moderate permeability. The soils are used for orchards, berries, nursery stock, vegetables, small grain, hay, and pasture. Native vegetation is Douglas fir, hazelbrush, blackberries, grasses, and weeds.

Sara Soil Series

Sara soils are found along the northern edge of the City limits. The slope for this soil series ranges from 0 to 50 percent. The Sara series consists of very deep, moderately well drained soils formed in old alluvium on terraces and terrace escarpments.


N
0
2,500
5,000
Feet
LEGEND:
UGA LIMITS
CITY LIMITS
WATER
SOIL CODES DESCRIPTION:
CvA COVE SILTY CLAY LOAM, 0 TO 3 PERCENT SLOPES
GeB GEE SILT LOAM, 0 TO 8 PERCENT SLOPES
GeD GEE SILT LOAM, 8 TO 20 PERCENT SLOPES
GeE GEE SILT LOAM, 20 TO 30 PERCENT SLOPES
GeF GEE SILT LOAM, 30 TO 60 PERCENT SLOPES
HIA HILLSBORO SILT LOAM, 0 TO 3 PERCENT SLOPES
HIC HILLSBORO LOAM, 8 TO 15 PERCENT SLOPES
HoA HILLSBORO SILT LOAM, 0 TO 3 PERCENT SLOPES
HoB HILLSBORO SILT LOAM, 3 TO 8 PERCENT SLOPES
HoC HILLSBORO SILT LOAM, 8 TO 15 PERCENT SLOPES
HoD HILLSBORO SILT LOAM, 15 TO 20 PERCENT SLOPES
HoE HILLSBORO SILT LOAM, 20 TO 30 PERCENT SLOPES
HoG HILLSBORO SILT LOAM, 30 TO 65 PERCENT SLOPES
OdB ODNE SILT LOAM, 0 TO 5 PERCENT SLOPES
PuA PUYALLUP FINE SANDY LOAM, 0 TO 3 PERCENT SLOPES
SIB SARA SILT LOAM, 0 TO 8 PERCENT SLOPES
SID SARA SILT LOAM, 8 TO 20 PERCENT SLOPES
SIF SARA SILT LOAM, 30 TO 50 PERCENT SLOPES
SmA SAUVIE SILT LOAM, 0 TO 3 PERCENT SLOPES
SmB SAUVIE SILT LOAM, 3 TO 8 PERCENT SLOPES
SpB SAUVIE SILTY CLAY LOAM, 0 TO 8 PERCENT SLOPES
WgB WASHOUGAL GRAVELLY LOAM, 0 TO 8 PERCENT SLOPES
SOURCE: CLARK COUNTY GIS.
CITY OF RIDGEFIELD
GENERAL SEWER PLAN
FIGURE 2-2
SOIL MAP
Gray & Osborne, Inc.
CONSULTING ENGINEERS
M:\RIDGEFIELD\GIS\SOILS.MXD

From 0 to 5 inches the soil is a dark brown silt loam, brown with a moderate fine granular structure. From 5 to 10 inches the soil transitions to a moderate medium platy structure that is hard and slightly plastic. From 10 to 72 inches the soil is a dark grayish brown silty clay loam.

These soils are usually moist and have a perched water table during the winter and early spring, but are dry for 45 to 60 consecutive days following summer solstice. These soils formed in alluvium. The series is moderately well drained with slow to very rapid runoff and moderately slow permeability. A perched water table is as high as 1 to 2 feet from December to April. The soils are used mainly for hay, pasture, and small grain. Some strawberries and potatoes are grown. Native vegetation is Douglas fir, red alder, western red cedar, and big leaf maple, with an understory of salal, Oregon grape, western swordfern, western brackenfern, salmonberry, and Douglas spirea.

Sauvie Soil Series

Sauvie soils are found immediately adjacent to Lake River and run from 0 to 8 percent slopes. These areas will not be suitable for development of any kind. The Sauvie series consists of deep, poorly drained soils that formed mainly in alluvium. Throughout the soil cross section, the soil is a very dark grayish brown silty clay loam, grayish brown, dry, slightly sticky, and slightly plastic.

The soils are saturated with water from about December through June and are subject to freshwater overflow during high tides unless diked and artificially drained. The Sauvie soils are found on flood plains along the lower Columbia River and its tributaries. The soils are characterized by poor drainage, slow runoff, and moderately slow permeability. When diked and drained, the soils are used for improved hay and pasture, small grain, and truck corps. Areas outside of a dike are in native vegetation or used for hay and pasture and commercial waterfowl areas. The native vegetation is red alder, ash, willow, cottonwood, grasses, and tussocks.

Cove Silty Clay Loam Soil Series

Cove silty clay loam soil is found in a few isolated locations within the City. The slopes range from 0 to 3 percent. These locations are affiliated with isolated small wetlands and are not suitable for future development. The Cove series consists of very deep, poorly to very poorly drained soils that formed in mixed alluvium from sedimentary and basic igneous rocks. Throughout the cross section, the soil is a very dark gray silty clay loam with many fine distinct yellowish brown lenses and averages 50 to 60 percent clay with reddish brown masses of iron accumulation.

The Cove soils are on flood plains and low stream terraces. The soils formed in deep clayey recent alluvium washed mainly from areas underlain by sedimentary and basic igneous rocks. The soils are very poorly drained, slow to ponded runoff with very slow permeability. Common flooding for brief periods occurs from December to April. A high water table fluctuates between 0 and 1.0 foot from the soil surface from December to June. Most of these soils are cultivated. Most of the soil is in hay and pasture, and some spring grain is grown. Native vegetation is sedges, grasses and a few ash, willows, and other trees.

Odne Silt Loam Soils

Odne silt loam soil is generally found in concave areas in drainageways or depressions within areas of Gee soils. In most places the slope is 1 to 2 percent; some side slopes that lead into the drainageways are steeper. In a typical profile the surface layer is about 10-inches thick. It is mottled, dark-gray heavy silt loam in the upper part, and mottled, dark-gray silty clay loam in the lower part. The subsurface layer is firm, mottled, gray silt loam about 9-inches thick. The next 8 inches is very firm, mottled, dark-gray silty clay loam that overlies 6 inches of firm, mottled, dark-gray clay loam. Below this, to a depth of 50 inches, is mottled dark-gray loam. This soil is poorly drained and very slowly permeable. The compact subsoil limits effective root penetration to a depth of less than 30 inches.

TOPOGRAPHY

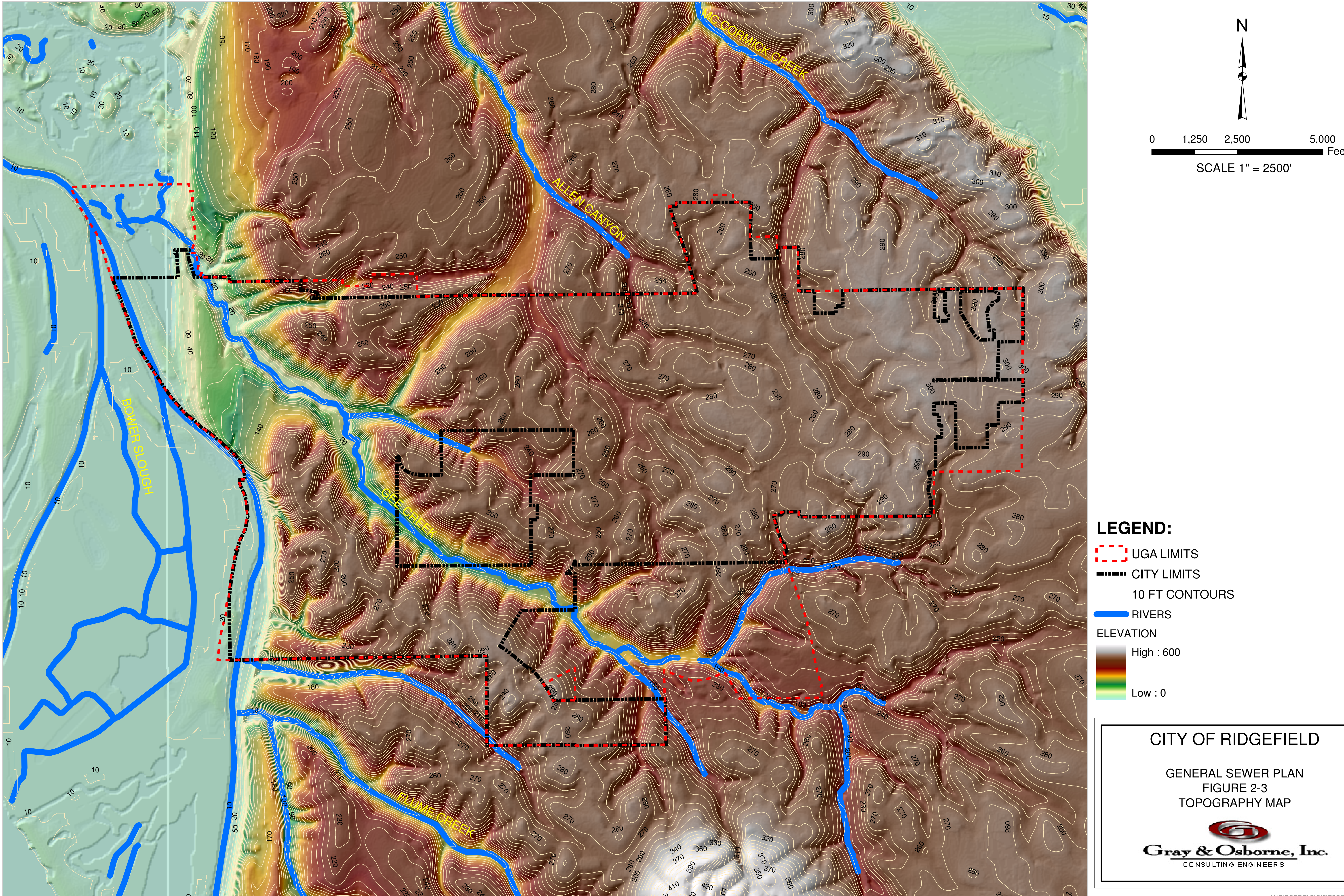
The City of Ridgefield is located on a series of ridges and hills that gradually descend from the east side of Interstate 5 to Lake River in the west. The highest point in the City is about 300 feet above mean sea level (msl) and the lowest point within City limits is at sea level (Lake River). The City's WWTP is located near Lake River and at the edge of the Ridgefield National Wildlife Refuge. The outfall discharges into Lake River at a location east of the treatment plant. Figure 2-3 provides a topographic overlay of the City.

SITE SENSITIVE AREAS

Site sensitive areas within the sewer service area include those classified as seismic hazard areas, flood hazard areas, wetlands, and surface waters.

Seismic Hazard Areas

Seismic hazard areas are those with low density soils (unconsolidated sediments) that are more likely to experience greater damage due to seismic-induced subsidence, liquefaction, or landslides. Seismic hazard areas are regulated mainly with respect to public safety and with the exception of potential damage due to an earthquake, these hazard areas do not impact wastewater facilities or natural resources. After an earthquake, there could be considerable damage to sewers and lift stations in some areas that might experience very severe earth movement. Earthquake areas of concern are identified in Figure 2-4.



CITY OF RIDGEFIELD

GENERAL SEWER PLAN
FIGURE 2-3
TOPOGRAPHY MAP

Gray & Osborne, Inc.
CONSULTING ENGINEERS

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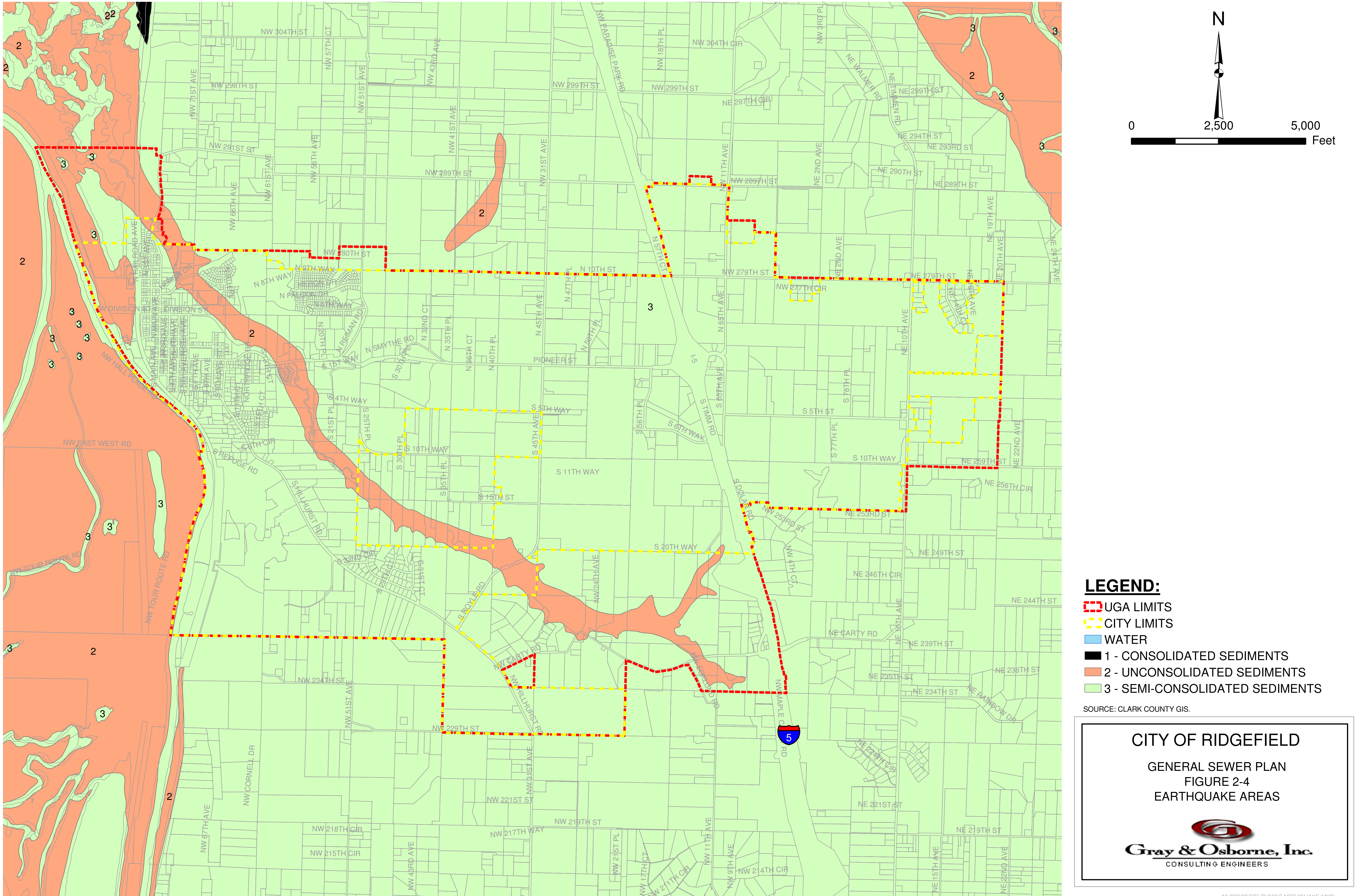


LEGEND:

- UGA LIMITS
- CITY LIMITS
- WATER
- 1 - CONSOLIDATED SEDIMENTS
- 2 - UNCONSOLIDATED SEDIMENTS
- 3 - SEMI-CONSOLIDATED SEDIMENTS

SOURCE: CLARK COUNTY GIS.

CITY OF RIDGEFIELD

GENERAL SEWER PLAN
FIGURE 2-4
EARTHQUAKE AREAS

Gray & Osborne, Inc.
CONSULTING ENGINEERS

M:\RIDGEFIELD\GIS\EARTHQUAKE.MXD

Landslides are a particular concern in unstable areas such as those identified in Figure 2-5. These locations are along the steep slopes affiliated with the ravines on either side of Gee Creek and other drainages in Ridgefield.

Flood Hazard Areas

Flood hazard areas are areas adjacent to lakes, rivers, and streams that are prone to flooding during peak runoff periods. Flood hazard areas deserve special attention due to the sensitive nature of their ecosystems as well as the potential for damage to structures located within the floodplain.

Construction of buildings and other development in flood hazard areas is regulated in accordance with the County's flood hazard construction standards. Typically, construction in flood hazard areas is not allowed or is limited to specific activities. Allowed activities might be mining or gravel extraction, recreational uses, repair to existing structures, utility and road construction or uses dependent upon water such as docks, wharves, and boating activities.

The 100-year and 500-year floodplains in the vicinity of Ridgefield are shown on Figure 2-6. The floodplains are associated with Lake River and Gee Creek. The City's wastewater treatment plant is located adjacent to Lake River but is situated above the 100-year flood plain.

Wetlands

Wetlands are defined by EPA as areas that are inundated with water for at least part of the year. The U.S. Fish and Wildlife Service defines wetlands as those areas that have characteristics such as hydrophyte plants, hydric soils, and frequent flooding. Wetlands support valuable and complex ecosystems and consequently development is severely restricted if not prohibited in most wetlands. The Clark County Wetlands Inventory map (Figure 2-7) identifies small wetlands scattered throughout Ridgefield. The wetlands are usually affiliated with the drainages that define the ridges with the City. In addition, there is a large area of wetlands affiliated with the Ridgefield National Wildlife Refuge on the western edge of the City. Ridgefield has Lacustrine, Palustrine and Riverine wetlands within City limits.

Surface Waters and Drainage Basins

Lakes and streams are classified as sensitive areas due to the variety of plants and animals they support. The primary surface water features within or near the City of Ridgefield sewer service area are Lake River and Gee Creek. Lake River, a tributary of the Columbia River, defines the western edge of the City. Gee Creek bisects the western third of the City. Figure 2-8 shows the drainage basins around the City of Ridgefield. The East Fork drainage refers to the East Fork of the Lewis River, which is located to the north of the City. The Salmon drainage refers to the Salmon Creek/Lake River drainage located to the south and east of the City. Salmon Creek is tributary to Lake River and all three water bodies are part of the Columbia River estuary.

Groundwaters and Recharge Areas

The aquifers in and around Ridgefield are highly productive, providing a large volume of potable water for the area. Figure 2-9 identifies the category one and two aquifer recharge areas in the Ridgefield area. The more western recharge area is affiliated with the City's water production wells located in Abrams Park.

Fish and Wildlife Habitat

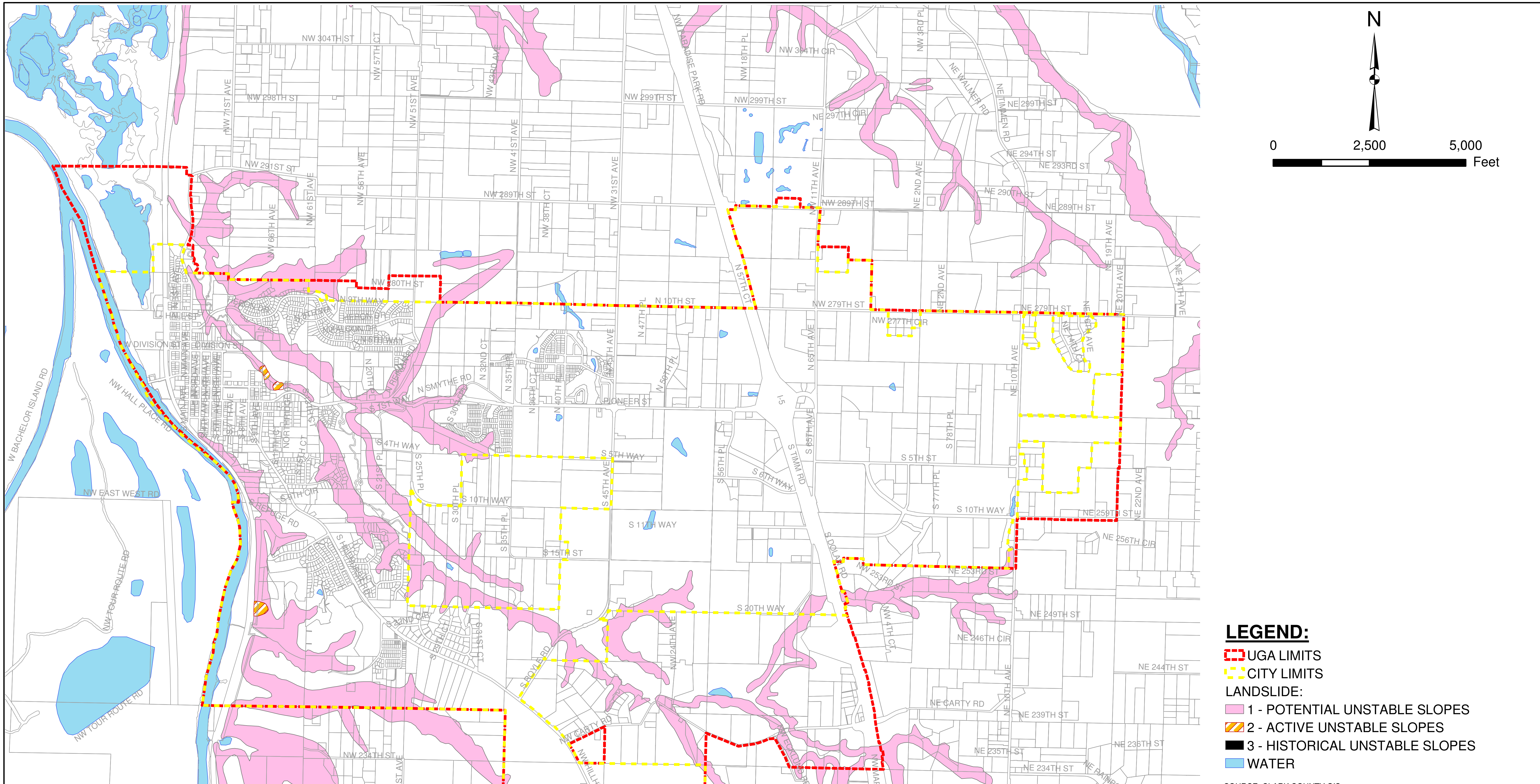
Fish and wildlife habitat is defined as areas essential for maintaining specifically listed species in suitable habitats. This definition was provided in "Fish and Wildlife Habitat Critical Area" section of WAC 365-190-080(5). The WAC further states that any proposed activity within 300 feet of these areas requires the preparation of a habitat assessment. This assessment is circulated to all the appropriate agencies for review. After agency review, a Habitat Management Plan may be required that would address the impacts the project would have on habitat, provide background information of specific species, and recommend protection and mitigation measures for those species.

After project implementation, an assessment and evaluation of the success of the identified measures is required. This plan is again circulated to the appropriate agencies for review. Minimum buffers from the critical habitat area may be required. As the main watercourses in the area, the habitat and water quality in Gee Creek and adjacent to Lake River are of particular concern. Figure 2-10 provides the sensitive and critical areas for the City of Ridgefield.

VEGETATION

Much of the land within the City has been cleared for agricultural purposes. Native vegetation remains in the Gee Creek drainage and in other locations such as steep hillsides and ravines where farming was impractical. The eastern side of the City is largely in grass pasture or blackberries where farming has been discontinued.

The dominant tree species in the Ridgefield area includes conifers such as Douglas fir, western red cedar, and western hemlock. Pacific red alder, big leaf maple, and other deciduous trees make up a significant portion of the second and third growth forests along with native conifer species. Dense brush grows on both unstable and stable areas and consists predominantly of blackberries, huckleberries, salal, and various fern species. The dense forest and brush cover mediates runoff and provides for uptake of water. On individual residential lots, the vegetation varies from dense forest on larger lots, to grass lawns, landscaping with shrubs, and ornamental trees.



CITY OF RIDGEFIELD

GENERAL SEWER COMPREHENSIVE PLAN / FACILITY PLAN
FIGURE 2-5
LANDSLIDE AREAS

Gray & Osborne, Inc.
CONSULTING ENGINEERS

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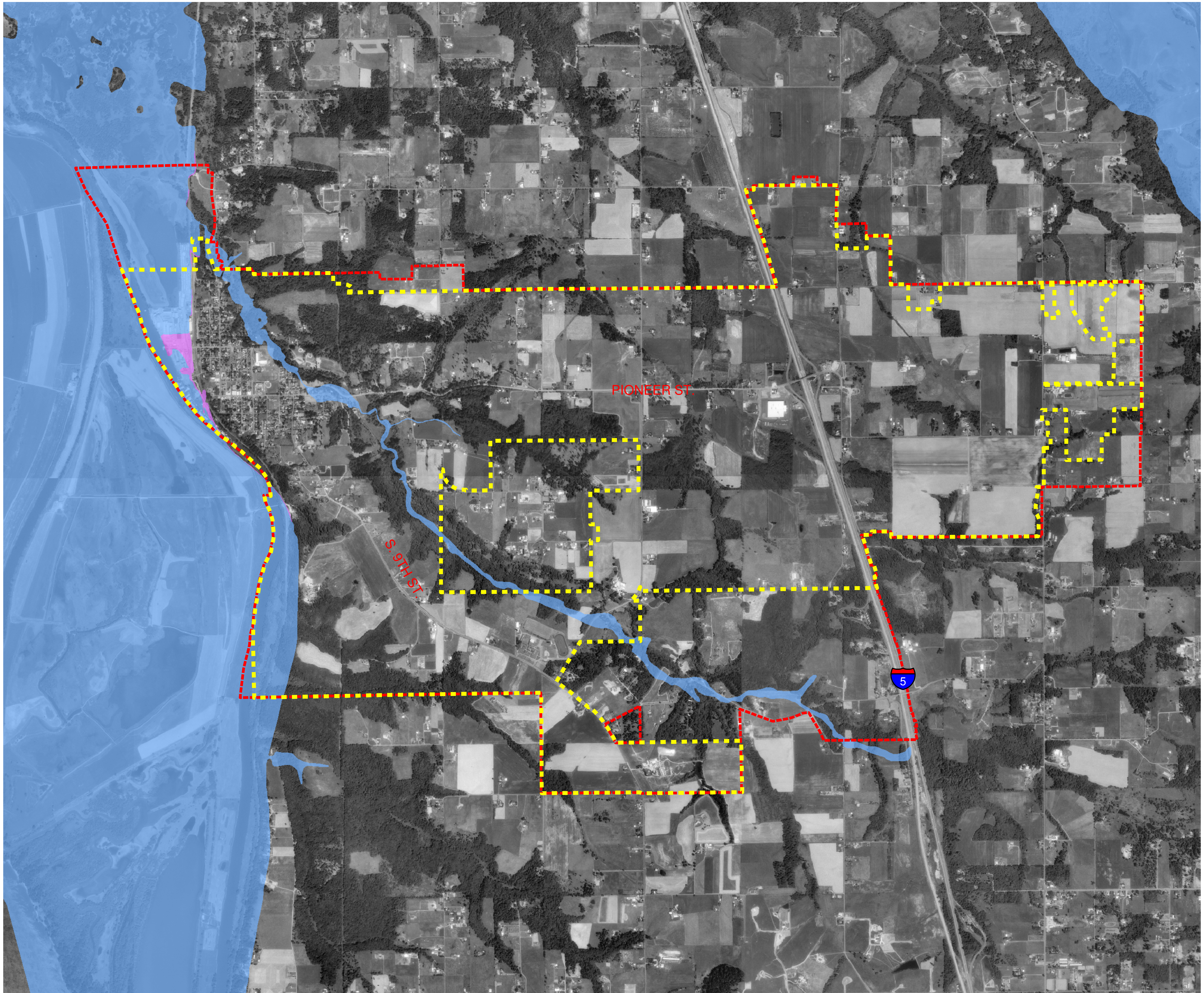

N

0 2,500 5,000 Feet

LEGEND:

CITY LIMITS

UGA LIMITS

FEMA FLOOD ZONES:

A - AN AREA INUNDATED BY 100 YEAR FLOODING, FOR WHICH NO BFE'S HAVE BEEN ESTABLISHED

X500 - AN AREA INUNDATED BY 500 YEAR FLOODING; AN AREA INDUNDATED BY 100-YEAR FLOODING WITH AVERAGE DEPTHS OF LESS THAN 1 FOOT OR WITH DRAINAGE AREAS LESS THAN 1 SQUARE MILE; OR AN AREA PROTECTED BY LEVEES FROM 100 YEAR FLOODING

CITY OF RIDGEFIELD

GENERAL SEWER PLAN
FIGURE 2-6
FLOODPLAIN MAP

Gray & Osborne, Inc.
CONSULTING ENGINEERS

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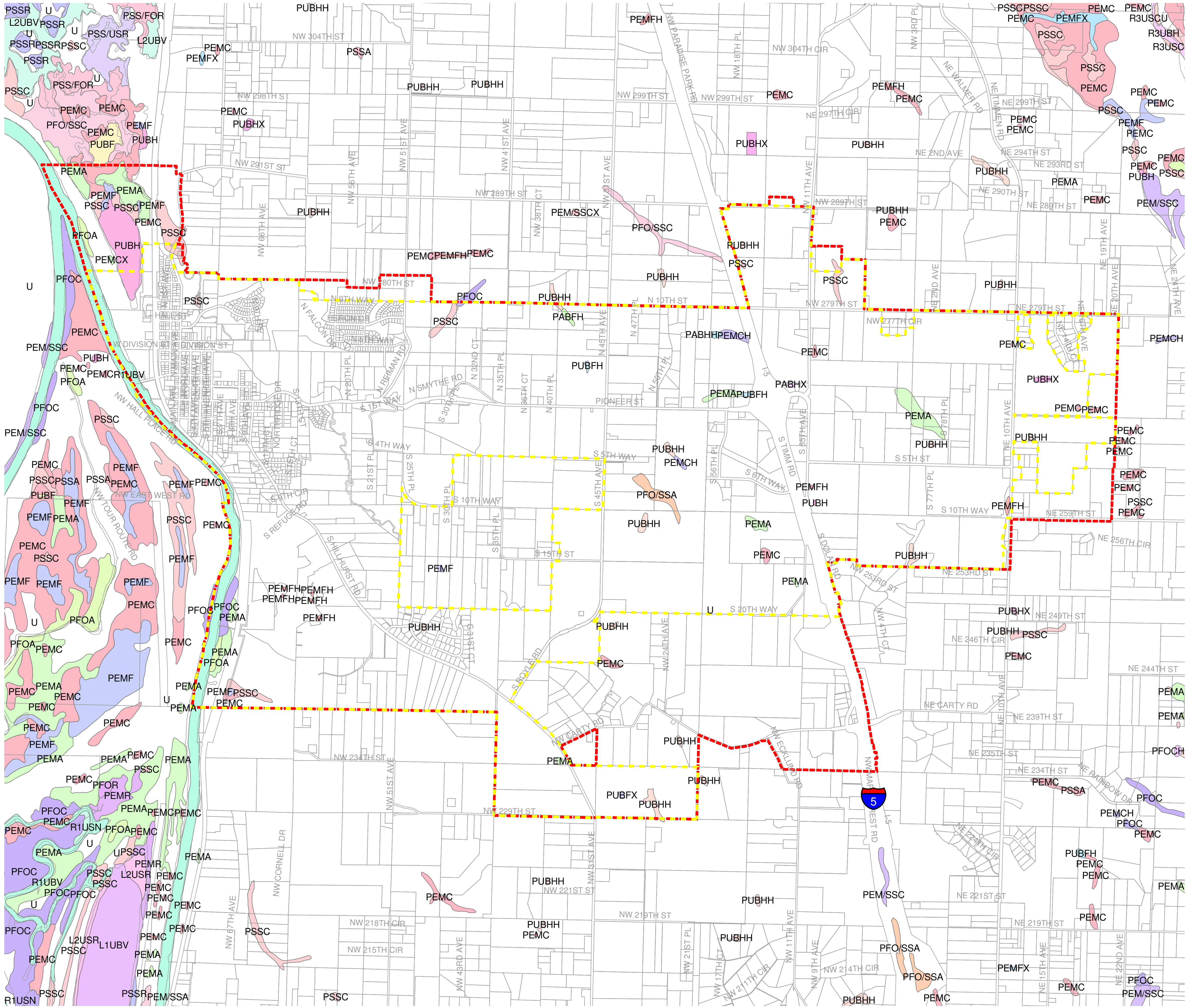

N

0 2,500 5,000 Feet

LEGEND:

CITY LIMITS

UGA LIMITS

WETLAND CODES DESCRIPTION:

L1UBV - [L] Lacustrine, [1] Limnetic, [UB] Unconsolidated Bottom, [V] Permenant-Tidal

L2UBV - [L] Lacustrine, [2] Littoral, [UB] Unconsolidated Bottom, [V] Permenant-Tidal

L2USR - [L] Lacustrine, [2] Littoral, [US] Unconsolidated Shore, [R] Seasonal-Tidal

PABFh - [P] Palustrine, [AB] Aquatic Bed, [F] Semipermanently Flooded, [h] Diked/Impounded

PABh - [P] Palustrine, [AB] Aquatic Bed, [h] Diked/Impounded

PABHx - [P] Palustrine, [AB] Aquatic Bed, [H] Permanently Flooded, [x] Excavated

PEM/FOR - [P] Palustrine, [EM] Emergent / , [FO] Forested, [R] Seasonal-Tidal

PEM/SSA - [P] Palustrine, [EM] Emergent / , [SS] Scrub-Shrub, [A] Temporarily Flooded

PEM/SSC - [P] Palustrine, [EM] Emergent / , [SS] Scrub-Shrub, [C] Seasonally Flooded

PEM/SSCx - [P] Palustrine, [EM] Emergent / , [SS] Scrub-Shrub, [C] Seasonally Flooded, [x] Excavated

PEMA - [P] Palustrine, [EM] Emergent, [A] Temporarily Flooded

PEMC - [P] Palustrine, [EM] Emergent, [C] Seasonally Flooded

PEMCh - [P] Palustrine, [EM] Emergent, [C] Seasonally Flooded, [h] Diked/Impounded

PEMCx - [P] Palustrine, [EM] Emergent, [C] Seasonally Flooded, [x] Excavated

PEMF - [P] Palustrine, [EM] Emergent, [F] Semipermanently Flooded

PEMFh - [P] Palustrine, [EM] Emergent, [F] Semipermanently Flooded, [h] Diked/Impounded

PEMFx - [P] Palustrine, [EM] Emergent, [F] Semipermanently Flooded, [x] Excavated

PEMR - [P] Palustrine, [EM] Emergent, [R] Seasonal-Tidal

PFO/SSA - [P] Palustrine, [FO] Forested / , [SS] Scrub-Shrub, [A] Temporarily Flooded

PFO/SSC - [P] Palustrine, [FO] Forested / , [SS] Scrub-Shrub, [C] Seasonally Flooded

PFOA - [P] Palustrine, [FO] Forested, [A] Temporarily Flooded

PFOC - [P] Palustrine, [FO] Forested, [C] Seasonally Flooded

PFOR - [P] Palustrine, [FO] Forested, [R] Seasonal-Tidal

PSS/FOR - [P] Palustrine, [SS] Scrub-Shrub / , [FO] Forested, [R] Seasonal-Tidal

PSS/USR - [P] Palustrine, [SS] Scrub-Shrub / , [US] Unconsolidated Shore, [R] Seasonal-Tidal

PSSA - [P] Palustrine, [SS] Scrub-Shrub, [A] Temporarily Flooded

PSSC - [P] Palustrine, [SS] Scrub-Shrub, [C] Seasonally Flooded

PSSR - [P] Palustrine, [SS] Scrub-Shrub, [R] Seasonal-Tidal

PUBF - [P] Palustrine, [UB] Unconsolidated Bottom, [F] Semipermanently Flooded

PUBFh - [P] Palustrine, [UB] Unconsolidated Bottom, [F] Semipermanently Flooded, [h] Diked/Impounded

PUBFx - [P] Palustrine, [UB] Unconsolidated Bottom, [F] Semipermanently Flooded, [x] Excavated

PUBh - [P] Palustrine, [UB] Unconsolidated Bottom, [h] Diked/Impounded

PUBHh - [P] Palustrine, [UB] Unconsolidated Bottom, [H] Permanently Flooded, [h] Diked/Impounded

PUBHx - [P] Palustrine, [UB] Unconsolidated Bottom, [H] Permanently Flooded, [x] Excavated

R1UBV - [R] Riverine, [1] Tidal, [UB] Unconsolidated Bottom, [V] Permenant-Tidal

R3UBH - [R] Riverine, [3] Upper Perennial, [UB] Unconsolidated Bottom, [H] Permanently Flooded

R3USC - [R] Riverine, [3] Upper Perennial, [US] Unconsolidated Shore, [C] Seasonally Flooded

SOURCE: CLARK COUNTY GIS.

CITY OF RIDGEFIELD

GENERAL SEWER PLAN
FIGURE 2-7
WETLANDS MAP

Gray & Osborne, Inc.
CONSULTING ENGINEERS

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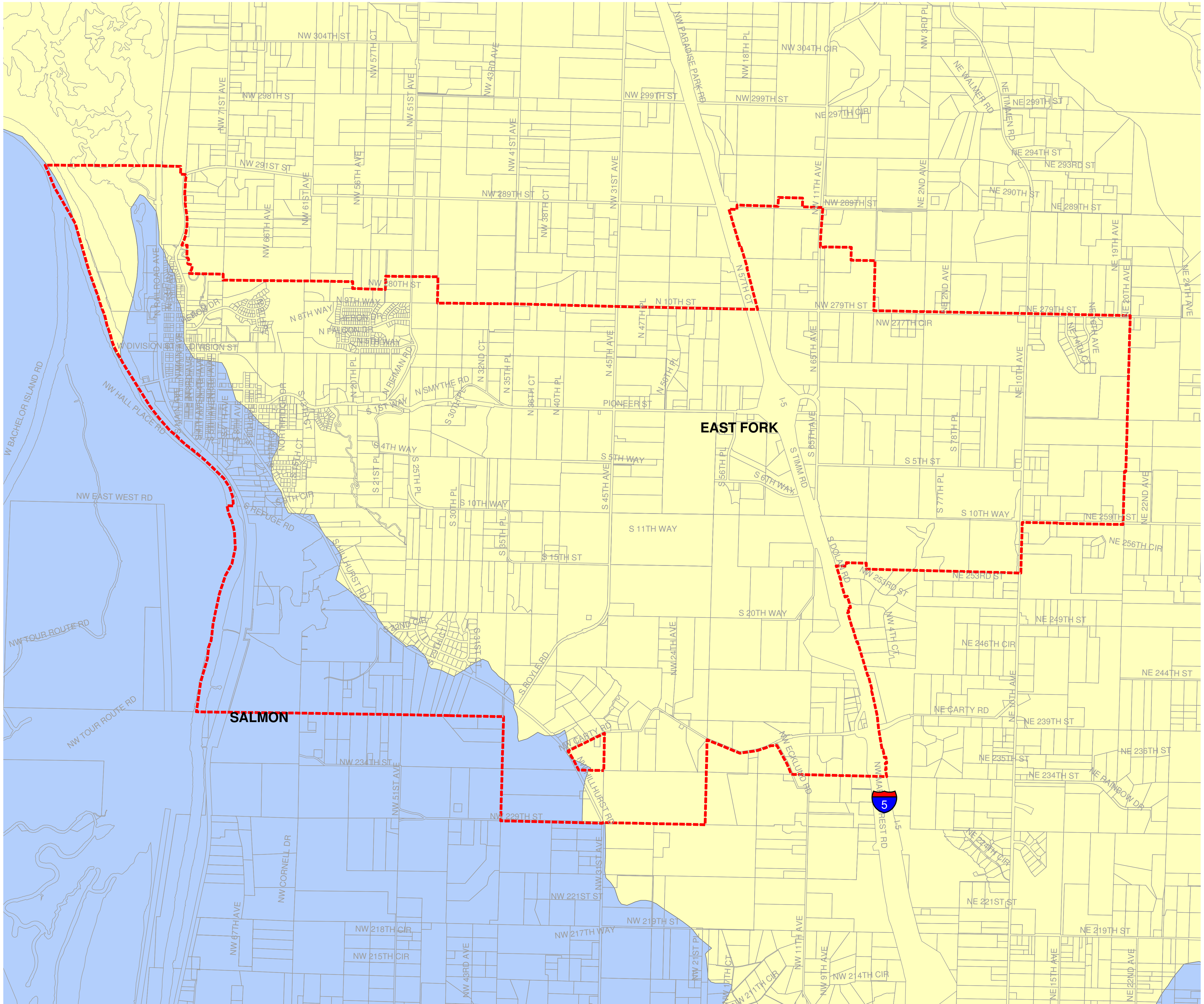

N

0 2,500 5,000 Feet

LEGEND:

UGA LIMITS

CITY LIMITS

BASINS:

EAST FORK

SALMON

SOURCE: CLARK COUNTY GIS.

CITY OF RIDGEFIELD

GENERAL SEWER PLAN
FIGURE 2-8
BASINS MAP

Gray & Osborne, Inc.
CONSULTING ENGINEERS

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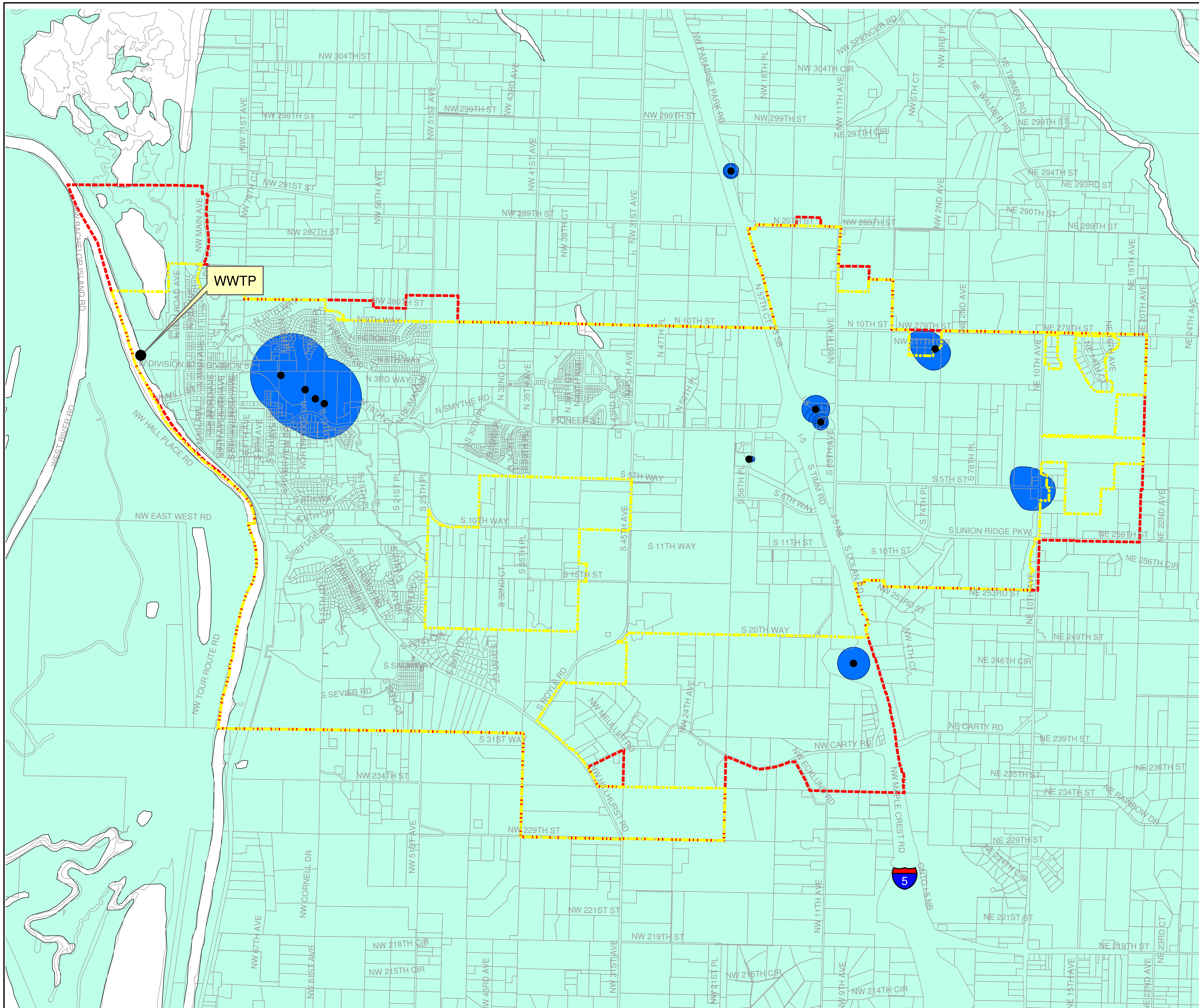

N

0 2,500 5,000 Feet

LEGEND:

- UGA LIMITS
- CITY LIMITS
- WELLS
- 1 - CATEGORY 1 RECHARGE AREAS
- 2 - CATEGORY 2 RECHARGE AREAS

SOURCE: CLARK COUNTY GIS.

CITY OF RIDGEFIELD

GENERAL SEWER PLAN
FIGURE 2-9
WELLS AND AQUIFIER MAP

Gray & Osborne, Inc.
CONSULTING ENGINEERS

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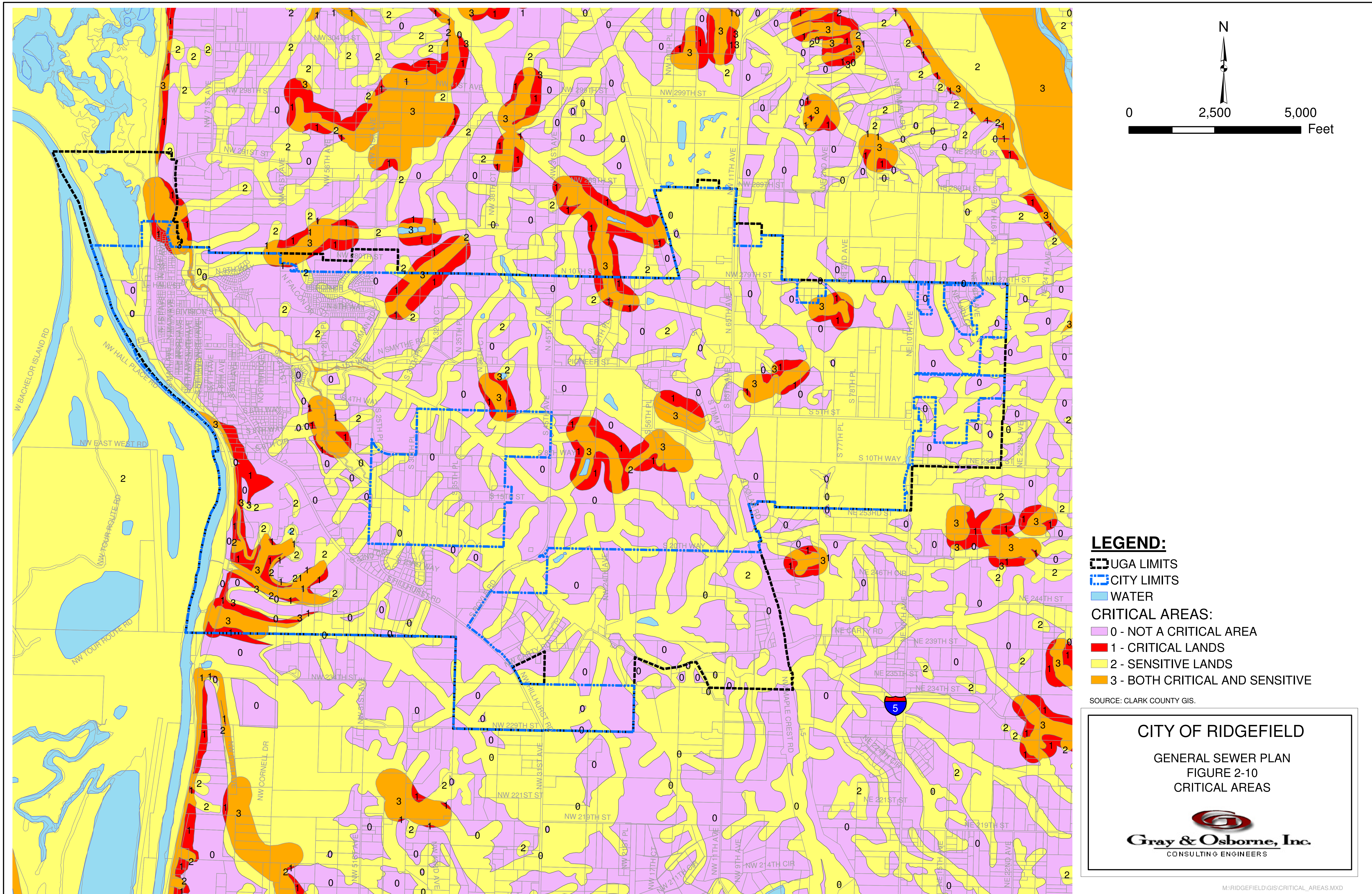

N
0 2,500 5,000 Feet
LEGEND:
UGA LIMITS
CITY LIMITS
WATER
CRITICAL AREAS:
0 - NOT A CRITICAL AREA
1 - CRITICAL LANDS
2 - SENSITIVE LANDS
3 - BOTH CRITICAL AND SENSITIVE
SOURCE: CLARK COUNTY GIS.
CITY OF RIDGEFIELD
GENERAL SEWER PLAN
FIGURE 2-10
CRITICAL AREAS
Gray & Osborne, Inc.
CONSULTING ENGINEERS
M:\RIDGEFIELD\GIS\CRITICAL_AREAS.MXD

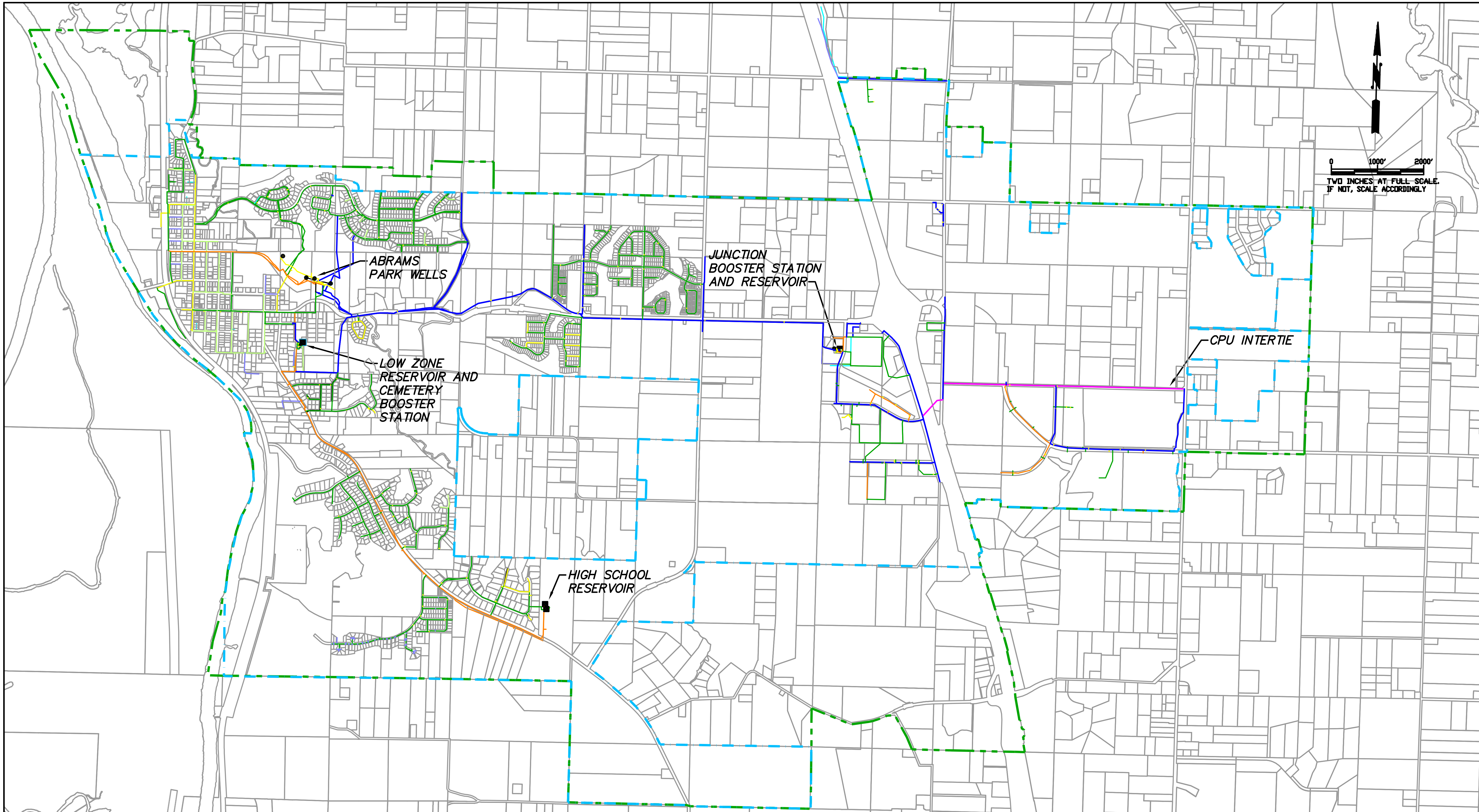
PUBLIC UTILITIES

Public utilities in the City of Ridgefield area include water, sewer, power, natural gas, and telephone. CenturyLink provides the telephone service to the area and Clark Public Utilities provides electrical power to this area. Natural gas is provided by Northwest Natural Gas.

The City of Ridgefield provides water service within the City limits. Some homes in the less developed areas of the City are still on individual wells, but they are expected to eventually tie into the City water system as the system expands. Clark Public Utilities (CPU) provides water service immediately to the east of the City limits and to the Tri Mountain Golf Course located to the northeast of the City. Figure 2-11 shows the water system for the City of Ridgefield. The existing WWTP is not within 3,000 feet of any public or private well. All public water supplies are shown on Figure 2-11. The City maintains a network of water distribution facilities designed to have minimum separation per the Department of Ecology's Criteria for Sewage Works Design.

ADJACENT WASTEWATER SERVICES

There are several providers of wastewater collection and treatment services within 20 miles of the City of Ridgefield's WWTP. La Center is approximately 2.7 miles to the northeast of Ridgefield and the Salmon Creek WWTP is approximately 10 miles south of Ridgefield. Salmon Creek WWTF is operated by Clark County and treats wastewater from the City of Battle Ground and Clark Regional Wastewater District that serves the north end of unincorporated Clark County and the Hazel Dell area. Marine Park WWTF is southeast of Ridgefield and so is the City of Vancouver's South WWTF and Water Reclamation Facility. The Cities of Kalama and Woodland are also within 20 miles of the City of Ridgefield. There are no industrial WWTFs within the direct vicinity of the City of Ridgefield, although there are likely industrial WWTFs in Vancouver, Washington.



EXISTING URBAN GROWTH BOUNDARY
EXISTING RIDGEFIELD CITY LIMITS

LESS THAN 3" EXISTING WATER LINE
3" EXISTING WATER LINE
4" EXISTING WATER LINE
6" EXISTING WATER LINE
8" EXISTING WATER LINE
10" EXISTING WATER LINE
12" EXISTING WATER LINE
14" AND GREATER EXISTING WATER LINE
EXISTING WELL
EXISTING RESERVOIR

CITY OF RIDGEFIELD
GENERAL SEWER PLAN
FIGURE 2-11
WATER SYSTEM FACILITIES

Gray & Osborne, Inc.
CONSULTING ENGINEERS

CHAPTER 3

LAND USE AND PLANNING CRITERIA

INTRODUCTION

The configuration of a wastewater system is influenced by land use, development trends and timing, regulatory requirements, the location of other utility systems, growth management, and topography. This Plan will develop a logical system of facilities to serve the City of Ridgefield based on topography, the drainage characteristics of the area, Urban Growth Area (UGA) considerations, and the City's growth objectives as set forth in the 2010 *Comprehensive Plan.*

BACKGROUND

The City of Ridgefield was originally situated along the shoreline of Lake River. The primary employer for the community was Pacific Wood Treating, a riverside industry that provided treated wood products to various national and international markets. Pacific Wood Treating ceased operations in the 1970s. After a decade of low growth, the City of Ridgefield has become a rapidly growing community with residential, commercial, and industrial sources of wastewater. The City also has an elementary school, middle school, and high school. Much of the recent growth has derived from the housing and commercial markets that have reached the capacity limits in the UGAs for the larger communities of Portland and Vancouver. These markets have now moved north to the City of Ridgefield.

RELATED PLANNING DOCUMENTS

The following plans and reports were used in the preparation of this Chapter.

- *City of Ridgefield Comprehensive Plan, 2010*
- *City of Ridgefield Sewer Capital Facilities Plan, 2010*
- *Tables, Documents and other data associated with the formation of the Discovery Clean Water Alliance (DCWA)*

GROWTH MANAGEMENT

The City of Ridgefield Comprehensive Plan was updated in 2010 and meets the requirements of the State Growth Management Act. The boundaries for the current UGA and City limits are provided in Figure 3-1.

STUDY AREA

The study area consists of the City's UGA. The City can be described as consisting of several subareas that will be impacted by future growth. The first subarea is the downtown area adjacent to Lake River which consists of the oldest part of the community. This area is largely built out, and is served by an existing gravity collection system. The second subarea is the land to the southeast of the City, and on the east and west sides of Hillhurst Drive. This area is zoned to become largely residential. The third subarea is to the east and northeast of the City and this area will also be largely residential. The fourth subarea consists of the commercial/industrial zoned areas located east of the City and adjacent to Interstate 5. This part of the City is typically identified as the "Junction" area and the zoning in this area is intended to attract family wage jobs to the City.

PLANNING PERIOD

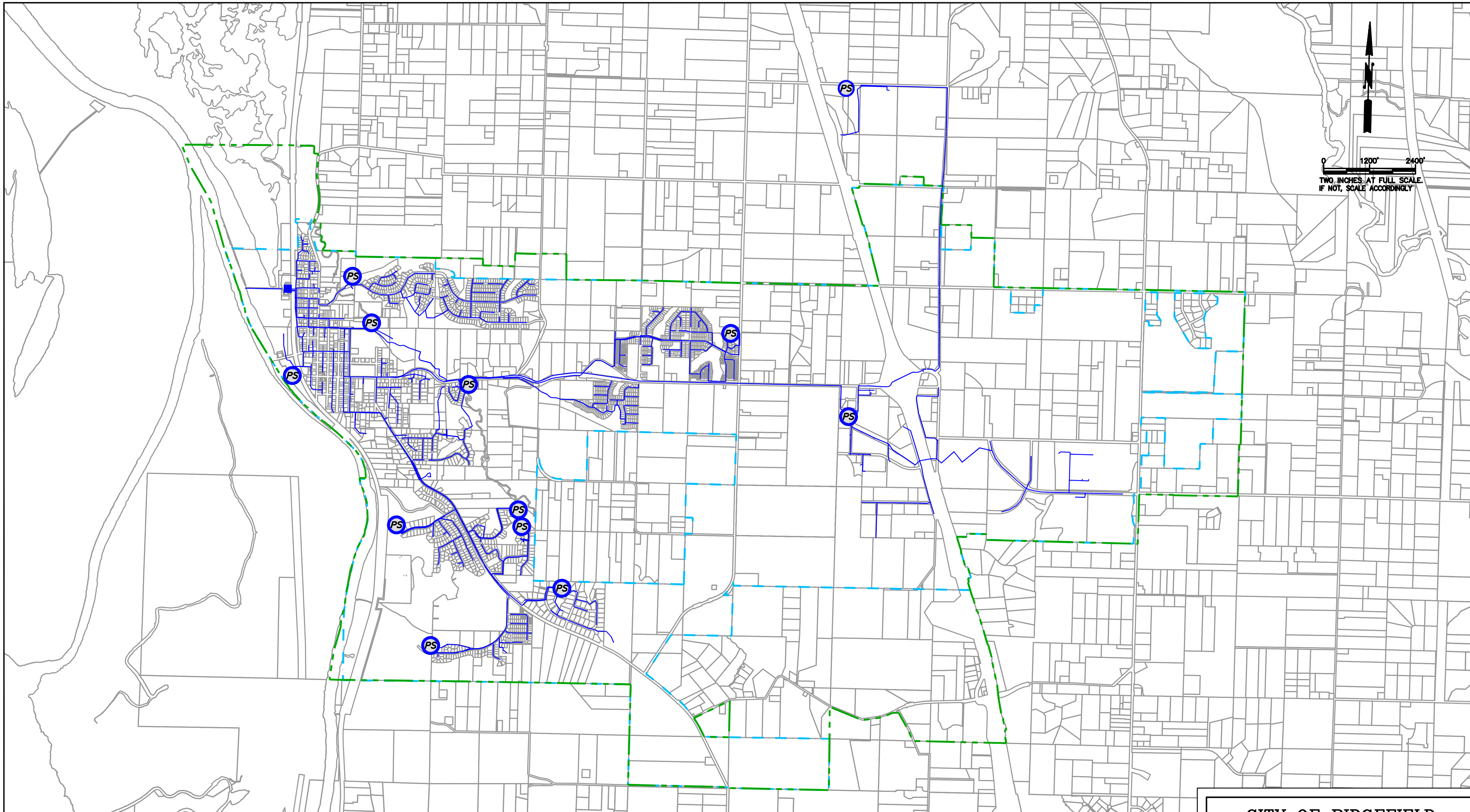
In order to provide wastewater services for growth, the wastewater system must be continuously evaluated and improved. A planning period for the evaluation of the wastewater utility should be long enough to be useful for an extended period of time, but not so long as to be impractical. The planning period for this General Sewer Plan is from 2013 through 2033, coinciding with a 20-year planning interval and in accordance with other regional planning documents. A 20- year collection system improvement schedule for 2013 to 2033 will also be provided to enable the City to plan collection system improvements for growth needs. Build out requirements are also identified for structures such as interceptors.

For an orderly and methodical approach to the expansion and financing of the City's wastewater system, time frames in increments of five years, up to 2033 are evaluated.

CURRENT LAND USE

The primary land use in Ridgefield is single-family residential, with major undeveloped areas of land within the City limits and the UGA. Figure 3-2 provides the current land use zoning within the City of Ridgefield. Figure 3-2 also shows the zoning designations within the urban growth area for the City of Ridgefield.

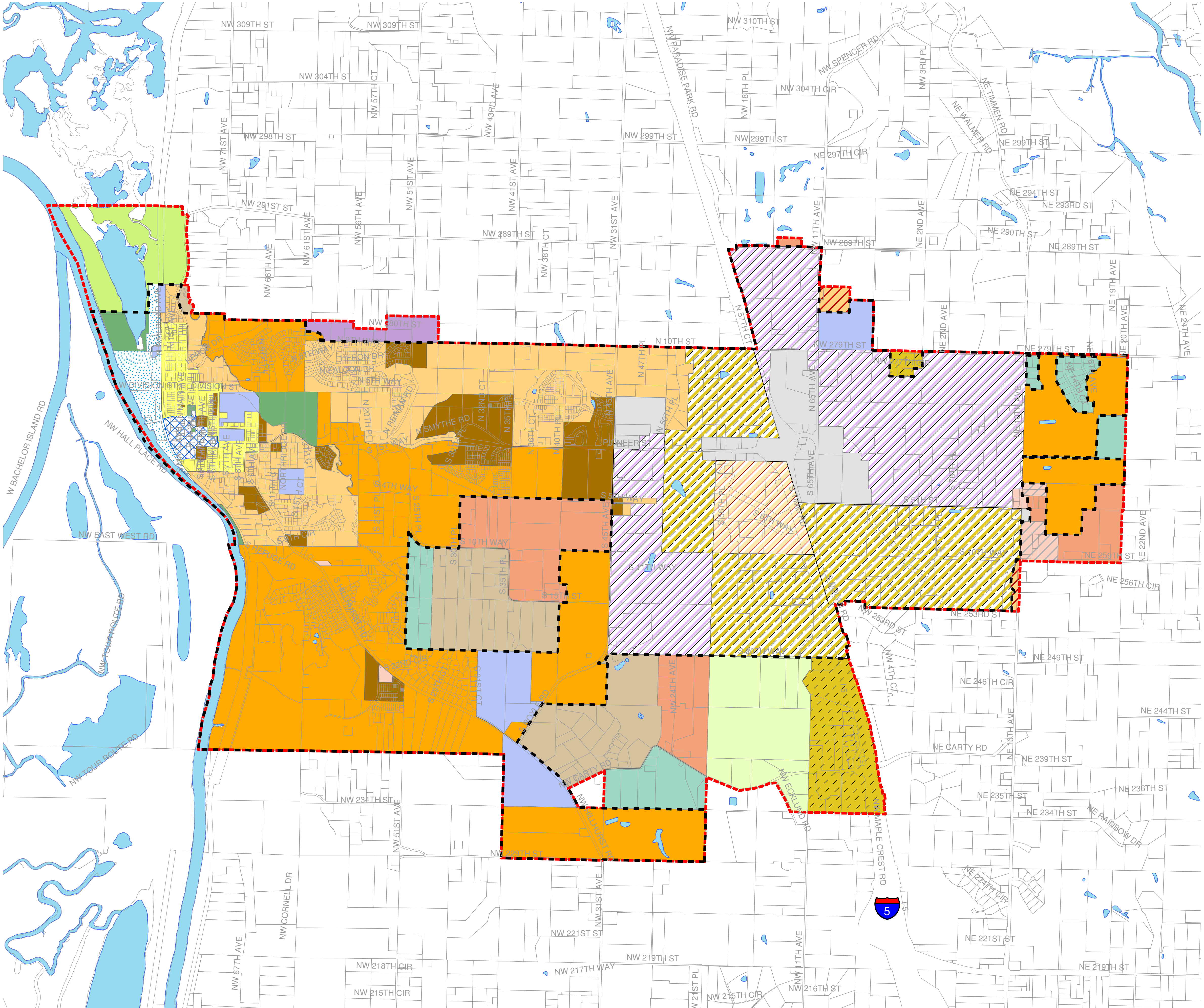
The City of Ridgefield is currently comprised of approximately 4,600 acres. Land use throughout the City is broken up into 5 major land use categories: urban residential, urban commercial, urban mixed use, urban public, and urban industrial. The City of Ridgefield land use categories, the governing Municipal Code Chapter, total acreage for each land use category, and percentage of the total acreage are listed in Table 3-1. Figure 3-3 identifies the land use designations within the current City limits and the urban growth area for the City of Ridgefield.



CITY OF RIDGEFIELD

GENERAL SEWER PLAN
FIGURE 3–1
EXISTING WASTEWATER SYSTEM

Gray & Osborne, Inc.
CONSULTING ENGINEERS



LEGEND:

- UGA LIMITS
- CITY LIMITS
- WATER

RIDGEFIELD ZONING DESIGNATION

- Downtown mixed use (DMU)
- Low density residential-5 (R-5)
- Low density residential (R-7.5)
- Low Density Residential-8.5 (R-8.5)
- Medium density residential (MDR-16)
- Master planned business park (MPBP)
- Industrial park (IP)
- Light industrial (ML)
- Neighborhood commercial (NC)
- Planned commercial development (PCD)
- Urban Public (UP)
- Parks/Open Space/Wildlife Refuge (P/OS/WL)
- Waterfront mixed use (WMU)

CLARK COUNTY ZONING DESIGNATION

- Business park (BP)
- Light industrial (ML)
- Neighborhood commercial (C-2)
- Parks/Open Space (P/OS)
- Single-Family Residential (R1-6)
- Single-Family Residential (R1-7.5)
- Single-Family Residential (R1-10)
- Residential (R-12)
- Residential (R-22)

SOURCE: CLARK COUNTY GIS.

CITY OF RIDGEFIELD

GENERAL SEWER PLAN
FIGURE 3-2
ZONING DESIGNATIONS

Gray & Osborne, Inc.
CONSULTING ENGINEERS

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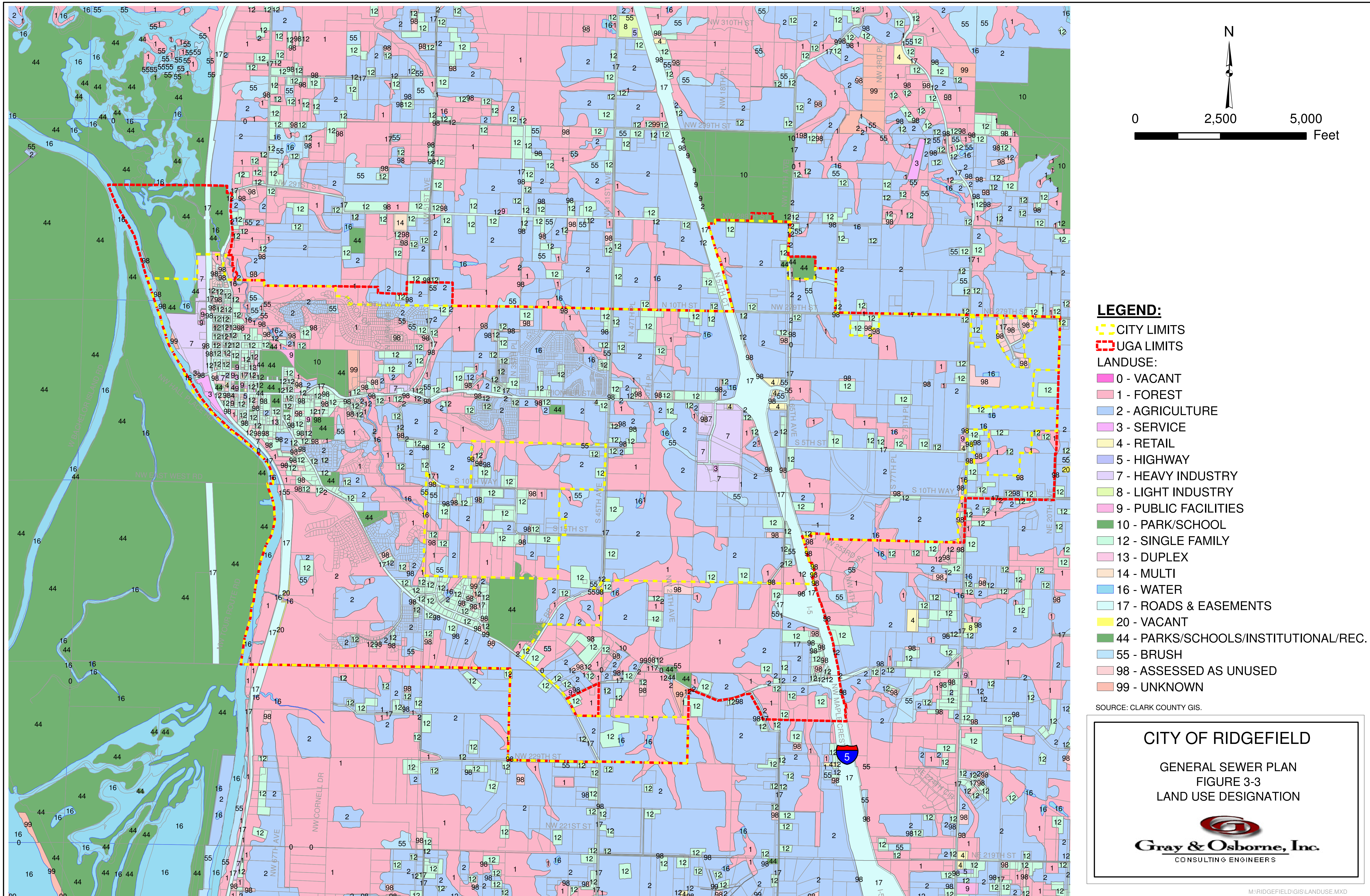


N
0
2,500
5,000
Feet
LEGEND:
CITY LIMITS
UGA LIMITS
LANDUSE:
0 - VACANT
1 - FOREST
2 - AGRICULTURE
3 - SERVICE
4 - RETAIL
5 - HIGHWAY
7 - HEAVY INDUSTRY
8 - LIGHT INDUSTRY
9 - PUBLIC FACILITIES
10 - PARK/SCHOOL
12 - SINGLE FAMILY
13 - DUPLEX
14 - MULTI
16 - WATER
17 - ROADS & EASEMENTS
20 - VACANT
44 - PARKS/SCHOOLS/INSTITUTIONAL/REC.
55 - BRUSH
98 - ASSESSED AS UNUSED
99 - UNKNOWN
SOURCE: CLARK COUNTY GIS.
CITY OF RIDGEFIELD
GENERAL SEWER PLAN
FIGURE 3-3
LAND USE DESIGNATION
Gray & Osborne, Inc.
CONSULTING ENGINEERS
M:\RIDGEFIELD\GIS\LANDUSE.MXD

LAND USE DESIGNATIONS

The following bulleted list briefly describes each of the land use categories. For more information regarding land use categories specific references to the City's Municipal Code (in Chapter 18) are identified.

- Low Density Residential – RLD-8, New development is limited to 5,000 sf per lot.
- Low Density Residential – RLD-6, New development is limited to 7,500 sf per lot.
- Low Density Residential – RLD-4, New development is limited to 8,500 sf per lot.
- Medium Density Residential – RMD-16, New development must have a minimum of eight buildings per buildable acre and a maximum of 16 buildings per buildable acre with a minimum of two acres developed.

TABLE 3-1

Existing Land Use

Land Use Category	Governing City Code Chapter	Acreage(1)	Percent of Total Acreage
Urban Residential			
Low Density Residential – RLD 8	18.210	90.6	1.99%
Low Density Residential – RLD-6	18.210	627.63	13.82%
Low Density Residential – RLD-4	18.210	1,482.74	32.65%
Medium Density Residential – RMD-16	18.220	210.13	4.63%
Urban Commercial/Industrial			
Planned Commercial	18.230	201.14	4.43%
Neighborhood Commercial	18.230	7.5	0.17%
Master Planned Business Park	18.240	788.09	17.35%
Industrial Park	18.240	697.87	15.37%
Light Industrial	18.240	120.86	2.66%

TABLE 3-1 – (continued)

Existing Land Use

Land Use Category	Governing City Code Chapter	Acreage[1]	Percent of Total Acreage
Mixed Use			
Water Front Mixed Use	18.230	54.3	1.20%
Downtown Mixed Use	18.230	22.75	0.50%
Urban Public			
Public Park/Wildlife Refuge	18.260 / 18.280	56.53	1.24%
Public Facility	18.260 / 18.280	181.28	3.99%
TOTAL		4,541.42	100.0%

(1) Acreages calculated based on land use mapping.

POPULATION

EXISTING POPULATION

Table 3-2 provides population estimates for the City of Ridgefield from the US Census and projection from the Washington State Office of Financial Management (OFM).

TABLE 3-2

Population 2000 to 2012

Year	Census Population
2000[1]	2,147
2001[2]	2,183
2002[2]	2,190
2003[2]	2,243
2004[2]	2,280
2005[2]	2,735
2006[2]	3,392
2007[2]	3,837
2008[2]	4,232
2009[2]	4,552
2010[1]	4,763
2011[2]	4,975
2012[2]	5,210

(1) US Census data.
(2) OFM Estimates.

The City is anticipating rapid population growth over the planning period. The projected population growth identified in Table 3-3 is computed based on the current population and the 2024 population from the 2010 City of Ridgefield Comprehensive Plan. The number of residents per ERU is as defined in the *2010 City of Ridgefield Comprehensive Plan*. Population for years beyond 2024 is projected to increase at a rate of 4.15 percent annually consistent with the Ridgefield 2010 Sewer Capital Facilities Plan and the DCWA formation documents.

TABLE 3-3

Population Projections
2013-2033

Year	Population
2013	5,932
2014	6,753
2015	7,688
2016	8,753
2017	9,965
2018	11,345
2019	12,917
2020	14,706
2021	16,742
2022	19,061
2023	21,701
2024	24,706
2025	25,731
2026	26,799
2027	27,911
2028	29,070
2029	30,276
2030	31,532
2031	32,841
2032	34,204
2033	35,623

CHAPTER 4

REGULATORY REQUIREMENTS

INTRODUCTION

The purpose of this chapter is to identify and summarize the regulations that affect the planning, design and approval of improvements discussed in this report. These regulatory requirements were used in developing the design criteria for the City of Ridgefield's wastewater collection, treatment, and disposal systems.

This chapter does not describe each regulation in detail; rather, it addresses important facets of the regulations that affect the planning and design process. Subsequent sections of this report address technical requirements of the regulations at a level of detail appropriate for the evaluation provided by that section. Although the City is pursuing participation in a regional conveyance and treatment system, and planning to transfer its collection system assets to the District, the regulatory requirements relating to the City's existing NPDES permit are presented in this chapter to provide background and requirements relating to the WWTP and any potential expansion beyond the current capacity.

FEDERAL AND STATE STATUTES, REGULATIONS AND PERMITS

In this section, some of the various state and federal laws that may affect wastewater system construction and operations are discussed, as well as other relevant permits, programs, and regulations.

FEDERAL CLEAN WATER ACT

The Federal Water Pollution Control Act is the principal law regulating the water quality of the nation's waterways. Originally enacted in 1948, it was significantly revised in 1972 and 1977, when it was given the common title of the "Clean Water Act" (CWA). The CWA has been amended several times since 1977. The 1987 amendments replaced the Construction Grants program with the State Revolving Fund (SRF), which provides low-cost financing for a range of water quality infrastructure projects.

The National Pollutant Discharge Elimination System (NPDES) is established by Section 402 of the CWA and subsequent amendments. The Department of Ecology (Ecology) administers NPDES permits for the United States Environmental Protection Agency (EPA) in Washington State. Most NPDES permits have a 5-year life span and place limits on the quantity and quality of pollutants that may be discharged. NPDES permits granted under Phase I of the CWA are required for point source discharges, including wastewater discharges to surface waters from municipal or industrial wastewater treatment facilities, stormwater discharges from industrial facilities, runoff from construction sites of more than five acres, and stormwater discharges from separate storm sewers serving populations of more than 100,000.

The City's current NPDES permit, No. WA0023272, along with the permit Fact Sheet, is attached as Appendix A. The City's current NPDES permit effluent limits and capacity limits are shown in Table 5-4 in Chapter 5.

The City's permit was issued in December 2003 and modified in September of 2009 after upgrade of the treatment plant to 0.7 mgd and as a result of extensive dilution zone modeling and effluent testing requirements. The permit was reauthorized in June of 2011 for another 5-year cycle ending June 30, 2016. Current permit limits are discussed in Chapter 5 and permit limits for a potential future expansion of the WWTP to 1.0 mgd are discussed in Chapter 6.

Section 303 of the CWA established the Total Maximum Daily Load (TMDL) program. Under this program, states must establish a list of water bodies that will not achieve water quality standards even with "all known available and reasonable technology (AKART)" in place. In such situations, Ecology conducts a TMDL analysis to determine the capacity of the water body to absorb pollutants and allocates pollutant loads among point and nonpoint discharges. Based on this loading capacity, "waste load allocations" are established for different pollutant sources in the watershed. Lake River has been identified as being non compliant with applicable water quality criteria. The pollutants of concern that have been identified are temperature and coliforms. Lake River has not yet been evaluated under the TMDL program.

Section 307 of the CWA established the National Pretreatment Program. This program is designed to protect publicly owned treatment works (POTWs) and limits the amount of industrial or other non-residential pollutant discharged to municipal sewer systems.

A 401 Water Quality Certification is required under the CWA for any activity that may result in discharge to surface waters including excavation activities that occur in streams, wetlands, or other waters of the nation. The USEPA has delegated 401 Certification to the Department of Ecology.

Section 404 of the CWA regulates discharges of fill or dredged materials in wetlands, including any related draining, flooding, and excavation. Pipeline and pump station projects in wetlands will require a Section 404 permit, in addition to any related local permits. In most cases, activities impacting greater than 1/3 of an acre will also require a Section 401 Certification.

FEDERAL ENDANGERED SPECIES ACT

On March 16, 1999, the National Marine Fisheries Service (NMFS) listed the Puget Sound Chinook as "threatened" under the Endangered Species Act (ESA). In 1999, the United States Fish and Wildlife Service (USFWS) listed the Bull Trout as "threatened."

Listing of other salmon species has followed in the last several years. These ESA listings have significantly impacted activities that affect salmon and trout habitat, such as water use, land use, construction activities, and wastewater disposal. Impacts to the City have included longer timelines for permit applications, and more stringent regulation of construction impacts and activities in riparian corridors.

The purpose of the 1972 ESA is to "provide a means whereby the ecosystems upon which endangered species and threatened species depend may be conserved..." In pursuit of this goal, the ESA authorizes NMFS and USFWS to list species as endangered or threatened, and to identify and protect the critical habitat of listed species. USFWS has jurisdiction over terrestrial and freshwater plants and animals such as Bull Trout, while NMFS is responsible for protection of marine species including anadromous salmon. Under the ESA, endangered status is conferred upon "any species which is in danger of extinction throughout all or a significant portion of its range," while threatened status is conferred upon "any species which is likely to become an endangered species within the foreseeable future throughout all or a significant portion of its range." The ESA defines critical habitat as the "geographical area containing physical and biological features essential to the conservation of the species."

Once a species is listed as endangered or threatened, the ESA makes it illegal for the government or individuals to "take" a listed species. "Take" has been interpreted by the federal courts to include "significant modification or degradation of critical habitat" that impairs essential behavior patterns. For species listed as endangered, the blanket prohibitions against "take" are immediate.

The ESA Section 9 "take" prohibition applies to all "persons" including local public entities. State and local governments may face double exposures through both their direct conduct and through the exercise of the regulatory authorities over activities, which can be construed as a "take."

Federal rules also allow threatened species to be protected through a more flexible Section 4(d) rule describing specific activities that are likely to result in a "take." The draft of the Section 4(d) rule prepared by NMFS was published in the Federal Register on January 3, 2000 (Federal Register, Vol. 65, No. 1). The final 4(d) rule was published in June 2000 and became effective January 8, 2001.

The 4(d) rules may exempt certain activities from "take" liabilities and thereby offer an alternative mechanism by which to secure relief from potential "take" liability. The 4(d) rule approves some specific existing state and local programs, and creates a means for NMFS to approve additional programs if they meet certain standards set out in the rule. NMFS published "A Citizen's Guide to the 4(d) Rule for Threatened Salmon and Steelhead on the West Coast" in June 2000. The guide introduces and explains the rule. The following discussion summarizes this guide.

Section 4(d) requires NMFS to issue regulations deemed "necessary and admissible to provide for the conservation to the species." NMFS must establish protective rules for all species now listed as threatened under the ESA. The rules need not prohibit all "take." There may be an "exception" from the prohibitions on take so long as the take occurs as the result of a program that adequately protects the listed species and its habitat. The 4(d) rule can "limit" the situations to which the take prohibitions apply. By providing limitation from take liability, NMFS encourages governments and private citizens to adjust their programs and activities to be "salmon safe."

One of the limitations on the take prohibitions contained in the 4(d) rule is Limit No. 12 – Municipal, Residential, Commercial, and Industrial development and redevelopment (MRCI). The 4(d) rule recognizes that MRCI development and redevelopment have a significant potential to degrade habitat and injure or kill salmon and steelhead in a variety of ways. The 4(d) guide states that with appropriate safeguards, MRCI development can be specifically tailored to minimize impacts on listed fish to the extent that additional Federal protections would not be needed to conserve the listed ESU. The guide further states that NMFS would individually apply the following 12 evaluation considerations when determining whether MRCI development ordinances or plans adequately conserve listed fish:

1. A MRCI development ordinance or plan ensures that development will avoid inappropriate areas such as unstable slopes, wetlands, areas of high habitat value, and similarly constrained sites.

2. A MRCI development ordinance or plan adequately prevents stormwater discharge impacts on water quality and quantity and stream flow patterns in the watershed – including peak and base flows in perennial streams.

3. A MRCI development ordinance or plan protects riparian areas well enough to attain or maintain Proper Functioning Condition (PFC), habitat that provided for the biological requirements of the fish, around all rivers, estuaries, streams, lakes, deepwater habitats, and intermittent streams.

4. A MRCI development ordinance or plan avoids stream crossings – whether by roads, utilities, or other linear development – wherever possible and, where crossings must be provided, minimize impacts.

5. A MRCI development ordinance or plan adequately protects historic stream meander patterns and channel migration zones and avoids hardening stream banks and shorelines.

6. A MRCI development ordinance or plan adequately protects wetlands, wetland buffers, and wetland function – including isolated wetlands.

7. A MRCI development ordinance adequately preserves permanent and intermittent streams' ability to pass peak flows.

8. A MRCI development ordinance or plan stresses landscaping with native vegetation to reduce the need to water and apply herbicides, pesticides, and fertilizer.

9. A MRCI development ordinance or plan contains provisions to prevent erosion and sediment run-off during (and after) construction and thus prevent sediment and pollutant discharge to streams, wetlands and other water bodies that support listed fish.

10. A MRCI development ordinance or plan ensures that demands on the water supply can be met without affecting either directly or through groundwater withdrawals – the flows salmon need.

11. A MRCI development ordinance or plans provides mechanisms for monitoring, enforcing, funding, reporting, and implementing its program.

12. A MRCI development ordinance or plan complies with all other state and Federal environmental and natural resource laws and permits.

The City has adopted an MRCI development ordinance.

In response to existing and proposed ESA listings of salmon, steelhead, and trout species throughout Washington State, Governor Locke established the Office of Salmon Recovery in 1997 to direct the State's salmon recovery efforts. The Office of Salmon Recovery is also supported by the Joint Natural Resources Council (composed of representatives of state natural resource agencies) in the preparation of the Statewide Strategy to Recover Salmon, entitled "Extinction is Not an Option" (January 1999). The goal of the Statewide Strategy is to restore wild salmon, steelhead, and trout populations to harvestable levels. Rather than attempting to avert additional ESA listings, the Statewide Strategy intends to provide local input into, and hopefully maintain some local control over the salmon recovery regulatory processes that will inevitably affect the majority of Washington State. The Statewide Strategy was submitted to NMFS in 1999 for possible inclusion in the Section 4(d) rule. The draft of the Section 4(d) rule was published in the Federal Register on January 3, 2000 (Federal Register, Vol. 65, No. 1). The final 4(d) rule was published in June 2000 and became effective January 8, 2001. The Statewide Strategy to Recover Salmon was not included in the 4(d) rule.

In order to minimize liability under the ESA, local governments must demonstrate that their land use regulations will not result in a prohibited "take" of a listed species, including adverse modification of critical habitat. Possible regulatory impacts may include the following:

- Adopt model critical areas ordinances designed to protect critical habitat.

- Amend critical areas ordinances to include riparian buffers, vegetation retention, soil retention, maximum road density within a watershed, maximum impervious surface in a watershed, and limits on road crossings of streams.

- Amend GMA comprehensive plans to require an "environmental protection element.

- Adopt stormwater operation and maintenance ordinances requiring regular, frequent maintenance of stormwater facilities.

- Increase inspection and enforcement of stormwater best management practices.

- Require monitoring of best management practices.

- Provide adequate funding of stormwater infrastructure, which may include implementation of stormwater utilities.

- Amend Shoreline Master Programs to encourage greater use of conservancy and natural designations, and limit conversion of agricultural and forest land.

It should be noted that the ESA includes a third-party citizen suit provision. Compliance with the Section 4(d) rule does not, therefore, rule out legal challenges, although it is likely to provide greater protection from successful litigation.

NATIONAL ENVIRONMENTAL POLICY ACT

The National Environmental Policy Act (NEPA) was established in 1969 and requires federal agencies to determine environmental impacts on all projects requiring federal permits or funding. Federally delegated activities such as NPDES permits or Section 401 Certification are considered state actions and do not require NEPA compliance. If a project involves federal action (through, for example, an Army Corps of Engineers Section 404 permit), and is determined to be environmentally insignificant, a Finding of No Significant Impact (FONSI) is issued, otherwise an Environmental Impact Statement (EIS) is required. NEPA is not applicable to projects that do not include a Federal component that would trigger the NEPA process.

FEDERAL CLEAN AIR ACT

The Federal Clean Air Act requires all wastewater facilities to plan to meet the air quality limitations of the region. The City falls in the jurisdiction of the Southwestern

Washington Clean Air Authority. An air quality permit for the City of Ridgefield's WWTP is not required.

STATE STATUTES, REGULATIONS AND PERMITS

STATE WATER POLLUTION CONTROL ACT

The intent of the state Water Pollution Control Act is to "maintain the highest possible control standards to ensure the purity of all waters of the state consistent with public health and the enjoyment…the propagation and protection of wildlife, birds, game, fish, and other aquatic life, and the industrial development of the state." Under the Revised Code of Washington (RCW) 90.48 and the Washington Administrative Code (WAC) 173-240, Ecology issues permits for wastewater treatment facilities and also land application of wastewater under WAC 246-271.

Submission of Plans and Reports for Construction of Wastewater Facilities, WAC 173-240

Prior to construction or modification of domestic wastewater facilities, engineering reports and plans, and specifications must be submitted to and approved by Ecology. This regulation outlines procedures and requirements for the development of an engineering report, which thoroughly examines the engineering and administrative aspects of a domestic wastewater facility project. This regulation defines a facility plan as described in Federal regulations, 40 CFR Part 35, as an engineering report.

Key provisions of WAC 173-240 are provided below.

- An engineering report for a wastewater facility project must contain everything required for a general sewer plan unless an up-to-date general sewer plan is on file with Ecology.

- An engineering report shall be sufficiently complete so that Plans and Specifications can be developed from it without substantial changes.

- A wastewater facility engineering report must be prepared under the supervision of a professional engineer.

- The engineering report shall include the following information (letter designations are taken from WAC 173-240-060; requirements that include those found in 40 CFR 35.917 for federal facility plan requirements are noted with an asterisk, "*").

  (a) Name, address, phone number of owner.
  (b) Project description.
  (c) Current and projected wastewater flows and loadings.

(d) Treatment standards.
(e) Receiving water characteristics, including dilution zone.
(f) Proposed treatment and disposal process, including an evaluation of alternatives.*
(g) Basic design data and calculations for each unit process.
(h) Site availability and relationship to 25/100 flood cycles and residential or developed areas.
(i) Flow diagram with hydraulic profile.
(j) Discussion of inflow and infiltration.*
(k) Provisions for treating industrial waste, including pre-treatment programs.*
(l) Outfall analysis.
(m) Method of final sludge disposal and alternatives considered.
(n) Provisions for future needs.
(o) Staffing and testing requirements.
(p) Estimated capital and O&M costs, evaluated in terms of annual costs and present worth.*
(q) A statement regarding compliance with any applicable state or local water quality plan.
(r) A statement regarding compliance with the State (or National) Environmental Policy Act, SEPA (or NEPA) as applicable.

All requirements of WAC 173-240 have been met for the Phase 1 (1.0 MGD) upgrade to the City's existing WWTP.

Criteria for Sewage Works Design, Washington State Department of Ecology

Ecology has published design criteria for collection systems and wastewater treatment plants. While these criteria are not legally binding, their use is strongly encouraged by Ecology since the criteria are used by the agency to review engineering reports for upgrading wastewater treatment systems. These design criteria, commonly referred to as the "Orange Book," primarily emphasize unit processes through secondary treatment. Any expansion or modification of the City of Ridgefield collection system and/or treatment plant will require continued conformance with Ecology criteria.

Certification of Operators of Wastewater Treatment Plants, WAC 173-230

Wastewater treatment plant operators are certified by the State water and wastewater operators' certification board. The operator assigned overall responsibility for operation of a wastewater treatment plant is defined by WAC 173-230 as the "operator in responsible charge." This individual must have State certification at or above the classification rating of the plant.

The City of Ridgefield Wastewater treatment plant is currently assigned a Class II rating. Level 2 operator are on staff for operation of the plant.

The plant is staffed Monday through Friday from 7:30 a.m. to 4:00 p.m. A one hour plant check is conducted on weekends and holidays and a staff person is on call at all times to respond to alarm calls. The City staff also handles collection system maintenance and operates the water system. The total staff time dedicated to the plant is estimated to be 2.1 full-time employees (FTEs).

WATER QUALITY STANDARDS FOR SURFACE WATERS OF THE STATE OF WASHINGTON, CHAPTER 173-201A WAC

Basis of Regulations

The State of Washington has authority under the Federal Water Pollution Control Act, also known as the Clean Water Act, (CWA) to establish and administer programs to meet the requirements of the CWA. Under RCW 98.40.35, the Washington Department of Ecology has the authority to establish "rules and regulations relating to standards of quality for waters of the State and for substances discharged therein..." The State of Washington also implements the National Pollutant Discharge Elimination System (NPDES) program, created under the CWA.

Description of Regulations

WAC 173-201A establishes water quality standards for the State of Washington. The State adopted revised water quality standards in 2003, 2006, and 2011 which have been approved by the EPA. The standards are based on two objectives: protection of public health and enjoyment, and protection of fish, shellfish, and wildlife. For each surface water body in the state, the revised standards assign specific uses, such as aquatic life, recreation, or water supply uses. Water quality standards have been developed for each use, for parameters such as fecal coliform, dissolved oxygen, temperature, pH, turbidity, and toxic, radioactive, deleterious substances. The water uses that are defined in the standards for freshwater are:

<u>Aquatic life uses</u>

- Char spawning and rearing
- Salmon and trout spawning, core rearing, and migration
- Salmon and trout spawning, non-core rearing, and migration
- Salmon and trout rearing and migration only
- Non-anadromous interior redband trout
- Indigenous warm water species

<u>Recreational uses</u>

- Extraordinary primary contact recreation
- Primary contact recreation
- Secondary contact recreation

Water supply uses

- Domestic water supply
- Agricultural water supply
- Industrial water supply
- Stock watering

Miscellaneous uses

- Wildlife habitat
- Harvesting
- Commerce and navigation
- Boating
- Aesthetics

Water Quality Classification

The City's existing WWTP discharges to Lake River. Lake River is a tributary to the Columbia River. Because Lake River is not separately identified in the water quality standards, the Columbia River standards apply. WAC 173-201A-602 identifies the following uses in the segment of concern:

- Aquatic life use: Non-core rearing, and migration for salmon and trout
- Recreation use: Primary contact recreation
- Water supply uses: domestic water supply, agricultural water supply, industrial water supply, stock watering
- Miscellaneous uses: wildlife habitat, harvesting, boating, commerce and navigation, aesthetics.

Water quality criteria for the salmon and trout spawning use is shown in Table 4-1:

TABLE 4-1

Water Quality Criteria for the Salmon and Trout Spawning, Non-Core Rearing and Migration Use

Parameter	Surface Water Criteria Value
Dissolved Oxygen	>8.0 mg/L
Temperature	17.5 degrees C (7-day average of daily maximum), (1) with no increase greater than t=28/(T+5) or (2) if natural temperature is >17.5 degrees C, then no increase >0.3 degrees C
pH	Not outside the range of 6.5 to 8.5 standard units, with no human-caused variation >0.5 standard units
Turbidity	<5 NTU over background (background <50 NTU) <10% increase over background (background >50 NTU)
Total dissolved gas	<110% of saturation
Ammonia	<0.233 mg/L

The bacterial water quality criteria for Lake River is based on the assigned recreational use as follows:

Freshwater

- Primary contact recreation: 100 fecal coliform colonies/100 mL

The water supply and miscellaneous uses do not have additional numerical criteria.

The water quality standards also have narrative criteria regarding toxic, radioactive, otherwise deleterious materials, or materials that impair aesthetics. These materials are prohibited in concentrations that affect aquatic life, human health or impair aesthetics.

Numeric criteria for 31 toxic substances are listed in WAC 173-201A-240. Criteria are listed on both an acute and chronic basis and for certain substances (e.g., metals, chlorine, and ammonia), the criteria must be calculated as a function of receiving water pH, hardness, and whether salmonids are present.

The water quality standards allow for variances and site-specific criteria to be developed in individual cases.

As noted previously, Lake River has non attainment status for fecal coliforms and temperature. The measurements that support the non attainment status were taken upstream of the WWTP outfall.

To remove a use from the list of uses for which a water body is protected, a use attainability analysis (UAA) must be performed. The UAA must demonstrate that the use does not exist in the water body or would not be attainable. The proposed change to the assigned uses must be consistent with Federal laws and subject to a public involvement process including consultations with Native American tribes.

Mixing Zones

WAC 173-201A-700 has provisions for mixing zones for a permitted discharge. Deviations from water quality standards for the surface water are allowed within the mixing zone. Mixing zones are allowed under the following conditions:

1. All known, available, and reasonable treatment (AKART) is applied prior to discharge to the mixing zone.

2. Water quality is not violated outside the mixing zone boundary.

3. When potential does not exist for damage to sensitive ecosystem or aquatic habitat, adverse public health effects, or interference with characteristic uses of the water.

Anti-Degradation Policy

The anti-degradation policy aims to maintain the highest possible quality of water in the State, by preventing the deterioration of water bodies that currently have higher quality than the water quality standards require. The revised water quality standards define three tiers of waters in the anti-degradation policy.

Tier I water bodies are those with violations of water quality standards, from natural or human-caused conditions. The focus of water quality management is on maintaining or improving current uses, and preventing any further human-caused degradation.

Tier II water bodies are those of higher quality than required by the water quality standards. The focus of the policy is on preventing degradation of the water quality, to preserve the excellent natural qualities of the water body. New or expanded actions are not allowed to cause a “measurable change” in the water quality, unless they are demonstrated to be “necessary and in the overriding public interest”.

New or expanded actions that may cause a measurable change in water quality must have a Tier II review conducted. For increased wastewater treatment plant discharges, this review will take place as part of the NPDES permit modification process. Measurable change, for the purpose of the anti-degradation policy, is defined as follows:

- Temperature increase greater than 0.3 degrees C
- Dissolved oxygen concentration decrease greater than 0.2 mg/L
- Bacteria level increase greater than 2 CFU/100 mL
- pH change greater than 0.1 standard units

- Turbidity increase greater than 0.5 NTU
- Any detectable change in concentration of toxic or radioactive substances, which include ammonia and chlorine.

The Ridgefield WWTP uses ultraviolet light for disinfection so it meets anti-degradation standards by not having chlorine in its effluent discharge to Lake River. To meet anti-degradation standards for ammonia, the permitted effluent discharge limits for ammonia will decrease as the permitted flow capacity of the facility increases. Current and projected ammonia discharge limits are shown in Table 6-8.

A new or expanded action may be determined by the Department of Ecology to be necessary and in the overriding public interest based on a review of the following factors:

- Economic benefits, such as job creation
- Providing or contributing to necessary social services
- Status as a demonstration project using innovative technical or management approaches that produce a significant improvement over AKART
- Prevention or remediation of environmental or public health threats
- Societal or economic benefits of better health protection
- The loss of assimilative capacity for future industry or development
- The loss of benefits associated with the current high water quality, i.e., uses such as fishing or tourism.

The new or expanded action would be allowed to measurably reduce the water quality only if it is demonstrated that the action has selected the combination of site, technical and managerial approaches that will minimize the effect on water quality. Alternative approaches that must be evaluated include:

- Pollution prevention or source control to reduce toxic compound discharges
- Reuse or recycling of wastewater
- Water conservation to minimize production of wastewater
- Land application or infiltration to reduce surface water discharges
- Alternative or enhanced treatment technologies
- Improved operation and maintenance of existing facilities
- Seasonal or controlled discharge to avoid critical water quality conditions
- Water quality offsets with another water quality action (point or non-point source), providing no net decrease of water quality.

Discharge Permits

The primary means for achieving the water quality standards of WAC 173-201A is the issuance of discharge permits, such as NPDES permits or State Waste Discharge permits, by the Department of Ecology.

When it is not possible to immediately achieve compliance with the standards in WAC 173-201A, Ecology may issue an order with a compliance schedule to allow for further water quality studies, implementation of best management practices or construction of necessary treatment capability. Compliance schedules may only be issued for existing discharges.

Assimilative capacity is a term that describes a surface water's ability to accept waste loadings without a permanent degradation of water quality. Ecology is presently conducting waste load capacity studies (also known as Total Maximum Daily Load, or TMDL, studies) for several major watersheds in the State of Washington. These studies will be utilized to determine the assimilative capacity of watersheds that are noted as "impaired" for having too high a temperature or having too high a concentration of a pollutant, such as BOD_5 or potentially toxic pollutants such as chlorine, ammonia, and metals. For example, the assimilative capacity of a surface water with respect to BOD_5 will be based on the mass of an oxygen-depleting substance (e.g., organic matter and ammonia) that can be discharged into a surface water without depleting dissolved oxygen to levels that would be detrimental to aquatic life.

The Federal Environmental Protection Agency, in consultation with Ecology, establishes and maintains a list of impaired water body segments, known as the 303(d) list. TMDL studies will generally be necessary to determine an allotted wasteload for any single discharger.

Discharging to surface water requires a National Pollutant Discharge Elimination System (NPDES) permit issue by Ecology under WAC 173-220. The minimum level of treatment required for discharge is called "All Known Available and Reasonable Treatment" (AKART) and represents a technology based standard for treatment plant performance. Minimum discharge standards for activated sludge (secondary treatment) facilities discharging to surface water, taken from WAC 173-221 are shown in Table 4-2. Secondary standards were developed for "conventional pollutants," and do not establish AKART for toxic pollutants. Ammonia is a toxic pollutant, and therefore, not the subject of Chapter 173-220 WAC, but of Chapter 173-201A WAC.

TABLE 4-2

Minimum WWTP Effluent Standards for Surface Water Discharge from a Secondary Treatment Plant

Parameter	Average Monthly	Average Weekly
5-day Biochemical Oxygen Demand (BOD_5)	Most stringent of the following: 30 mg/L may not exceed 15 percent of the average influent concentration	45 mg/L
Total Suspended Solids (TSS)	Most stringent of the following: 30 mg/L may not exceed 15 percent of the average influent concentration	45 mg/L
Fecal Coliform Bacteria[(1)]	200/100 mL	400/100 mL
pH	Shall be within the range of 6.0 to 9.0	

(1) The averages for fecal coliform are based on the geometric mean of the samples taken.

Under RCW 90.48, Water Pollution Control, Ecology is authorized to condition NPDES permits so that the discharge meets water quality standards. Therefore, other permit conditions in addition to or more stringent than the above could be added to ensure that the water quality of the receiving water is not degraded. For example, an ammonia limit was added to Ridgefield's NPDES permit to prevent degradation of the receiving water. Existing and proposed Ridgefield permit limits are discussed in Chapter 5 and Chapter 6 of this Plan and summarized in Table 6-8.

Mixing Zone Analysis

The City's treatment plant currently has an outfall located in Lake River. A study and computer model analysis was performed on the existing discharge into Lake River. This study determined that the previous diffuser did not meet Department of Ecology requirements for diffuser design. The diffuser was modified during the 0.7 mgd upgrade to satisfy Department of Ecology requirements. The dilution modeling and mixing zone analysis in Appendix C and Appendix D have shown that the City's existing outfall and receiving water can provide sufficient dilution to assimilate a maximum month flow of at least 1.0 mgd.

STATE ENVIRONMENTAL POLICY ACT

The WAC 173-240-050 requires a statement in all wastewater comprehensive plans that proposed projects are evaluated using the State Environmental Policy Act (SEPA), if applicable. The capital improvements proposed in this plan will fall under SEPA regulations. A non-project SEPA checklist is included in Appendix B of this report to comply with the requirements of SEPA. The City has issued a determination of non-significance (DNS).

GROWTH MANAGEMENT

The City of Ridgefield has conducted planning under the 1990 State Growth Management Act as embodied in the 2010 City of Ridgefield Comprehensive Plan. This planning is discussed in detail in Chapter 3 of this Plan.

ACCREDITATION OF ENVIRONMENTAL LABORATORIES (WAC 173-050)

The State of Washington requires that all laboratories reporting data to comply with NPDES and Solid Waste Disposal (SWD) permits must be generated by an accredited laboratory. This accreditation program establishes specific tasks for quality control and quality assurance (QA/QC) that are intended to ensure the integrity of laboratory procedures. Accreditation requirements must be met for any on-site laboratory or outside laboratory used to analyze samples. Only accredited commercial laboratories may be used for analyses reported for compliance with NPDES or SWD permits.

The City of Ridgefield currently has an accredited laboratory facility for measurement of pH and alkalinity, and contracts out all of the other compliance related laboratory testing to the Clark County Salmon Creek WWTP.

MINIMUM STANDARDS FOR SOLID WASTE HANDLING (WAC 173-304)

Grit and screenings are not subject to the sludge regulations in WAC 173-308, but their disposal is regulated under the State solid waste regulations, WAC 173-304. Waste placed in a municipal solid waste landfill must not contain free liquids, nor exhibit any of the criteria of a hazardous waste as defined by WAC 173-303. To be placed in a municipal solid waste landfill, grit and screenings must pass the paint filter test, which determines the amount of free liquids associated with the solids, and the toxic characteristics leachate procedure (TCLP) test, which determines if the waste has hazardous characteristics.

WETLANDS

Dredging and Filling Activities in Natural Wetlands (Section 404 of the Federal Water Pollution Control Act)

A U.S. Army Corps of Engineers permit is required when locating a structure, excavating, or discharging dredged or fill material in waters of the United States or transporting dredged material for the purpose of dumping it into ocean waters. Typical projects requiring these permits include the construction and maintenance of piers, wharves, dolphins, breakwaters, bulkheads, jetties, mooring buoys, and boat ramps.

If wetland fill activities cannot be avoided, negative impacts can be mitigated by creating new wetland habitat in upland areas, and if other federal agencies agree, the Corps will generally issue a permit.

Wetlands Executive Order 11990

This order directs Federal agencies to minimize degradation of wetlands and enhance and protect the natural and beneficial values of wetlands. The order also mandates avoidance and mitigation of impacts to wetlands, and must be considered before an NPDES permit is issued. Assurances must be provided that the natural and beneficial values of wetlands will be protected and enhanced by the discharge.

SHORELINE MANAGEMENT ACT

The Shoreline Management Act of 1971 (RCW 90.58) establishes a broad policy giving preference to shoreline uses that protect water quality and the natural environment, depend on proximity to the water, and preserve or enhance public access to the water. Shoreline Management Act jurisdiction extends to lakes or reservoirs of 20 acres or greater, streams with a mean annual flow of 20 cubic feet per second (CFS) or greater, marine waters, and an area inland 200 feet from the ordinary high water mark. Projects are reviewed by local governments according to state guidelines and a local Shoreline Master Program.

Local Shoreline Master Programs are developed in accordance with guidelines from the Department of Ecology (Ecology). Although this rule does impose a varying level of scrutiny within the shoreline area, the purpose is to use “Best Available Science” as required by the Growth Management Act to ensure that regulations are substantively linked to the protection of shoreline functions and values.

FLOODPLAIN DEVELOPMENT PERMIT

Local governments that are participating in the National Flood Insurance Program are required to review projects (including wastewater collection facilities) in a mapped flood plain and impose conditions to reduce potential flood damage from flood water. A Floodplain Development Permit is required prior to construction.

HYDRAULIC PROJECT APPROVAL

Under the Washington State Hydraulic Code (WAC 220-110), the Washington State Department of Fish and Wildlife (WDFW) requires a hydraulic project approval (HPA) for activities that will “use, divert, obstruct, or change the natural flow or bed” of any waters of the state. For activities such as pipeline crossings of streams, an HPA will be required, and will include provisions necessary to minimize project specific and cumulative impacts to fish.

REGULATORY AGENCIES

The above regulations, permits, and programs are administered by various local, State, and Federal agencies. The history, purpose, and authority of these agencies are discussed below.

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

The stated mission of the EPA is to protect human health and to safeguard the natural environment upon which life depends. The EPA's purpose includes protecting all Americans from significant human health risks and the environment, ensuring that national environmental efforts are based on the best available scientific information, ensuring that federal laws are enforced fairly, and that environmental protection contributes to making our communities and ecosystems diverse, sustainable, and economically productive. Ecology currently administers NPDES permits, 401 Water Quality Certifications, and State Revolving Fund (SRF) loans for the EPA.

THE NATIONAL MARINE FISHERIES SERVICE

Under the ESA, NMFS is responsible for the protection of marine life, including anadromous salmon such as the Lower Columbia Chinook. When a species is listed as "endangered," the prohibitions against "take" of the species are immediate under Section 9 of the ESA. Although NMFS may choose to invoke the blanket prohibitions of Section 9, the "threatened" status of the Lower Columbia Chinook allows more flexibility to establish regulations designed to protect these species. These regulations, known collectively as a Section 4(d) rule, outline activities exempted from the "take" prohibitions of Section 9.

Table 4-3 shows the evolutionarily significant units (ESU) of salmon that use the Columbia River for rearing and transport portions of their life cycles, according to the National Marine Fisheries Service, (from the NMFS Northwest Region webpage, 3/13).

TABLE 4-3

Evolutionarily Significant Units of Columbia River Salmon

Species/ESU	Status	Date	FR Notice
Salmonids Under NMFS Jurisdiction:			
Lower Columbia River Chinook Salmon	Threatened Critical Habitat	6-28-05 9-02-05	70 FR 37160 70 FR 52630
Lower Columbia River Steelhead	Threatened Critical Habitat	1-05-06 9-02-05	71 FR 834 70 FR 52630
Columbia River Chum Salmon	Threatened Critical Habitat	6-28-05 9-02-05	70 FR 37160 70 FR 526304
Lower Columbia River Coho	Critical Habitat(1)	1-10-11	76 FR 1392

(1) The Critical Habitat Designation is under development.

UNITED STATES ARMY CORPS OF ENGINEERS

Under Section 404 of the CWA, the US Army Corps of Engineers (Corps) is authorized to regulate discharge of fill and dredged material to waters of the United States, including wetlands. The Corps employs a system of General or Nationwide Permits for blanket authorization of activities such as utility lines that have minimal adverse impact on the environment. In situations where adverse impact is probable, the Corps may issue an Individual Permit after reviewing an analysis of alternatives. Enforcement actions may be taken by the Corps or EPA.

WASHINGTON STATE DEPARTMENT OF ECOLOGY

The mission of Ecology's Water Quality Program is to protect, preserve, and enhance the state surface and ground water quality and to promote the wise management of water for the benefit of current and future generations. Ecology performs various functions under state and federal authority and has both local and regional offices. Ecology is also responsible for awarding low interest loans for pollution control projects through the State Revolving Fund.

Ecology issues permits under the State Water Pollution Control Act, Section 401 Water Quality Certification, and NPDES permits in compliance with the CWA under EPA authority. Ecology also reviews and approves plans for on-site systems receiving State or Federal construction grants under the CWA. Ecology regulates discharge of waste to state groundwater, discharge of industrial or commercial waste to sewers, and the use of reclaimed water through the State Waste Discharge permit program. Local Ecology offices issue Temporary Modification of Water Quality Criteria Permits for construction near or in water that might cause short-term water quality violations.

Ecology also regulates the management and disposal of biosolids. The biosolids permit is a general permit that provides coverage for applicants that have conducted the required biosolids analysis. Because biosolids management is a significant component of this Plan, Chapter 9 provides a more comprehensive assessment of the biosolids issues applicable to Ridgefield.

WASHINGTON STATE DEPARTMENT OF FISH AND WILDLIFE

Under WAC 220-110 and RCW 75.20, any form of work that uses, diverts, obstructs, or changes the natural flow or bed of any fresh water of the state requires hydraulic project approval from the Department of Fish and Wildlife. Approval would be required for all City construction projects that cross or otherwise take place in streams or shorelines.

STATE AND LOCAL HEALTH DEPARTMENTS

The Department of Health (Health) was formed in 1989 and is the primary state agency responsible for protecting public health. Health issues Waste Discharge Permits for reclaimed water use in conjunction with Ecology and approves onsite wastewater disposal systems between 3,500 and 100,000 GPD.

CITY AND COUNTY PLANNING POLICIES

The Washington Administrative Code (173-240-050) requires a statement in all Wastewater Comprehensive Plans regarding compliance with any adopted water quality management plan pursuant to the Federal Water Pollution Control Act as amended. The City complies with the Federal Water Pollution Control Act by having an NPDES permit for the WWTP.

The Washington Administrative Code (173-240-050) requires a statement in all Wastewater Comprehensive Plans regarding compliance with the State Environmental Policy Act (SEPA), if applicable.

ON-SITE SEPTIC SYSTEM REGULATIONS

In some cases wastewater may be treated and disposed of on-site either by individual septic systems or community on-site systems. On-site septic systems should be designed to meet the Washington Department of Health Design Standards. Approval of the systems will be made either by the local health department for systems under 3,500 gallons per day, or the Washington State Department of Health for systems less than 100,000 gallons per day but greater than 3,500 gallons per day. The statute that provides the authority for the Department of Health (DOH) to regulate sewage systems is found in RCW 70.118B.

Septic systems that are currently active within City limits will be phased out as the wastewater collection system is expanded. Properties within county jurisdiction surrounding the City are usually served by septic systems. However, the Tri Mountain Golf Course and the Washington State Patrol truck weighing station located on northbound I-5 (and outside the Ridgefield UGA) are served by a force main connected to the City sewer system.

CITY SEWER ORDINANCES AND PLANNING POLICIES

Title 13 of the Ridgefield Municipal Code sets rules and regulations for the City's sewer system. The ordinance establishes rates and connection charges for City sewer customers. The City also has construction standards for developer constructed additions and connections to the City system, and the City has also adopted Pretreatment Standards for the Sanitary Sewer Collection System.

The siting of any wastewater facilities such as pump stations or wastewater treatment facilities must comply with the City planning and zoning policies at the time of construction.

CHAPTER 5

EXISTING CONDITIONS

INTRODUCTION

The City of Ridgefield owns and operates a wastewater collection system and treatment plant. The collection system derives from two different periods in the City's history. The older part of the system is concrete pipe constructed largely in the 1950s. Starting in the 1990s, a considerable amount of new PVC pipe was added to the collection system. The collection system is a dedicated sanitary sewer and does not carry stormwater flows. The City has a separate dedicated storm sewer system that manages storm sewer flows.

The current wastewater treatment plant uses an activated sludge process and was last upgraded in 2007 to a capacity of 0.7 mgd. Originally built in the 1950s, the plant has undergone several major upgrades. The most recent upgrade provided increased secondary treatment and sludge handling capacity, and extended the existing outfall further into Lake River and added a diffuser. The plant site is located adjacent to Lake River at the lowest point of the community. The plant's mechanical components and tankage are located above the 100-year flood plain.

EXISTING WASTEWATER COLLECTION SYSTEM

A network of 6-inch- to 10-inch-diameter gravity sewers serve the older areas of the City. Most of the older collection system is located on the "ridge" between Lake River and Gee Creek, where most of the older part of the City is situated. These sewers were constructed in the mid-1950s to serve only the then-developed portions of the City and were not sized to be large enough to accommodate the future growth areas now being planned.

Most of the City's new growth has been in areas outside of the older part of the City. Three such areas, the south Hillhurst Road area, the Ridgefield Junction area, and the Heron Ridge/Bellwood Heights developments have collection systems that discharge to pump stations which pump to 4-inch- and 6-inch-diameter sewer force mains that discharge to the downtown system. The discharges from the growth served by these systems are beginning to consume the remaining capacity of the older gravity collection system. The T-7 pump station and force main project was constructed in 2006 to convey wastewater from the east and south portions of the City's UGA around the downtown collection system, directly to the WWTP.

In all, the City maintains approximately 223,000 lineal feet of gravity sewer and force mains. In Chapter 3, Figure 3-1 presented the area served by the existing sewer system.

A sewer system base map is provided in Appendix F. Table 5-1 provides an inventory of the gravity sewer and force mains in the system.

TABLE 5-1

Inventory of Gravity and Force Mains

Description	Type(1)	Size (in)	Material	Length (LF)
Downtown Area Sewer (Constructed in 1959)	G	4	Concrete	100
	G	6	Concrete	3,750
	G	8	Concrete	19,600
	G	10	Concrete	2,350
Newer Sewer (1986 - Present)	G	6	PVC	11,250
	G	8	PVC	124,350
	G	10	PVC	8,300
	G	12	PVC	4,100
	G	15	PVC	1,150
	G	16	PVC	750
	G	18	PVC	4,050
	G	24	PVC	300
	G	30	PVC	200
	FM	4	PVC	16,900
	FM	6	PVC	38,250
	FM	12	PVC	10,950

(1) G is a gravity line. FM is a Force Main.

One key consideration for the City is the capacity and condition of the downtown collection system. A capacity analysis of the downtown system was performed. The results of this analysis are presented in Table 5-2. The analysis indicates that the line connecting manhole D-1 to the treatment plant limits the maximum capacity of the downtown collection system. This line runs east to west; passing under the Burlington Northern Railroad line and drains into the WWTP influent lift station. This line is estimated to have a maximum hydraulic conveyance capacity of 0.72 mgd and conveys all wastewater flow originating in the historic downtown Ridgefield area. It should be noted that two force mains (the T-7 force main and the Taverner force main) have also been constructed in the last 10 years that convey sewer flows from other areas of the City under the railroads tracks to the WWTP. These force mains are described in greater detail below.

TABLE 5-2

WWTP Influent Pipe Hydraulic Analysis

Trunk Line Designation	Manhole		Diameter (in)	Length (ft)	Slope (ft/ft)	Manning Coefficient	Capacity	
	Upstream	Downstream					(cfs)	(mgd)
T-3	CO	MH71	6	188	0.0081	0.014	0.47	0.30
T-3	MH71	D4	8	400	0.031	0.014	1.98	1.28
T-3	D4	MH70	8	400	0.039	0.014	2.22	1.44
T-3	MH70	MH69	8	254	0.0461	0.014	2.42	1.56
T-3	MH69	MH68	8	265	0.138	0.014	4.18	2.70
T-3	MH68	MH67	8	194	0.1491	0.014	4.34	2.81
T-3	MH67	MH66	8	290	0.058	0.014	2.71	1.75
T-3	MH66	MH63	8	350	0.0522	0.014	2.57	1.66
T-3	MH63	MH62	8	324	0.065	0.014	2.87	1.85
T-3	MH62	MH61	8	420	0.0055	0.014	0.83	0.54
T-3	MH61	D3	8	500	0.003	0.014	0.62	0.40
T-2	MH57	MH56	8	227	0.004	0.014	0.71	0.46
T-2	MH56	MH54	8	214	0.005	0.014	0.80	0.51
T-2	MH54	MH49	8	129	0.005	0.014	0.80	0.51
T-2	MH49	MH48	8	340	0.025	0.014	1.78	1.15
T-2	MH48	MH46	8	332	0.037	0.014	2.16	1.40
T-2	MH46	D3	8	182	0.05	0.014	2.52	1.63
T-2	D3	MH45	8	344	0.025	0.014	1.78	1.15
T-2	MH45	MH44	8	307	0.004	0.014	0.71	0.46
T-2	MH44	MH39	8	276	0.0045	0.014	0.75	0.49
T-2	MH39	MH37	8	276	0.004	0.014	0.71	0.46
T-2	MH37	MH35	8	263	0.004	0.014	0.71	0.46
T-2	MH35	MH27	8	245	0.06	0.014	2.76	1.78
T-2	MH27	MH26	8	25	0.004	0.014	0.71	0.46
T-1	MH26	MH25	8	365	0.005	0.014	0.80	0.51
T-1	MH25	MH24	8	115	0.0544	0.014	2.62	1.70
T-1	MH24	MH19	8	276	0.0083	0.014	1.03	0.66
T-1	MH19	MH15	10	228	0.003	0.014	1.12	0.72

TABLE 5-2 – (continued)

WWTP Influent Pipe Hydraulic Analysis

Trunk Line Designation	Manhole		Diameter (in)	Length (ft)	Slope (ft/ft)	Manning Coefficient	Capacity	
	Upstream	Downstream					(cfs)	(mgd)
T-1	MH15	MH12	10	267	0.003	0.014	1.12	0.72
T-1	MH12	D2	10	256	0.003	0.014	1.12	0.72
T-1	D2	D1	10	180	0.003	0.014	1.12	0.72
T-1	D1	WWTP	10	188	0.003	0.014	1.12	**0.72**

EXISTING PUMP STATIONS AND FORCE MAINS

The City also owns and operates a number of pump station and force mains. The major ones are described below.

Hillhurst Force Main (Serving Wishing Well, Cassini View, and Osprey Pointe Pump Stations)

The Hillhurst Force Main is located along Hillhurst Road, running from the lift station located at South 22nd Circle in the Wishing Well Estates subdivision to the gravity collection system south of Cemetery Road. In addition to serving the Wishing Well Estates subdivision, the system also conveys flows from the Ridgefield High School where a lift station owned and operated by the school discharges to the subdivision sewers. The Wishing Well Estates Lift Station has a capacity of 100 gallons per minute (gpm). In the last 10 years, additional lift stations were connected to this force main with the Cassini View development and the Osprey Pointe development. Each of these lift stations has a rated capacity of 120 gpm.

Taverner Ridge Force Main (Serving Taverner Ridge and Canyon’s Ridge Pump Stations)

The Taverner Ridge Force Main is located on the southwest side of Hillhurst Road and conveys wastewater from residential developments on the southwest side Hillhurst Road through the historic downtown area directly to the WWTP. The force main is 6-inch PVC. Currently it serves the Taverner Ridge Lift Station with a capacity of 285 gpm and the Canyon’s Ridge Lift Station with a capacity of 333 gpm.

Junction Force Main

The Junction Force Main serves the Junction area. This force main is a 6-inch PVC pipeline that extends from the Junction Lift Station near South 56th Place to the gravity sewer system near the Gee Creek Lift Station. The Junction Lift Station is located west of South 56th Place and south of Pioneer Street and has a capacity of approximately 215 gpm. The Junction Lift Station may have to be expanded and improved, or replaced to serve the growing needs of the Junction area until such time as a gravity-flow trunk sewer system becomes available for this area. The capacity of this system could be increased on an interim basis if larger pumps were installed or flow equalization was provided to dampen peak flows.

Gee Creek Meadows Pump Station and T-7 Force Main

The Gee Creek Meadows Lift Station located south of Pioneer Street, just west of Gee Creek conveys wastewater around the historic downtown sewers directly to the WWTP. The Gee Creek Meadows Lift Station has a current design capacity of 1,000 gpm and discharges to one of two parallel 12-inch force mains that travel through Abrams Park all the way to the City's treatment facility. Most wastewater south and east of the historic downtown area is pumped by the Gee Creek Meadows Lift Station.

Pioneer Canyon Force Main

The Pioneer Canyon Force Main consists of two 12-inch pipes that convey wastewater from near the intersection of North 45th Avenue and Pioneer Canyon Drive to a gravity trunk sewer near the intersection of Pioneer Street and Smythe Road. The sewer lift station has a capacity of 3,100 gpm and is designed to convey wastewater from much of the area east of 45th Avenue.

Heron Ridge Force Main

The Heron Ridge Force Main conveys wastewater from the Heron Ridge Lift Station to the downtown collection system near Main Avenue. The Heron Ridge Lift Station is located north of Heron Drive and serves the subdivisions of Heron Ridge and Bellwood Heights north of Gee Creek. The force main is a 6-inch PVC pipeline. The lift station capacity is approximately 300 gpm.

Other Lift Stations

There are several other smaller lift stations located throughout the Ridgefield Urban Growth Area (UGA). These stations serve facilities that are located below the gravity system. One lift station, serving Abrams Park and the surrounding homes, pumps through a force main that discharges into the gravity-flow system manhole at the intersection of Fifth and Division. Another lift station is located at the Marina west of the railroad tracks. There is also an existing lift station for the Tri Mountain Golf Course and WSDOT weigh station located in the Allen Canyon drainage basin outside of the UGA (but in the Urban Reserve Area). This station discharges to a 4-inch-diameter force main that carries the wastewater south to the Junction gravity collection system where all the flows are directed to the Junction Force Main described above.

Table 5-3 provides a summary of the pump stations currently in the City collection system.

TABLE 5-3

Inventory of Existing Pump Stations

Sewer Lift Stations Description	Type	Number of Pumps	Horsepower	Year Built
Wishing Well Estates	Submersible	2	2 @ 18	1992
Junction	Submersible	2	2 @ 10	1985
Gee Creek Meadows	Submersible	2	2 @ 25	1993(1)
Heron Ridge	Submersible	2	2 @ 15	2002
Golf Course	Submersible	2	2 @ 25	1994
Abrams Park	Submersible	2	2 @ 7.5	1987
Marina Lift Station	Submersible	2	2 @ 5	1974
Taverner Ridge	Submersible	2	2 @ 15	2005
Osprey Point	Submersible	2	2 @ 18	2005
Cassini View	Submersible	2	2 @ 18	2005
Canyon's Ridge	Submersible	2	2 @ 35	2006
Pioneer Canyon	Submersible	3	3 @ 70	2007

(1) The pump station was upgraded in 2006 as part of the T-7 Force Main Project.

Septic Tank Effluent Pump Systems

There are also eight Septic Tank Effluent Pump (STEP) systems located in the City. Six of these systems are located along Pioneer Street with the remaining two located along Hillhurst Road. The City maintains the mechanical components (pumps) for these systems and will pump the septic tanks associated with each of these systems as necessary. The City's current policy is to prohibit the use of new STEP systems in the City.

SEWER SYSTEM CONNECTIONS

As of 2012, the sewer system served approximately 1,687 residential sewer connections. As of March 2013, the sewer system served 83 commercial connections. The commercial connections consist of schools, warehouse facilities, light industrial facilities, restaurants, stores, and offices. The wastewater from the non-residential sources consists mostly of toilet and food preparation flows. None of the commercial flows represent an unusual waste stream.

EXISTING WASTEWATER TREATMENT FACILITY

The City of Ridgefield operates a conventional activated sludge wastewater treatment facility (WWTP) to provide secondary treatment of municipal sewage from the City of Ridgefield and the area within the sewer service area. After treatment, the effluent is discharged through an outfall to Lake River. The WWTP process flow diagram is provided in Figure 5-1.

The as-built plans for the last WWTP expansion (dated February 2006) indicate that the existing facility was designed to treat a maximum month flow of 0.7 mgd, with a maximum month organic loading of 1,240 lb BOD_5/day and a maximum month solids loading of 1,240 lb TSS/day. The WWTP design loadings and effluent limits, as indicated in the existing NPDES permit (WA0023272), are shown below in Table 5-4. The NPDES permit, which was issued in 2011, is included in Appendix A. The fact sheet identifies the existing WWTP as a reliability Class 2 Plant.

TABLE 5-4

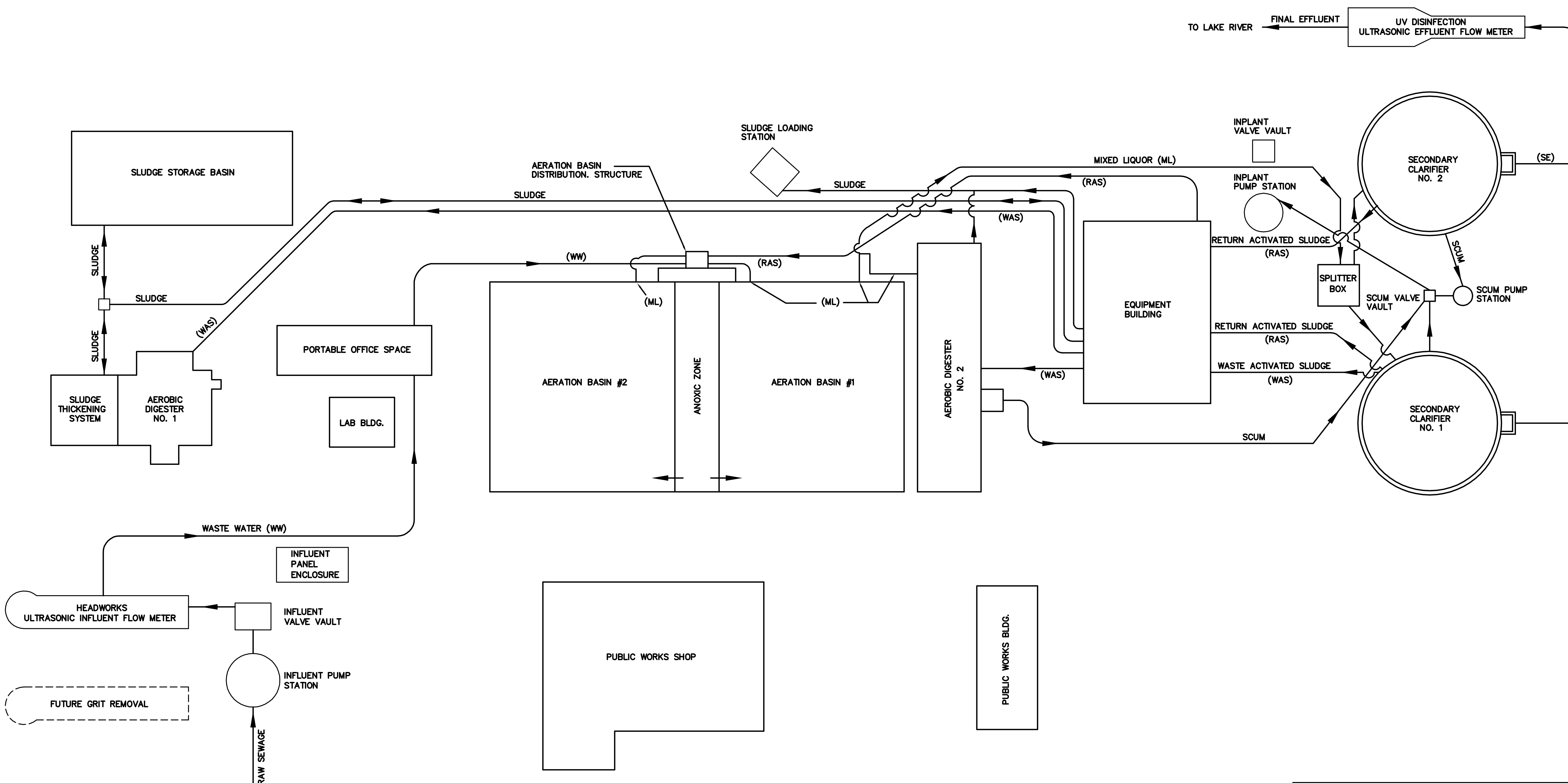
Existing WWTP Design Criteria and NPDES Permit Limits

Parameter	Value
Maximum Month Flow	0.7 mgd
Maximum Month Influent BOD_5 Loading	1,240 lbs/day
Maximum Month Influent TSS Loading	1,240 lbs/day
Maximum Month Ammonia Loading	160 lbs/day
Effluent Limits:	
BOD_5 Concentration (monthly avg.*)	30 mg/L
BOD_5 Concentration (weekly avg.)	45 mg/L
BOD_5 Loading (monthly avg.)	175 lbs/day
BOD_5 Loading (weekly avg.)	263 lbs/day
TSS Concentration (monthly avg.*)	30 mg/L
TSS Concentration (weekly avg.)	45 mg/L
TSS Loading (monthly avg.)	175 lbs/day
TSS Loading (weekly avg.)	263 lbs/day
Fecal Coliform Count (monthly avg.)	100/100 mL
Fecal Coliform Count (weekly avg.)	200/100 mL
pH	Shall not be outside the range 6.0 to 9.0
Total Ammonia as N (monthly avg.)	1.4 mg/L (8.2 lb/day)
Total Ammonia as N (daily max.)	3.14 mg/L

*The average monthly effluent concentration for BOD_5 and TSS shall not exceed 30 mg/L or 15 percent of the respective monthly average influent concentration.

EXISTING UNIT PROCESSES

A description of each unit process at the existing WWTP is presented below and a summary of each unit process is presented in Table 5-5 at the end of this chapter.



CITY OF RIDGEFIELD

GENERAL SEWER PLAN
FIGURE 5-1
PROCESS FLOW DIAGRAM

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Influent Pump Station

Raw sewage flows by gravity from the 10-inch diameter interceptor sewer, which crosses under the adjacent railroad tracks, to the influent pump station located at the southeast corner of the plant. The influent pump station wet well is 10'-0" inside diameter, 11'-0" deep and equipped with three 7.5 hp submersible centrifugal pumps. All three of the influent pumps are equipped with a variable frequency drive (VFD), which varies the speed of each pump based on a signal from the ultrasonic level sensor located in the wet well. A low level float and high level float generate an alarm via the plant programmable logic controller (PLC) and provide backup control of the pumps. All three pumps discharge to a common 8-inch force main. Each pump has an isolation plug valve and check valve on the 6-inch discharge line, all of which are located in a below-grade valve vault adjacent to the wet well. The influent pumps each have 7.5 hp, 460 V motors and a design operating condition of 520 gpm at 29.8 feet of head. The capacity of the existing influent pump station with one pump out of service, per DOE criteria, is 950 gpm (1.4 mgd). The station was constructed in 2000.

Headworks

Raw sewage is pumped from the Influent Pump Station to the headworks. In addition, sewage from the T-7 force main is conveyed directly to the headworks via a 12-inch pipe. The headworks is an above-grade concrete structure, which has a mechanical fine screen, manually cleaned bypass bar screen, influent sampler, and influent flow meter. The mechanical fine screen and manually cleaned bar screen are located in adjacent 1'-8"-wide concrete channels separated by isolation stop gates. Screenings from the mechanical fine screen drop into a dumpster for landfill disposal. The influent sampler is located upstream of the influent flow meter. The influent flow meter consists of a 9-inch Parshall flume equipped with an ultrasonic level sensor. The influent sampler is a refrigerated automatic unit, which collects flow-proportional samples.

Grit System

A grit removal system was added to the headworks in 2003. The grit removal process begins with a Smith & Loveless Pista Grit system. The City has a Model 2.5 Pista Grit circular settling tank system driven by 3/4-hp motor. Settled grit is removed with a Wemco recessed impeller pump and lifted into a classifier which both drains the grit and conveys the grit by a screw conveyor into the same dumpster that is used for the headworks screenings. The Wemco pump is powered by a Duty Master 7.5-hp motor. The classifier is a Goodman Conveyor. Drainage from the classifier is returned to the headworks.

Aeration Basins

The Ridgefield WWTP operates as a conventional activated sludge system. The purpose of the activated sludge system is to remove suspended and colloidal solids and dissolved organic matter from wastewater. This removal is accomplished by introduction of the wastewater into a biological reactor (aeration basin) containing a high concentration of actively growing microorganisms in the presence of dissolved oxygen. The microorganisms utilize the waste material as a source of food to obtain the energy necessary for their own life processes and growth. The rapid growth of these organisms results in the creation of a flocculant biological mass which can be removed from the liquid stream by sedimentation in the secondary clarifier, thus creating a clear effluent with a low organic content. In the activated sludge process, the high concentration of active biological mass is maintained by continuously recycling the organisms back into the aeration basin. Effective settling and separation of the biological mass from the liquid stream in the secondary clarifiers is essential for the proper operation of the activated sludge system. Some removal (wasting) of the biological mass is also conducted in order to maintain a steady-state population in the system. The aeration basins have been sized to provide adequate retention time to achieve nitrification to meet the required effluent ammonia concentration in the NPDES permit.

Wastewater flows by gravity from the headworks to a concrete distribution structure adjacent to the aeration basins. The distribution structure also receives discharge from the plant drain pump station and return activated sludge (RAS) flow, which is pumped from the secondary clarifier. The combined wastewater and RAS, which is commonly called mixed liquor, flows by gravity from the distribution structure to the aeration basins. The aeration basins are a concrete structure consisting of two equally sized aeration basins with a volume of 174,000 gallons each and a single anoxic basin with a volume of 48,000 gallons. The anoxic basin is located between the aeration basins, sharing a common wall with each basin, and is equipped with four platform-mounted surface mixers. Aeration and mixing of the aeration basins is provided by three aeration blowers, which are located in the equipment building, and a fine bubble air diffusion system. A submersible recycle pump is located in each basin to recirculate mixed liquor to the anoxic basin.

Mixed liquor flows by gravity from the distribution structure through the anoxic basin and then to each aeration basin over isolation slide gates. Mixed liquor from the aeration basins discharges over effluent weirs and then combines the flow to the secondary clarifier.

The aeration blowers are positive displacement blowers equipped with VFDs. The PLC automatically adjusts the aeration rate as a function of an operator-adjusted time schedule, the dissolved oxygen concentration in the aeration basin, or in proportion to influent flow. The variable speed submersible recycle pumps operate continuously. Two of the anoxic basin mixers are constant speed and two mixers are equipped with VFDs that can be adjusted by the operator.

Secondary Clarifiers

Mixed liquor flows from each aeration basin to two 50-foot-diameter circular, concrete secondary clarifiers through 14-inch diameter center influent pipes. The clarifiers are equipped with a clarifier mechanism with a 1/2-hp drive motor, sludge scrapers, scum skimmer blade, scum collection box, energy dissipating inlet, and flocculating feedwell. The clarified effluent flows over the peripheral v-notch weir to the effluent trough where it flows by gravity to the UV disinfection system. Settled solids from the clarifiers are collected in sludge hoppers, which have suction piping connection to three horizontal screw centrifugal Return Activated Sludge (RAS) pumps and two recessed impeller Waste Activated Sludge (WAS) pumps, located in the equipment building. Scum flows by gravity from the scum collection box to the scum pump station.

UV Disinfection System/Effluent Flow Measurement

Secondary effluent flows by gravity from the secondary clarifier to the UV disinfection system structure. This structure consists of a concrete channel with three UV banks, a downstream finger weir for level control, a 3-foot-wide effluent trapezoidal weir with an ultrasonic level sensor, and an effluent sampler. The effluent sampler is a refrigerated automatic unit, which collects flow-proportional samples.

River Outfall

Treated effluent is discharged to Lake River via a 10-inch concrete outfall pipe constructed in the 1950s. The outfall was extended further into the river and a diffuser was added as part of the most recent plant upgrade in 2006.

Non-Potable Water System

A non-potable water system supplies plant effluent for process and maintenance uses. Two end suction centrifugal pumps, located adjacent to the UV disinfection system channel, pump plant effluent to a strainer and hydropneumatic tank in the equipment building. A pressure transducer on the hydropneumatic tank piping controls the on/off status of the non-potable water pumps to maintain the desired water pressure. The non-potable water pumps transfer effluent from a section of the UV disinfection system channel located downstream of the finger weir and upstream of the trapezoidal weir. This section is 4'-0" long and 6'-8" wide, with a side water depth of 6'-6" and with a storage volume of 1,300 gallons.

Solids Handling System

The existing sludge stabilization process consists of two aerobic digesters. Digester No. 1 is a converted concrete Imhoff tank with a volume of 50,000 gallons, and is equipped with coarse bubble diffusers, which receive low-pressure air from a designated dual-speed blower located in the equipment building. Aerobic Digester No. 2 is a rectangular concrete aerobic digester (converted from the existing rectangular clarifier) with a 16.25-foot side water depth and a volume of 64,000 gallons. The sludge storage basin is a 60,000-gallon concrete tank that is not equipped with aeration equipment. Waste activated sludge is pumped from the clarifier sludge hopper by the WAS pump, which is located in the equipment building adjacent to the two RAS pumps. A magnetic flow meter is installed on the WAS discharge line for WAS flow measurement. The scum pump transfers scum to the aerobic digester from the scum pump station. Aeration and mixing are supplied to the aerobic digester via coarse bubble air diffusers, which receive low-pressure air from the variable speed positive displacement digester blower, located in the equipment building. Supernatant is decanted using a telescoping valve, which is connected by a 4-inch pipe to the plant drain pump station. Sludge is wasted from the digester to a rotary sludge thickener. The sludge transfer pump discharge piping extends to a 3-inch camlock fitting for connection to the sludge hauling truck at the concrete sludge loading pad. Currently, all sludge is disposed of off-site by contract to the Clark County Salmon Creek Wastewater Treatment Plant.

Aeration System

There are five aeration blowers, located in the equipment building, which supply air to the various processes. The three aeration basin blowers are variable speed 50-hp positive displacement blowers. The discharge piping of each of the blowers is connected to a common header that feeds fine bubble diffuser membranes in the aeration basin. The Aerobic Digester No. 2 blower (No. 1) is a dual-speed 25-hp positive displacement blower. The Aerobic Digester No. 2 blower (No. 2) is a variable speed 100-hp positive displacement blower.

Plant Drain Pump Station

A plant drain pump station receives flows from the plant drain lines and has the ability to drain the secondary clarifier and aerobic digester. The plant drain pump station wet well is an 8-foot I.D., 12-foot-deep, manhole equipped with two submersible centrifugal pumps. Each pump discharge line has an isolation plug valve and a check valve, which are located in a below-grade valve vault adjacent to the wet well. The discharge lines are connected to a common 6-inch pipe, which is connected to the aeration basin distribution structure. The wet well is equipped with four floats for pump control and alarms.

Auxiliary Generator

The existing auxiliary diesel generator and automatic transfer switch are located in the equipment building. The generator is rated at 400 kW, 3 phase, 480 V. It will power all equipment at the existing WWTP.

Equipment Building

The equipment building has a pump room, electrical room, and a blower room. The pump room has three RAS pumps; two WAS pump, one sludge transfer pump, and space for two future pumps. The non-potable water system hydropneumatic tank and strainer and a waterline with reduced pressure backflow preventer are also located in the pump room. The blower room contains the five aeration blowers and the auxiliary generator. The electrical room contains the main switchboard, automatic transfer switch, panel board, PLC control panel, and equipment motor control centers (MCC) for all of the equipment that was installed in the latest upgrade.

Lab and Office Buildings

The plant has two portable buildings that serve as a lab building and an office building. The lab building has a small process control laboratory, a bathroom, and a storage room. The Clark County Salmon Creek Wastewater Plant performs the majority of the laboratory analysis required for monthly compliance reporting purposes. The office serves as the location where reporting data is compiled and provided to the regulatory agencies. Telemetry data from lift stations, the wastewater treatment plant, and the City water system are also received and monitored in this building.

EXISTING WWTP UNIT PROCESS DATA

Table 5-5 summarizes some key parameters for the existing WWTP unit processes.

TABLE 5-5

Existing WWTP Unit Process Data

Influent Pump Station	
Influent Pumps:	
Quantity of Pumps	3
Pump Type	Submersible Centrifugal
Motor Size	7.5 hp
Drive	Variable Speed
Capacity (each)	520 gpm @ 29.8 ft
Pump Station Capacity	950 gpm (1.4 mgd)

TABLE 5-5 – (continued)

Existing WWTP Unit Process Data

Influent Screens	
Mechanical Fine Screen	
Quantity	1
Type	Helical Auger
Screen Width	20 inches
Mesh Diameter	0.25 inch
Motor Size	1 hp
Capacity	3.5 mgd
Bypass Bar Screen:	
Quantity	1
Type	Manual Coarse Bar
Screen Width	24 inches
Bar Spacing	0.75-inch
Grit Removal	
Grit Removal System	
Quantity	1
Type	Vortex
Motor Size	0.75 hp
Grit Cyclone	
Quantity	1
Grit Classifier	
Quantity	1
Screw Diameter	9-inch
Motor Size	0.75 hp
Grit Pump	
Quantity	1
Motor Size	7.5 hp
Influent Flow Measurement	
Type	Parshall Flume
Size	9 inch
Capacity	3.3 mgd

TABLE 5-5 – (continued)

Existing WWTP Unit Process Data

Anoxic Basin	
Quantity	1
Side Water Depth	15 ft
Volume	48,000 gal
Mixing	
Type	Vertical Shaft
Quantity	4
Drive	2 Variable Speed, 2 Constant Speed
Motor Size	1 hp
Aeration:	
Type	Fine Bubble Diffusers
Aeration Basins	
Quantity	2
Side Water Depth	12 ft
Volume, Each	174,000 gal
Effluent Weir Length	7 feet
Aeration	
Type	Fine Bubble Diffusers
Mixed Liquor Recycle Pumps	
Quantity	3
Pump Type	Horizontal Centrifugal
Motor Size	3 hp
Drive	Variable Speed
Capacity (each)	375 gpm @ 13.5 ft
Aeration Basin Blowers	
Quantity	3
Type	Positive Displacement
Capacity, Each	800 scfm @ 9 psi
Motor Size	50 hp
Drive	Variable Speed
Maximum Speed	1,850 rpm

TABLE 5-5 – (continued)

Existing WWTP Unit Process Data

Secondary Clarifiers	
Quantity	2
Clarifier No. 1	
Diameter	50 ft
Effective Settling Area	1963 ft^2
Effective Side Water Depth	14 ft
Volume	205,600 gal
Weir Length	141 ft
Drive Size	1/2 hp
Clarifier No. 2	
Length x Width	50 ft
Effective Settling Area	1963 ft^2
Effective Side Water Depth	14 ft
Volume	205,600 gal
Weir Length	141 ft
Drive Size	1/2 hp
Effluent Disinfection	
Type	Ultraviolet
UV Tube Type	Low Pressure, Low Output, Horizontal
Quantity of Channels	1
Channel Width	27 in
Channel Depth	4 ft
Channel Length	32 ft
Flow Control Weir Length	27 ft
Quantity of Banks	3
Quantity of Modules Per Bank	4
Quantity of Lamps Per Module	8
Total Quantity of Lamps	96
Design UV Transmittance (Min)	65%
Effluent Disinfection Standard	200 cfu/100 mL
Disinfection Dose Required	33,000 μW sec/cm^2
Peak Rated Flow To Meet Standard	1.93 mgd
Effluent Flow Measurement	
Type	Cippoietti Weir
Size	3 ft
Capacity	5 mgd

TABLE 5-5 – (continued)

Existing WWTP Unit Process Data

Non-Potable Water Pumps	
Quantity of Pumps	2
Pump Type	Close Coupled End Suction Centrifugal
Motor Size	15 hp
Drive	Constant Speed
Capacity (each)	100 gpm @ 231 ft
Plant Drain Pumps	
Quantity of Pumps	2
Pump Type	Submersible Centrifugal
Motor Size	5 hp
Drive	Constant Speed
Capacity	226 gpm @ 32 ft
Return Activated Sludge Pumps	
Quantity of Pumps	3
Clarifier No. 1 Pumps	
Quantity of Pumps	2 (1 shared standby)
Pump Type	Horizontal Screw Centrifugal
Motor Size	3 hp
Drive	Variable Speed
Capacity (each)	375 gpm @ 13.5 ft
Clarifier No. 2 Pumps	
Quantity of Pumps	2 (1 shared standby)
Pump Type	Horizontal Screw Centrifugal
Motor Size	3 hp
Drive	Variable Speed
Capacity (each)	375 gpm @ 13.5 ft
Waste Activated Sludge Pumps	
Quantity of Pumps	2
Pump Type	Recessed Impeller Centrifugal
Motor Size	3 hp
Drive	Constant Speed
Capacity (each)	60 gpm @ 22.5 ft
Sludge Transfer Pump	
Quantity of Pumps	1
Pump Type	Progressing Cavity
Motor Size	15 hp
Drive	Constant Speed
Capacity	225 gpm @ 50 psi

TABLE 5-5 – (continued)

Existing WWTP Unit Process Data

Scum Pump	
Quantity of Pumps	2
Scum Pump No. 1 (Clarifier No. 1)	
Pump Type	Submersible Centrifugal
Motor Size	1.9 hp
Drive	Constant Speed
Capacity	110gpm @ 15 ft
Aerobic Digester	
Quantity	2
Digester No. 1	
Volume	50,000 gallons
Aeration:	
Type	Coarse Bubble Diffusers
Digester No. 1 Blower:	
Quantity	1
Type	Positive Displacement
Capacity	345 scfm, 10 psig
Motor Size	25 hp
Drive	Dual Speed
Maximum Speed	1,190 rpm
Digester No. 2	
Length x Width	44 ft x 12 ft
Side Water Depth	16.25 ft
Volume	64,000 gallons
Aeration:	
Type	Coarse Bubble Diffusers
Digester No. 2 Blower:	
Quantity	1
Type	Positive Displacement
Capacity	1,477 scfm, 7.5 psig
Motor Size	100 hp
Drive	Variable Speed
Maximum Speed	1,850 rpm

TABLE 5-5 – (continued)

Existing WWTP Unit Process Data

Auxiliary Generator	
Quantity	1
Rating	400 kW, 480 V, 3 Phase

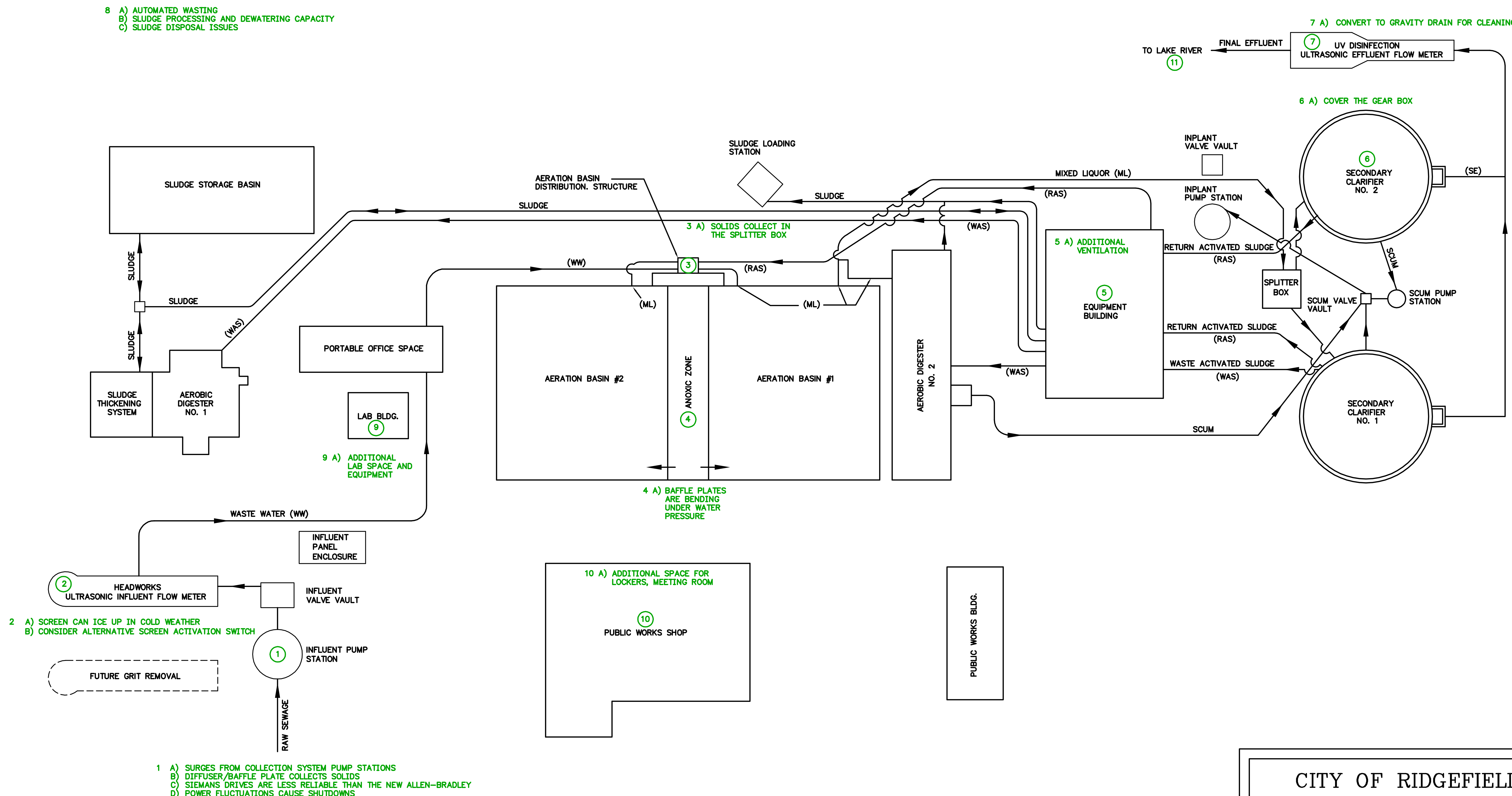
OPERATIONS AND MAINTENANCE

Operations and maintenance is provided in compliance with the NPDES permit and as described in the treatment plant's Operations and Maintenance Manual.

PERMIT VIOLATIONS

A review of monthly monitoring reports (DMRs) from January 2008 through December of 2012 was made to determine the number and nature of permit violations reported by the WWTP. No violations of the average monthly discharge limits were observed for BOD_5, TSS, or Ammonia. However, six daily exceedances were recorded for ammonia since 2010 (when ammonia limits were added to the City's NPDES permit). The DMR reports from January 2008 to December 2012 are provided in Appendix E.

As indicated in the DMR data, the plant generally operates in a manner compliant with the permit. However, some improvements could be made to the plant to improve reliability and operability. In discussions with the treatment plant operators, a number of potential operational improvements have been identified for future plant improvements. The operator concerns are summarized in Figure 5-2. Since the City is pursuing a regional solution for wastewater treatment and disposal, these improvements would only be implemented if a delay in connection to the regional system necessitates construction of the Phase 1 (1.0 mgd) upgrade or if the plant remains in operation for a significant amount of time following connection to a regional system.



CITY OF RIDGEFIELD

GENERAL SEWER PLAN
FIGURE 5-2
OPERATIONAL CONCERNS

Gray & Osborne, Inc.
CONSULTING ENGINEERS

CHAPTER 6

EXISTING AND PROJECTED WASTEWATER FLOWS AND CHARACTERISTICS

INTRODUCTION

Adequate design of wastewater treatment and conveyance facilities requires the determination of the quantity and quality of wastewater generated from each of the contributing sources. Ridgefield wastewater is predominantly domestic in origin with lesser amounts contributed by commercial and industrial businesses and by public use facilities such as schools, parks, and municipal functions. Infiltration and inflow contributions result from groundwater and surface water entering the sewer system during periods of high groundwater levels and rainfall, respectively.

DEFINITION OF TERMS

In this Chapter, the existing wastewater characteristics for the service area will be analyzed and projections made for future conditions. The terms and abbreviations used in the analysis are described below.

WASTEWATER

Wastewater is water-carried waste from residential, business and public use facilities, together with quantities of groundwater and surface water which enter the sewer system through defective piping and direct surface water inlets. The total wastewater flow is quantitatively expressed in millions of gallons per day (mgd).

DOMESTIC WASTEWATER

Domestic Wastewater is wastewater generated from single and multifamily residences, permanent mobile home courts, and group housing facilities such as nursing homes. Domestic wastewater flow is generally expressed as a unit flow based on the average contribution from each person per day. The unit quantity is expressed in terms of gallons per capita per day (gpcd).

EQUIVALENT DWELLING UNIT (EDU)

A baseline wastewater contributor that represents the average single-family residential household. An EDU can also express the average annual flow contributed by a single-family household, in units of gallons per day. The City's 2010 Comprehensive Plan identifies a residential EDU as equivalent to 2.79 residents.

INFILTRATION

Infiltration is groundwater entering a sewer system by means of defective pipes, pipe joints, or manhole walls. Infiltration quantities exhibit seasonal variation in response to groundwater levels. Storm events trigger a rise in the groundwater levels and increase infiltration flows. The highest infiltration flows are observed following significant storm events or following prolonged periods of precipitation. Since infiltration is related to the total amount of piping and appurtenances in the ground and not to any specific water use component, it is generally expressed in terms of the total land area being served. The unit quantity generally used is gallons per acre per day (gpad).

INFLOW

Inflow is surface water entering the sewer system from yard, roof, and footing drains, from cross connections with storm drains and through holes in manhole covers. Peak inflow occurs during heavy storm events when storm sewer systems are taxed beyond their capacity, resulting in hydraulic backups and local ponding. Inflow, like infiltration, can be expressed in terms of gallons per acre per day (gpad).

AVERAGE DRY WEATHER FLOW

Average Dry Weather Flow (ADWF) is wastewater flow during periods when the groundwater table is low and precipitation is at its lowest of the year. The dry weather flow period in western Washington normally occurs from June through September. During this time, the wastewater strength is highest, due to the lack of dilution with the ground and surface water components of infiltration and inflow (I/I). The higher strength coupled with higher temperatures and longer detention times in the sewer system create the greatest potential for system odors during this time. The average dry weather flow is the average daily flow during the three lowest consecutive flow months of the year. For this study, average flows for June, July, and August were used for determining the Average Dry Weather Flow.

AVERAGE ANNUAL FLOW

Average Annual Flow (AAF) is the average daily flow over a calendar year. This flow parameter is used to estimate annual operation and maintenance costs for treatment and pump station facilities.

MAXIMUM MONTHLY FLOW (TREATMENT DESIGN FLOW)

Maximum Monthly Flow (MMF) is the average daily flow during the highest flow month of the year. This wintertime flow is composed of the normal domestic, commercial and public use flows with significant contributions from inflow and infiltration. The predicted maximum monthly flow at the end of the design period is used as the design flow for sizing treatment processes and selecting treatment equipment. For planning purposes, the estimated maximum month flow contribution per EDU is 292 gal/EDU/day.

PEAK DAY FLOW

Peak Day Flow (PDF) is the highest flow occurring during a one day period in a calendar year. In western Washington, the peak day flow occurs in the winter due to the presence of more infiltration and inflow (I/I). This wintertime flow is composed of the normal domestic, commercial and public use flows with significant contributions from inflow and infiltration. The peak day flow at the end of the design period is used to design some wastewater treatment processes.

PEAK HOUR FLOW

Peak Hour Flow (PHF) is the maximum expected peak hourly flow, which typically occurs during a wet weather day. The peak hour flow occurs in response to a significant storm event preceded by prolonged periods of rainfall, which have previously developed a high groundwater table in the service area. Peak hourly flows are used in sizing the hydraulic capacity of wastewater collection, treatment and pumping components. Historical peak hourly flow is typically determined from the treatment plant flow records.

COMMERCIAL AND INDUSTRIAL WASTEWATER

Commercial and Industrial Wastewater is non-residential wastewater generated from business activities, such as restaurants, retail and wholesale stores, service stations, and office buildings. In addition, as noted in Chapter 3, the City is anticipating significant future commercial growth. Commercial and industrial wastewater quantities are expressed in this Plan as equivalent dwelling units (EDUs). Future non-residential wastewater quantities are projected based on the number of retail and non-retail employees as projected in the 2010 Capital Facilities Plan. Maximum month flow per retail employee is 100 gallons per day. The maximum month flow per non-retail employee is 20 gallons per day. Baseline (current) non-residential flow has been determined based on the proportion of wintertime metered water use by non-residential customers.

BIOCHEMICAL OXYGEN DEMAND (BOD)

Biochemical Oxygen Demand (BOD) is a measure of the oxygen required by microorganisms in the biochemical oxidation of organic matter. BOD is an indicator of the organic strength of the wastewater. If BOD is discharged untreated to the environment, biodegradable organics will deplete natural oxygen resources and result in the development of septic conditions. BOD data together with other parameters are used in the sizing of the treatment facilities and provide a measurement for determining the effectiveness of the treatment process. BOD is expressed as a concentration in terms of milligrams per liter (mg/L) and as a mass load in terms of pounds per day (lb/day). The term BOD typically refers to a test conducted over a 5-day period, often written as BOD_5.

SUSPENDED SOLIDS

Suspended Solids is the solid matter carried in the waste stream. Suspended solids are expressed in the same terms as BOD; milligrams per liter for concentration and pounds per day for mass load. The amount of suspended solids in the wastewater is used in the sizing of treatment facilities and provides another measure of the treatment effectiveness. The concentration of total suspended solids (TSS) in wastewater affects the treatment plant sludge production rate and ultimate disposal requirements.

OTHER CONTAMINANTS OF CONCERN

Other contaminants of concern in wastewater include nutrients such as nitrogen and phosphorous, ammonia, priority pollutants, heavy metals and dissolved organics. Secondary treatment standards are concerned with the removal of biodegradable organics, suspended solids, and pathogens. Many of the more stringent water quality and biosolids standards that have been developed recently deal with the removal of nutrients, metals, and priority pollutants.

Nutrients such as nitrogen and phosphorus, along with carbon, are essential requirements for growth. When discharged to the aquatic environment, these nutrients can lead to the growth of undesirable aquatic life. When discharged in excessive amounts on land, they can also lead to the pollution of groundwater. The ammonia form of nitrogen can exert an oxygen demand and is toxic to aquatic life.

Priority pollutants are organic and inorganic compounds selected on the basis of their known or suspected carcinogenicity, mutagenicity, teratogenicity, or high acute toxicity. Many of these compounds are found in wastewater.

Heavy metals usually result from commercial and industrial discharges and may result in violations of water quality standards or biosolids standards. Inorganic constituents such as calcium, sodium, and sulfate are added to the original domestic water supply as a result of water use and may have to be removed if the wastewater is reused.

EXISTING WASTEWATER SERVICE POPULATION, FLOWS AND LOADINGS

Wastewater treatment plant (WWTP) records for the 60-month period from January 2008 through December 2012 were reviewed and analyzed to determine wastewater characteristics and influent loadings. These wastewater flows and loadings were then used in conjunction with projected population data to help determine projected future wastewater flows and loadings. Monthly discharge monitoring report (DMR) data for this period are provided in Appendix G.

Table 6-1 provides monthly plant flow, BOD_5, and TSS data for the period from September 2008 to December 2012. Table 6-2 shows the available ammonia data for the period from October 2008 to December 2012. Graphical representations of the influent values in these tables for average monthly WWTP flows, 5-day biochemical oxygen demand (BOD_5) loading, total suspended solids (TSS) loading, and ammonia loading from this period are shown in Figures 6-1, 6-2, 6-3 and 6-4, respectively.

TABLE 6-1

Summary of WWTP Data (Monthly Averages) for City of Ridgefield WWTP (January 2008 – December 2012)

Month	Avg. Monthly Influent Flow (mgd)	Influent BOD Conc. (mg/L)	Influent BOD Loading (lb/day)	Influent TSS Conc. (mg/L)	Influent TSS Loading (lb/day)	Effluent BOD Conc. (mg/L)	Effluent BOD Loading (lb/day)	Effluent TSS Conc. (mg/L)	Effluent TSS Loading (lb/day)	BOD Removal (%)	TSS Removal (%)
Jan-08	0.424	225	787	197	685	4	16	5	19	98	97
Feb-08	0.400	220	371	217	437	6	11	5	11	98	98
Mar-08	0.335	274	753	295	815	7	19	6	15	97	98
Apr-08	0.319	206	553	246	659	4	11	5	14	98	99
May-08	0.284	240	582	285	692	8	19	10	24	97	97
Jun-08	0.278	287	685	343	820	5	12	7	18	98	98
Jul-08	0.249	340	709	367	765	4	8	5	9	99	99
Aug-08	0.253	316	676	373	798	3	6	3	6	99	99
Sep-08	0.268	324	719	333	739	3	7	4	8	99	99
Oct-08	0.288	291	683	273	642	6	13	5	11	98	98
Nov-08	0.335	263	754	246	719	4	13	5	16	98	98
Dec-08	0.380	302	876	239	712	4	13	5	16	98	98
Jan-09	0.405	210	654	203	655	8	24	10	32	96	95
Feb-09	0.303	321	817	270	690	22	56	24	60	93	91
Mar-09	0.324	227	603	244	647	6	15	5	14	98	98
Apr-09	0.322	260	688	247	656	6	15	6	16	98	98
May-09	0.325	273	762	275	770	5	14	6	18	98	98
Jun-09	0.284	322	755	295	692	3	8	3	7	99	99

TABLE 6-1 – (continued)

Summary of WWTP Data (Monthly Averages) for City of Ridgefield WWTP (January 2008 – December 2012)

Month	Avg. Monthly Influent Flow (mgd)	Influent BOD Conc. (mg/L)	Influent BOD Loading (lb/day)	Influent TSS Conc. (mg/L)	Influent TSS Loading (lb/day)	Effluent BOD Conc. (mg/L)	Effluent BOD Loading (lb/day)	Effluent TSS Conc. (mg/L)	Effluent TSS Loading (lb/day)	BOD Removal (%)	TSS Removal (%)
Jul-09	0.263	333	722	301	651	3	7	3	7	99	99
Aug-09	0.270	312	681	304	668	5	11	6	13	98	98
Sep-09	0.300	298	736	300	740	4	9	4	10	99	99
Oct-09	0.240	322	642	321	634	5	10	5	9	98	99
Nov-09	0.305	264	635	270	653	6	15	7	16	98	97
Dec-09	0.299	267	690	253	655	8	23	9	25	97	96
Jan-10	0.365	291	863	228	664	4	11	4	3	97	98
Feb-10	0.334	281	756	247	671	3	8	3	2	99	99
Mar-10	0.303	299	738	287	708	5	13	7	9	98	98
Apr-10	0.304	277	695	281	703	4	11	5	4	99	98
May-10	0.282	294	660	338	752	6	12	6	13	98	98
Jun-10	0.307	272	668	300	736	3	9	5	3	99	98
Jul-10	0.242	377	763	383	774	5	9	7	4	99	98
Aug-10	0.239	330	648	322	633	4	8	5	3	99	98
Sep-10	0.250	313	660	282	596	3	6	3	2	99	99
Oct-10	0.264	300	647	288	616	3	7	4	2	99	99
Nov-10	0.361	232	718	229	715	4	13	4	4	98	98
Dec-10	0.417	225	790	204	723	5	20	6	7	97	97

TABLE 6-1 – (continued)

Summary of WWTP Data (Monthly Averages) for City of Ridgefield WWTP (January 2008 – December 2012)

Month	Avg. Monthly Influent Flow (mgd)	Influent BOD Conc. (mg/L)	Influent BOD Loading (lb/day)	Influent TSS Conc. (mg/L)	Influent TSS Loading (lb/day)	Effluent BOD Conc. (mg/L)	Effluent BOD Loading (lb/day)	Effluent TSS Conc. (mg/L)	Effluent TSS Loading (lb/day)	BOD Removal (%)	TSS Removal (%)
Jan-11	0.397	240	779	219	707	5	16	5	5	98	98
Feb-11	0.330	275	726	262	697	4	10	4	3	99	99
Mar-11	0.439	192	707	192	708	6	20	6	9	97	97
Apr-11	0.367	211	645	205	627	6	19	6	5	97	97
May-11	0.308	260	653	245	617	6	16	8	20	98	97
Jun-11	0.267	329	727	314	692	6	13	7	16	98	98
Jul-11	0.246	290	595	314	642	4	7	4	2	99	99
Aug-11	0.241	301	614	324	659	6	12	6	3	98	98
Sep-11	0.256	280	598	315	674	6	12	8	5	98	98
Oct-11	0.274	267	616	265	613	3	7	4	3	99	98
Nov-11	0.352	232	636	225	614	6	17	6	6	97	97
Dec-11	0.307	263	663	245	618	5	12	6	15	98	98
Jan-12	0.407	210	683	205	673	5	19	6	6	97	97
Feb-12	0.355	279	799	276	789	6	18	5	4	98	98
Mar-12	0.460	176	685	194	771	5	22	6	8	97	97
Apr-12	0.375	244	763	244	769	5	16	6	19	98	97
May-12	0.321	245	642	276	725	5	13	6	5	98	98
Jun-12	0.282	295	709	313	751	5	12	6	4	98	98

TABLE 6-1 – (continued)

Summary of WWTP Data (Monthly Averages) for City of Ridgefield WWTP (January 2008 – December 2012)

Month	Avg. Monthly Influent Flow (mgd)	Influent BOD Conc. (mg/L)	Influent BOD Loading (lb/day)	Influent TSS Conc. (mg/L)	Influent TSS Loading (lb/day)	Effluent BOD Conc. (mg/L)	Effluent BOD Loading (lb/day)	Effluent TSS Conc. (mg/L)	Effluent TSS Loading (lb/day)	BOD Removal (%)	TSS (%)
Jul-12	0.252	301	626	324	676	7	16	12	7	98	96
Aug-12	0.226	291	548	301	569	7	13	11	6	98	96
Sep-12	0.219	317	578	334	609	8	15	10	5	98	97
Oct-12	0.260	285	587	324	675	8	16	9	6	97	97
Nov-12	0.346	231	646	246	689	6	18	8	7	97	97
Dec-12	0.446	192	738	195	752	5	22	5	6	97	97
Average(1)	**0.314**	**273**	**685**	**274**	**687**	**5**	**14**	**6**	**10**	**98**	**98**
Min(2)	**0.219**	**176**	**371**	**192**	**437**	**3**	**6**	**3**	**2**	**93**	**91**
Max(3)	**0.460**	**377**	**876**	**383**	**820**	**22**	**56**	**24**	**60**	**99**	**99**
NPDES Permit Limit	**0.7**	**NA**	**1,240**	**NA**	**1,240**	**30(4)**	**175**	**30(4)**	**175**	**85**	**85**

(1) 4-Year Average (January 2008 – December 2012).

(2) Minimum Monthly Average (January 2008 – December 2012).

(3) Maximum Monthly Average (January 2008 – December 2012).

(4) The City's NPDES permit sets an effluent BOD and TSS concentration limit of 30 mg/L or 15 percent of the influent concentration, whichever is less.

TABLE 6-2

Summary of WWTP Ammonia Data (Monthly Averages) City of Ridgefield WWTP (September 2009 – December 2012)

Month	Average Monthly Influent Flow (MGD)	Average Influent Ammonia Conc. (mg/L)	Average Influent Ammonia Loading (lb/day)	Average Effluent Ammonia Conc. (mg/L)	Average Effluent Ammonia Loading (lb/day)	Ammonia Removal %
Jan-08	0.424	NA	NA	5.1	18.0	NA
Feb-08	0.400	NA	NA	3.1	10.5	NA
Mar-08	0.335	NA	NA	0.5	1.3	NA
Apr-08	0.319	NA	NA	0.1	0.1	NA
May-08	0.284	NA	NA	0.2	0.4	NA
Jun-08	0.278	NA	NA	0.2	0.6	NA
Jul-08	0.249	NA	NA	0.3	0.6	NA
Aug-08	0.253	NA	NA	0.1	0.3	NA
Sep-08	0.268	NA	NA	0.1	0.2	NA
Oct-08	0.288	NA	NA	0.5	1.2	NA
Nov-08	0.335	NA	NA	0.5	1.5	NA
Dec-08	0.380	NA	NA	0.8	2.5	NA
Jan-09	0.405	NA	NA	3.9	13.2	NA
Feb-09	0.303	NA	NA	30.3	76.6	NA
Mar-09	0.324	NA	NA	26.9	72.7	NA
Apr-09	0.322	NA	NA	1.3	3.5	NA
May-09	0.325	NA	NA	0.2	0.6	NA
Jun-09	0.284	NA	NA	0.4	0.9	NA
Jul-09	0.263	NA	NA	0.8	1.8	NA
Aug-09	0.270	NA	NA	NA	NA	NA
Sep-09	0.300	NA	NA	0.4	0.7	NA
Oct-09	0.240	50	98	0.3	0.8	99.2
Nov-09	0.305	37	90	0.3	0.8	99.2
Dec-09	0.299	41	102	NA	NA	NA
Jan-10	0.365	34	102	1.2	3.6	96.5
Feb-10	0.334	35	102	0.3	0.9	99.1
Mar-10	0.303	37	91	0.3	0.8	99.2
Apr-10	0.304	43	108	0.3	0.8	99.3
May-10	0.282	48	111	1.9	4.2	96.3
Jun-10	0.307	43	110	0.3	0.8	99.3
Jul-10	0.242	53	104	0.4	0.7	99.3
Dec-10	0.417	26	90	0.4	1.5	98.4
Jan-11	0.397	34	110	0.7	2.2	98.0

TABLE 6-2 - (continued)

Summary of WWTP Ammonia Data (Monthly Averages) City of Ridgefield WWTP (September 2009 – December 2012)

Month	Average Monthly Influent Flow (MGD)	Average Influent Ammonia Conc. (mg/L)	Average Influent Ammonia Loading (lb/day)	Average Effluent Ammonia Conc. (mg/L)	Average Effluent Ammonia Loading (lb/day)	Ammonia Removal %
Feb-11	0.330	36	92	0.3	0.9	99.1
Mar-11	0.439	29	101	0.3	1.1	98.9
Apr-11	0.367	38	114	0.4	1.3	98.9
May-11	0.308	51	127	0.3	0.7	99.4
Jun-11	0.267	49	110	0.3	0.7	99.4
Jul-11	0.246	45	92	0.4	0.8	99.1
Aug-11	0.241	49	98	0.8	1.6	98.4
Sep-11	0.256	54	114	0.5	1.0	99.1
Oct-11	0.274	51	116	0.3	0.7	99.4
Nov-11	0.352	40	113	0.3	0.9	99.2
Dec-11	0.307	47	121	0.7	1.7	98.6
Jan-12	0.407	39	126	2.9	10.4	91.8
Feb-12	0.355	44	129	1.4	4.0	96.9
Mar-12	0.460	35	129	0.3	1.2	99.1
Apr-12	0.375	36	110	0.3	0.9	99.2
May-12	0.321	48	134	0.3	0.8	99.4
Jun-12	0.282	50	112	0.3	0.7	99.4
Jul-12	0.252	57	121	0.3	0.6	99.5
Aug-12	0.226	53	99	0.3	0.6	99.4
Sep-12	0.219	54	95	0.3	0.6	99.4
Oct-12	0.260	47	97	0.3	0.7	99.3
Nov-12	0.346	37	96	0.3	0.8	99.1
Dec-12	0.446	24	85	0.4	1.6	98.1
Average(1)	**0.314**	**44**	**108**	**0.5**	**1.5**	**98.7**
Minimum(2)	**0.219**	**24**	**85**	**0.3**	**0.6**	**91.8**
Maximum(3)	**0.460**	**57**	**134**	**2.9(4)**	**10.4(5)**	**99.5**
NPDES Permit Limit	**0.700**	**NA**	**160**	**1.4**	**8.2**	**NA**

(1) 39-Month Average (October 2009 – December 2012)
(2) Minimum Monthly Average (October 2009 – December 2012)
(3) Maximum Monthly Average (October 2009 – December 2012)
(4) The WWTP exceeded the allowable average effluent ammonia concentration in May 2010 and January 2012.
(5) The WWTP exceeded the allowable average effluent ammonia loading in January 2012.

FIGURE 6-1

Monthly Average Flows and Influent NPDES Limit (January 2008 – December 2012)

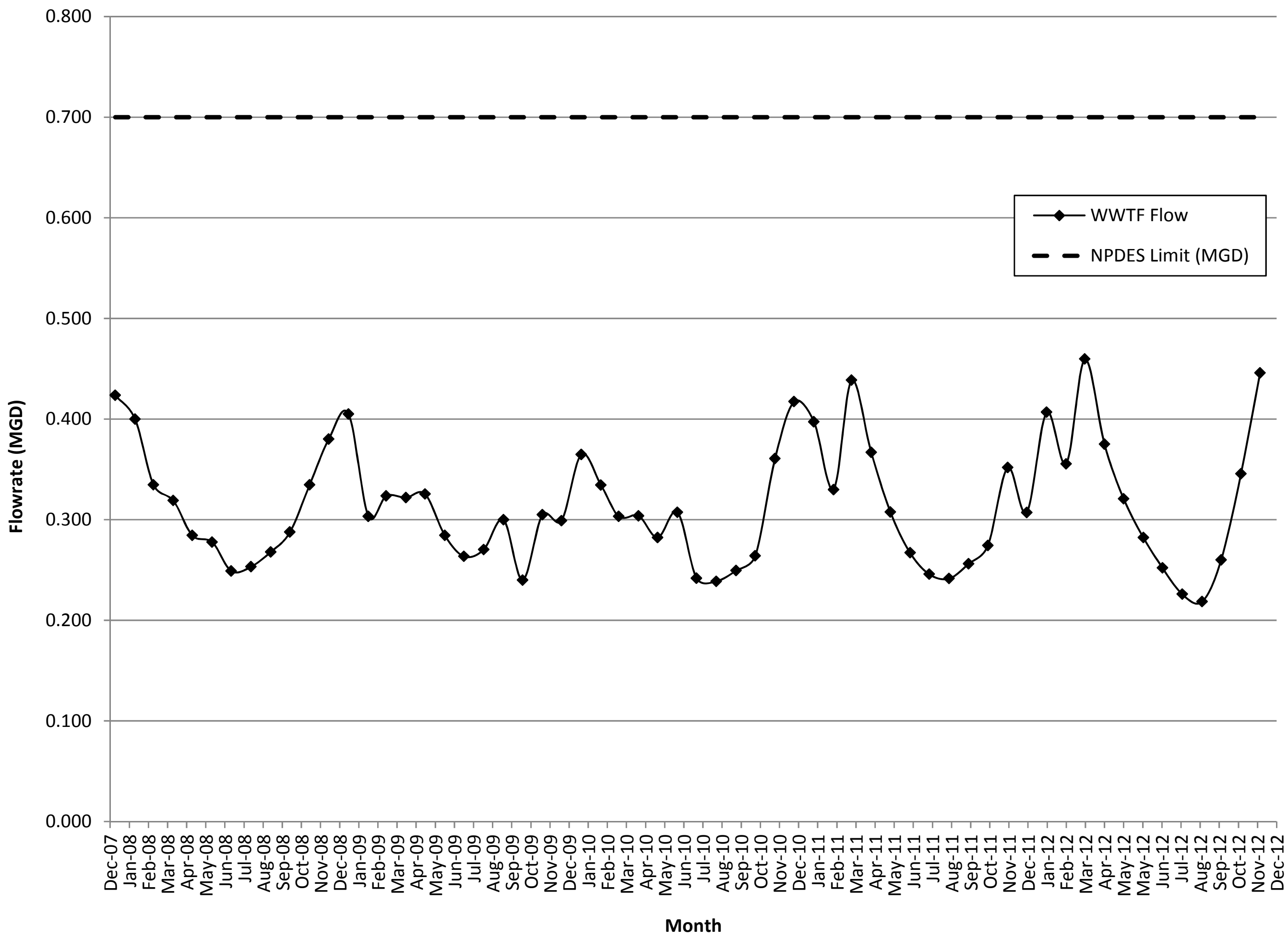


FIGURE 6-2

Monthly Average Influent BOD5 Loading and Influent NPDES Limit (January 2008 – December 2012)

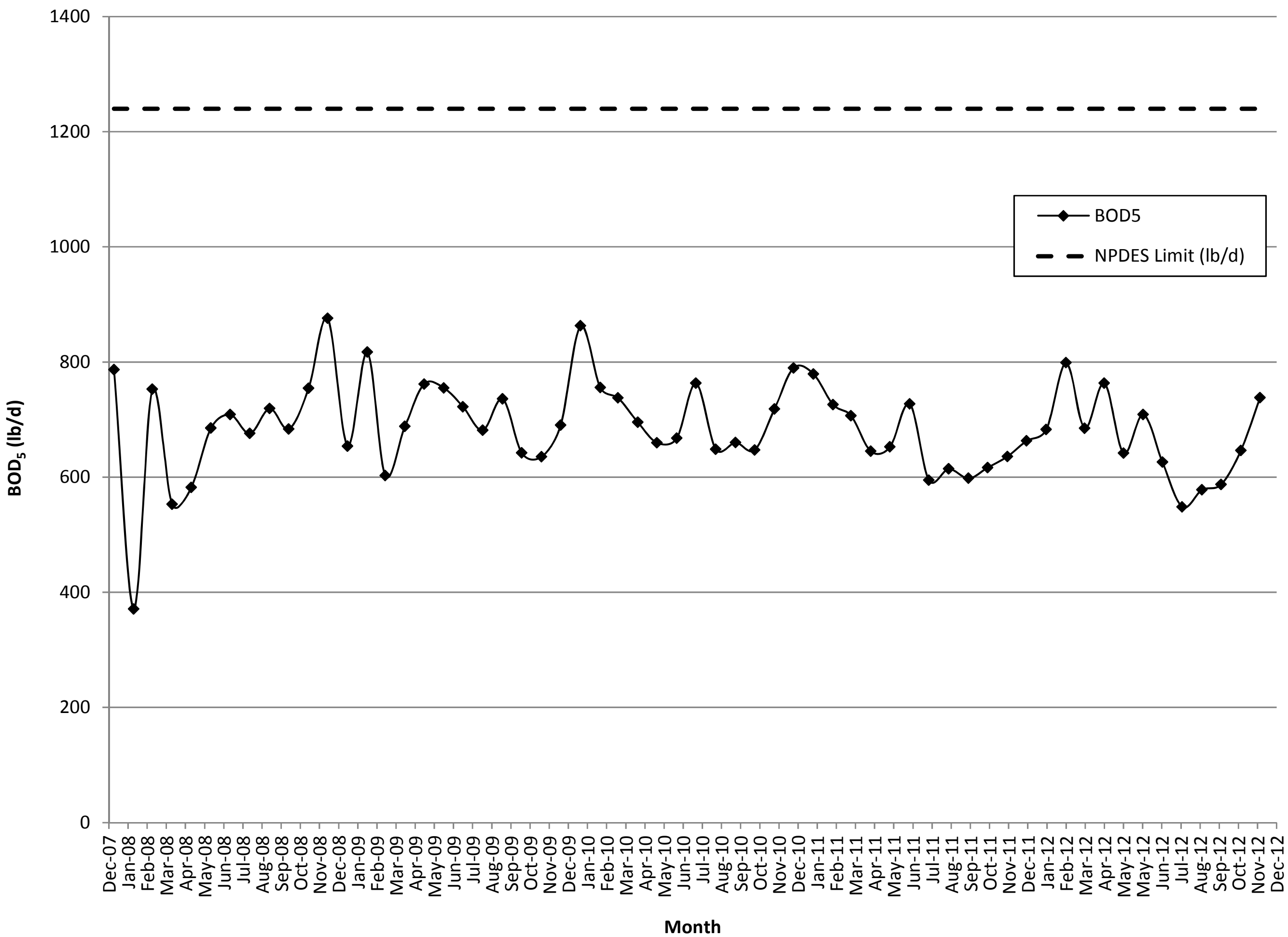


FIGURE 6-3

Monthly Average Influent TSS Loading and Influent NPDES Limit (January 2008 – December 2012)

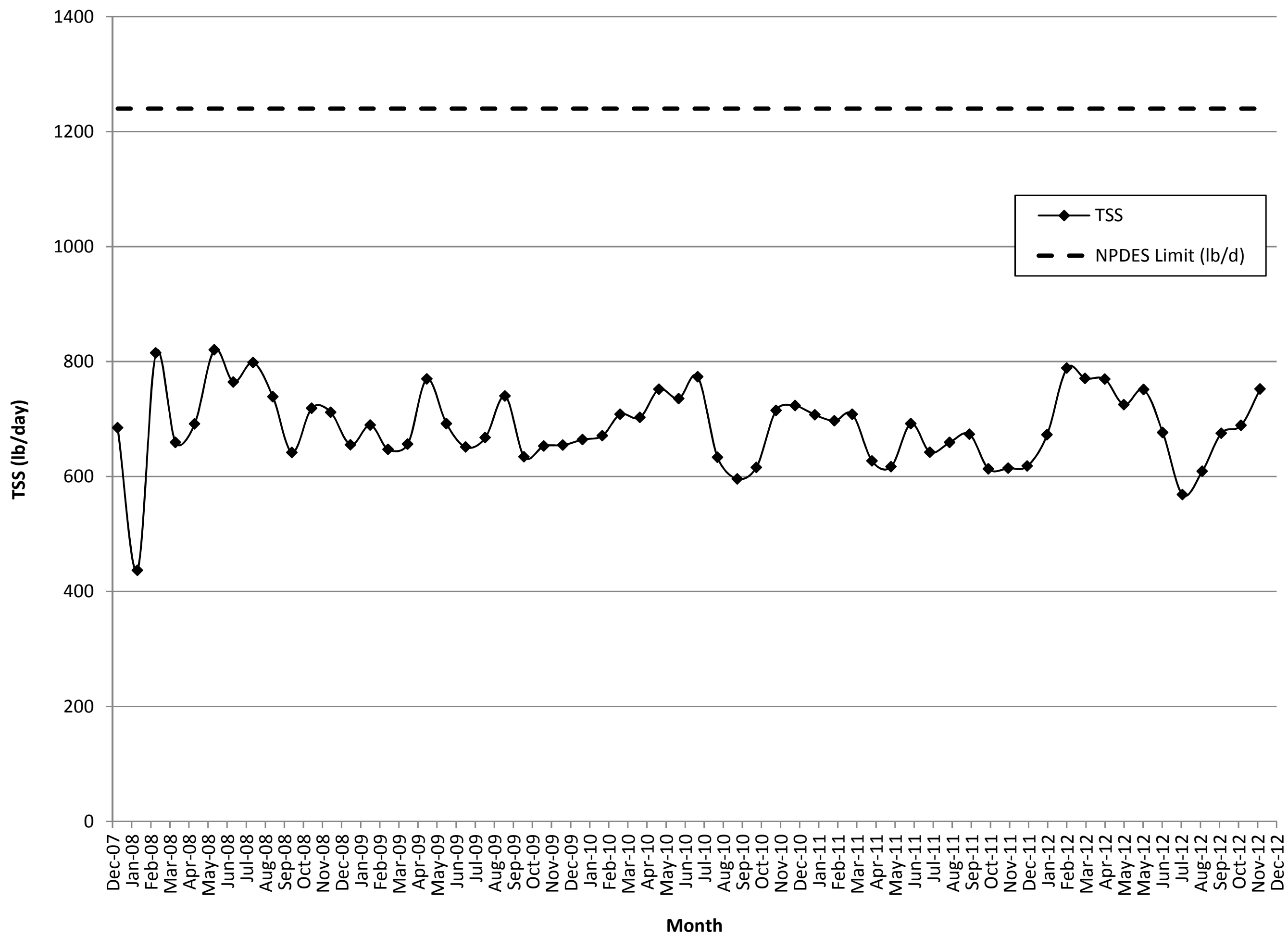
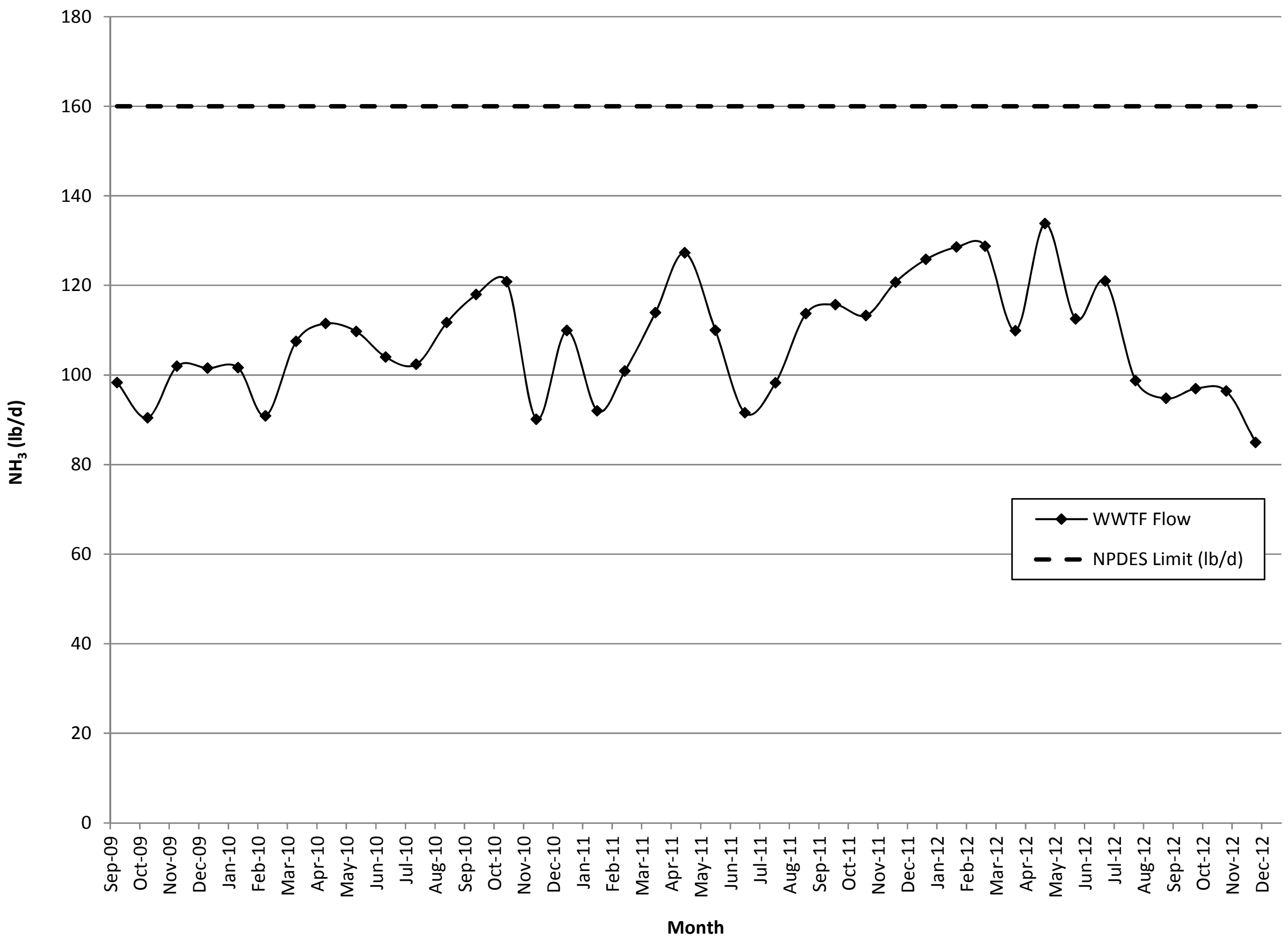


FIGURE 6-4

Monthly Average Influent Ammonia Loading and Influent NPDES Limit (September 2009 – December 2012)



EXISTING WASTEWATER SERVICE POPULATION

The existing and historic census population data are presented in Table 3-2.

EXISTING FLOWS

Wastewater Flows at WWTP

Table 6-1 and Figure 6-1 show that monthly WWTP flows ranged from 0.219 mgd to 0.460 mgd, and the maximum month permitted flow of 0.700 mgd was not exceeded during the 60-month period of analysis.

The average dry weather flow for 2012 was 0.219 mgd. With an average residential population of 5,210 during this time period, this translates to a dry weather per capita flow of 42 gal/cap/day (gpcd) and 117 gal/EDU/day, based on 2.79 persons per EDU.

The average annual flow for the 5-year period from January 2008 to December 2012 was measured at 0.314 mgd.

The maximum monthly flow of 0.460 mgd occurred in March of 2012. This is slightly less than the highest recorded maximum month flow of 0.494 mgd from January 2006. The peak day flow of 0.824 mgd was recorded on January 2, 2009.

2008 to 2012 WWTP flows are summarized in Table 6-3.

TABLE 6-3

2008 to 2012 WWTP Flows

Flow Type	Flow Rate (mgd)
Average Dry Weather Flow	0.219
Annual Average Flow	0.314
Maximum Month Flow	0.460
Peak Day Flow	0.824

Infiltration and Inflow

The U.S. EPA manual entitled *I/I Analysis and Project Certification* provides guidelines on how to determine if infiltration and/or inflow are excessive. The manual states that if the highest average daily flow recorded over a period of seasonal high groundwater without precipitation is greater than 120 gpcd, then further studies must be conducted to quantify excessive infiltration and evaluate corrective measures. WWTP rainfall records show a 13-day period, November 30 through December 13, 2011, during which time rainfall did not exceed 0.01 inches per day. During this time, the groundwater table was high due to a total rainfall of 7.64 inches in November 2011. The highest daily flow recorded during this time period was 0.317 mgd, on December 5. With an estimated total residential population of sewer users in 2011 of 4,975 (Table 3-2), this flow and population translates to 64 gpcd. Because this value is less than the EPA guideline of 120 gpcd, Ridgefield is not considered to have excessive infiltration by EPA criteria.

The EPA manual also states that if the average daily flow recorded in any single day is greater than 275 gpcd, then further studies must be conducted to quantify excessive inflow and evaluate corrective measures. The peak day flow at the WWTP was 0.824 mgd on January 2, 2009. With an estimated total City population of 4,552 through the month of November (as reported by the Office of Financial Management), this flow and population translate to 181 gpcd. Because this value is significantly less than the EPA guideline of 275 gpcd, Ridgefield is not considered to have excessive inflow by EPA criteria, and it is not required that a comprehensive investigation be conducted to quantify, evaluate corrective measures, and reduce inflow to the collection system. However, the City of Ridgefield does have an ongoing I/I reduction program, which includes the following:

- Maintenance of storm drains;
- Repairing leaks in sewers, manholes and pumping stations;
- Smoke testing and televising sewers;
- Replacing leaking manhole covers;
- Monitoring wastewater flows throughout the collection system; and
- Performing quality assurance inspections on sewer pipe installed in the new City developments.

EXISTING BOD_5 LOADING

Monthly average influent BOD_5 loadings ranged from 371 lb/day to 876 lb/day for the 60-month period of analysis as shown in Table 6-1 and Figure 6-2. The permitted monthly average influent BOD_5 design loading of 1,240 lb/day was not exceeded during the 60-month period of analysis. The average influent BOD_5 concentration for the 60-month period of January 2008 – December 2012 was 273 mg/L, which is typical of medium to high strength domestic wastewater. The maximum month BOD_5 loading of 876 lb/day was observed in December of 2008. The residential population in 2008 was 4,232. This BOD_5 loading and population translates to a maximum month BOD_5 loading of 0.21 lb per capita per day (lb/cap/day) or 0.58 lb/EDU/day. This value is only slightly greater than the design criteria of 0.2 lb/cap/day recommended by the Washington State Department of Ecology. The average influent BOD_5 loading for the 5-year period of January 2008 – December 2012 is 685 lb/day. The ratio of maximum month to annual average BOD_5 loading is 1.3:1.

EXISTING TOTAL SUSPENDED SOLIDS LOADING

Monthly average influent TSS loadings ranged from 687 lb/day to 820 lb/day as shown in Table 6-2 and Figure 6-3. The permitted TSS loading of 1,240 lb/day was not exceeded during the 60-month period of analysis. The average influent TSS concentration of 274 mg/L for this time period is typical of medium to high strength domestic wastewater. The maximum month TSS loading of 820 lb/day was observed in June of 2008 during which time the resident population was 4,232, giving a loading of 0.19 lb/cap/day or 0.53 lb/EDU/day. This loading is slightly less than the Ecology criteria of 0.2 lb/cap/day. The ratio of maximum month to annual average TSS loading is 1.2:1.

EXISTING NITROGEN LOADING

Monthly average influent ammonia loadings have been tracked since October of 2009. Average influent loadings ranged from 85 lb/day to 134 lb/day as shown in Table 6-3 and Figure 6-4. The permitted ammonia loading of 160 lb/day was not exceeded during the 39-month period of analysis. The average influent ammonia concentration of 44 mg/L for this time period is typical of high strength domestic wastewater. The maximum month ammonia loading of 57 lb/day was observed in July of 2012 during which time the resident population was 5,210, giving a loading of 0.011 lb/cap/day or 0.031 lb/EDU/day. The ratio of maximum month to annual average ammonia loading is 1.24:1. Total Kjeldahl Nitrogen (TKN) was not measured directly but is approximated based on a TKN to Ammonia nitrogen ratio of 1.5:1.

PROJECTED WASTEWATER FLOWS AND LOADINGS

INTRODUCTION

Projected wastewater flows and loadings have been developed through 2033.

Projected Population and EDUs

Table 6-4 shows projected population and EDUs for low and high growth rate scenarios through 2033. Figure 6-5 shows a graphical representation of the EDUs corresponding to low, medium, and high growth rate scenarios. Figure 6-6 shows a graphical representation of the maximum month flow corresponding to low, medium, and high growth rate scenarios. These projections have been developed based on population projections and EDU estimates from the following documents/sources:

- *2010 City of Ridgefield Comprehensive Plan*
- *2010 City of Ridgefield Capital Facility Plan*
- *Documents used in support of the formation of the Discovery Clean Water Alliance*
- Financial Modeling prepared by Clark Regional Wastewater District

Figure 6-5 Projected EDUs by Growth Scenario

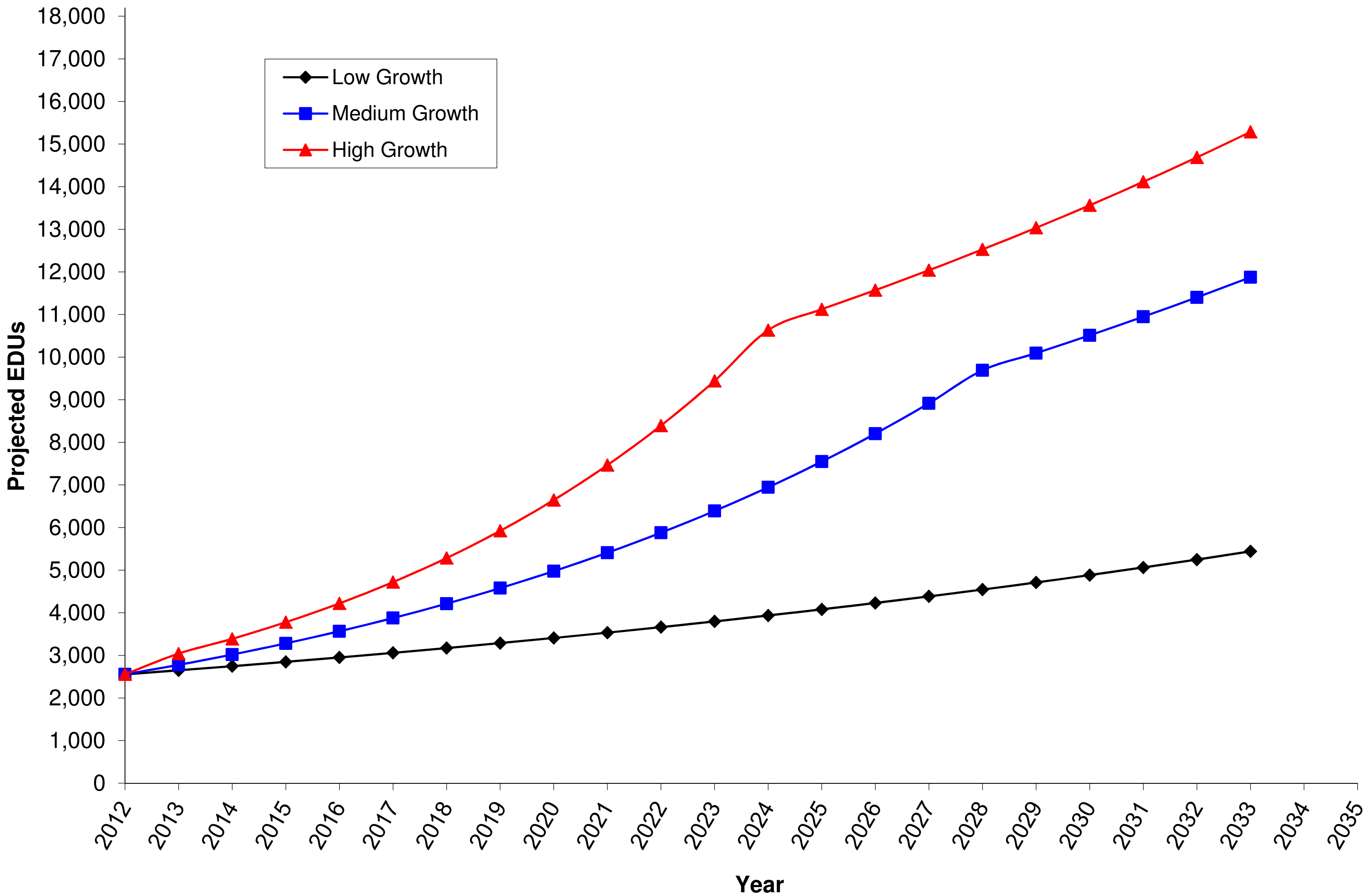
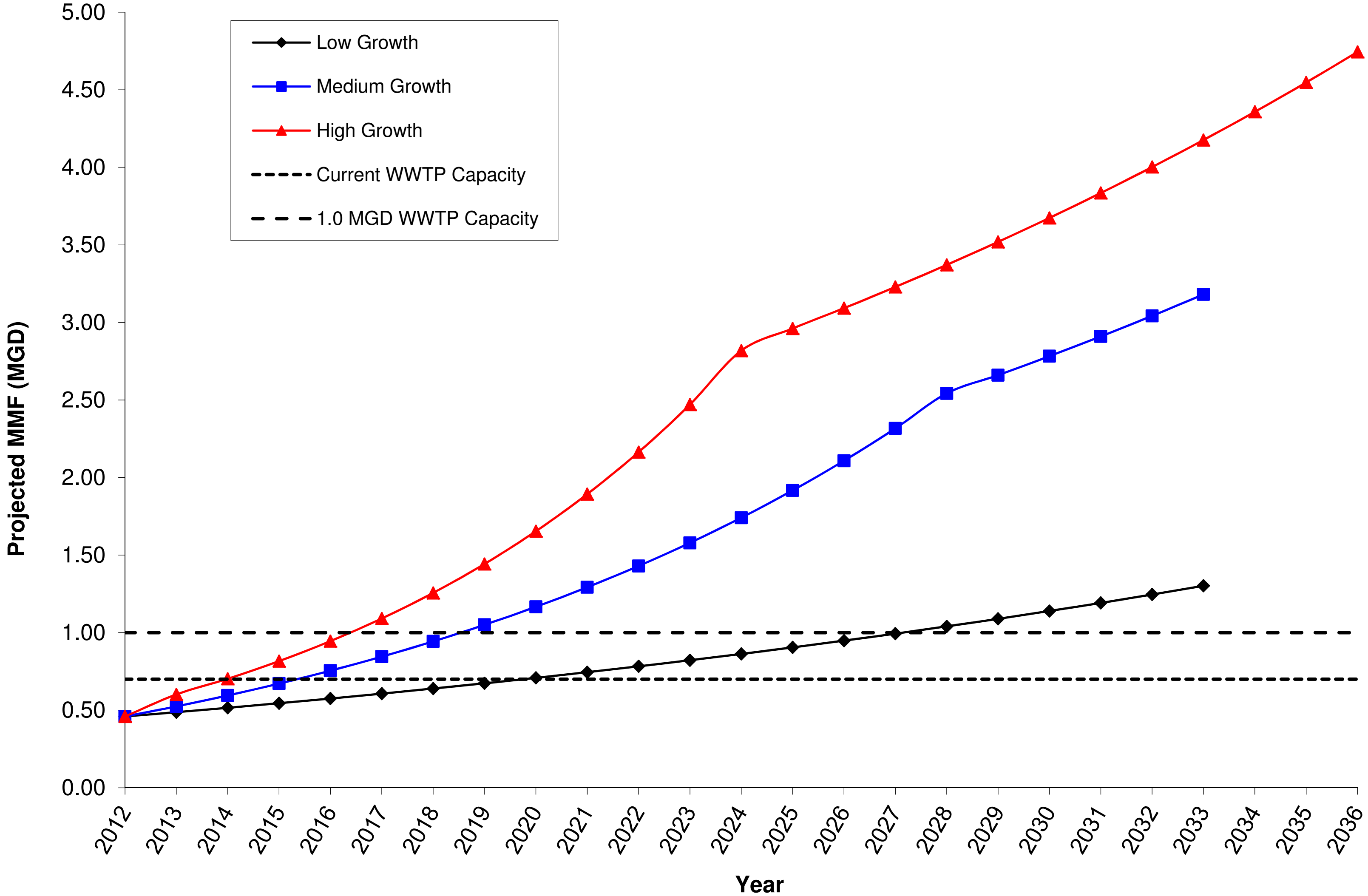


Figure 6-6 Projected Maximum Month Flow by Growth Scenario



The projections shown in Table 6-4 and Figure 6-5 are based on the following assumptions:

High Growth Rate Scenario

- The number of residential EDUs is determined based on population divided by 2.79 people per EDU (per 2010 Comprehensive Plan).
- 2024 population is taken from the 2010 Comprehensive Plan
- Intermediate population estimates are based on interpolation between the current (2012) population of 5,210 and a projected 2024 population of 24,706.
- Population between 2024 and 2033 is determined by applying a uniform annual growth rate of 4.15 percent in accordance with the extrapolated growth rate from the 2010 Capital Facilities Plan.
- The number of non-residential EDUs for each year is determined as the sum of the current number of non-residential EDUs plus the number of projected additional non-residential EDUs. Non-residential flow is determined by dividing non-residential flow by 292 gpd.
- Additional non-residential flow is determined by projected number of retail employees multiplied by 100 gal/day plus the number of nonretail employees multiplied by 20 gal/day.
- The number of retail and non-retail employees projected in 2025 is 1,771 and 14,580, respectively, per the 2010 Capital Facility Plan.
- Intermediate non-residential flow values are determined by interpolating between current non-residential flow and 2025 non-residential flow.
- Non-residential flow between 2025 and 2033 is determined by applying a uniform annual growth rate of 4.15 percent in accordance with the extrapolated growth rate from the 2010 Capital Facilities Plan.
- The amount of additional non-residential flow contributed in each projection year is divided by 292 gal/EDU to determine the number of EDUs added in that year.
- Residential EDUs are determined as the sum of the 2012 number of residential EDUs and the projected number of additional residents divided by 2.79 persons/EDU.
- Non-residential EDUs are determined as the sum of the 2012 number of non-residential EDUs and the projected number of additional non-residential EDUs
- Total EDUs are the sum of residential and non-residential EDUs.

Moderate Growth Rate Scenario

- 2028 EDUs are taken from the documents supporting the formation of the DCWA.
- The intermediate numbers of EDUs are determined by interpolating between the 2012 number of EDUs and the 2028 number of EDUs.
- EDUs between 2028 and 2033 are determined by applying a uniform annual growth rate of 4.15 percent in accordance with the extrapolated growth rate from the 2010 Capital Facilities Plan.
- Population is determined as the sum of the 2012 population and the projected number of additional EDUs multiplied by 2.79 persons/EDU.

Low Growth Rate Scenario

- 2033 EDUs are taken from projections in the Clark Regional Wastewater District financial model.
- The intermediate numbers of EDUs are determined by interpolating between the 2012 number of EDUs and the 2033 number of EDUs.
- Population is determined as the sum of the 2012 population and the projected number of additional EDUs multiplied by 2.79 persons/EDU.

TABLE 6-4

Projected Population and EDUs for Low and High Growth Scenarios

	Low Growth		High Growth	
Year	**Population**	**EDUs**	**Population**	**EDUs**
2012	5,210	2,556	5,210	2,556
2013	5,471	2,650	5,932	3,042
2014	5,742	2,747	6,753	3,388
2015	6,023	2,847	7,688	3,778
2016	6,314	2,952	8,753	4,220
2017	6,615	3,060	9,965	4,719
2018	6,928	3,172	11,345	5,284
2019	7,252	3,288	12,917	5,923
2020	7,588	3,408	14,706	6,646
2021	7,937	3,533	16,742	7,465
2022	8,298	3,663	19,061	8,393
2023	8,672	3,797	21,701	9,443
2024	9,060	3,936	24,706	10,633
2025	9,463	4,080	25,731	11,122

TABLE 6-4 – (continued)

Projected Population and EDUs for Low and High Growth Scenarios

	Low Growth		High Growth	
Year	**Population**	**EDUs**	**Population**	**EDUs**
2026	9,880	4,230	26,799	11,572
2027	10,312	4,385	27,911	12,040
2028	10,760	4,545	29,070	12,527
2029	11,224	4,712	30,276	13,035
2030	11,706	4,884	31,532	13,564
2031	12,205	5,063	32,841	14,114
2032	12,723	5,249	34,204	14,688
2033	13,259	5,441	35,623	15,285

Projected Flows

Projected maximum month and average daily wastewater flows are developed from the population and EDU projections in Table 6-4.

The future annual average flows are projected by multiplying the projected maximum month flows by the current (2012) annual average to maximum month flow ratio of 0.72:1.

The peak day flows are projected by using a weighted peak day flow to annual average flow peaking factor. This weighted peaking factor uses the current peak day to annual average flow ratio of 2.62:1 for the current population to projected population ratio and uses a projected future peak day to annual average ratio of 2.0:1 for the new population to projected population ratio. This approach assumes that the peak day per capita I/I component from new sources will be less than that of existing sources because new sewer construction materials and methods will allow less I/I than the existing sewers. The peak day to annual average flow ratio of 2.0:1 is based on data from various cities in Western Washington. The equation for calculating the projected peak day flow is given below:

$$\text{PDF} = \text{AAF} * 2.62 * \left(\frac{\text{Current Population}}{\text{Projected Total Population}}\right) + \text{AAF} * 2.0 * \left(1 - \frac{\text{Current Population}}{\text{Projected Total Population}}\right)$$

Where PDF = Peak Day Flow and AAF = Annual Average Flow.

The above equation can be rearranged to give the weighted hourly peaking factor:

$$\text{PDF} = \text{AAF} * \text{PF}_{\text{PD}}$$

Where PF_{PD}= Weighted (peak day) peaking factor =

$$2.62*(\frac{\text{Current Population}}{\text{Projected Total Population}})+2.0*(1-\frac{\text{Current Population}}{\text{Projected Total Population}})$$

The current and future peak hour flows are projected by multiplying the annual average flow by a population-based peaking factor, given by the equation:

$$PF = (18 + sqrt(P))/(4 + sqrt(P))$$

where P = population, in thousands of people (Department of Ecology *Criteria for Sewage Works Design*, 1998).

A summary of existing and projected flows and peaking factors is given below in Table 6-5. Existing flows have been determined from the discharge monitoring reports for the year 2012. Based on the 2012 maximum month flow and the current number of residential sewer connections, the 2012 maximum month EDU value was 173 gal/EDU/day.

Wastewater flows are influenced significantly by rainfall patterns. The years 2008 to 2012 were characterized by average to below average winter rainfall. To ensure that a conservative factor is used to project maximum month wastewater flows moving forward, flow data was reviewed back through 2001. Table 6-6 shows maximum month flow and annual rainfall amounts from 2001 to 2012. The last significantly wet year was the winter of 2005 to 2006. The maximum month flow during this period was 0.494 mgd in January 2006. To determine the residential component of this flow, the total maximum month flow was multiplied by the percentage of total water use by residential accounts for the months of February and March of 2006. Approximately 65 percent of water use was residential use during this period, therefore it is assumed that the component of maximum month flow due to residential accounts was 0.321 mgd. The number of residential connections at the end of 2005 were 1,101, therefore, the maximum month residential flow was determined to be 292 gal/connection/day. In order to provide a conservative estimation of future wastewater flow, projected maximum month flow will be determined by multiplying the projected number of EDUs by 292 gal/EDU/day.

TABLE 6-5

Existing and Projected Flows and Peaking Factors (High Growth Rate Scenario)

Parameter	Year				
	2012(3)	2018	2023	2028	2033
New EDUs	(1)	2,728	6,887	9,971	12,729
Total EDUs	2,556	5,284	9,443	12,527	15,285
Total Residential Population	5,210	11,345	21,701	29,070	35,623
Annual Average Flow, mgd	0.33	0.90	1.78	2.43	3.01
Max Month Flow, mgd	0.46	1.26	2.47	3.37	4.18
Daily Peaking Factor	2.62	2.3	2.1	2.1	2.1
Peak Day Flow, mgd	0.87	2.07	3.82	5.12	6.29
Hourly Peaking Factor(2)	3.2	2.9	2.6	2.5	2.4
Peak Hour Flow, mgd	1.07	2.62	4.66	6.05	7.23

(1) In 2012 it was estimated that the City served 2,556 EDUs. The flow per EDU for 2012 was calculated at 173 gal/EDU.

(2) The hourly peaking factor for 2012 onward was estimated according to Section C1-3.3.2 of the Ecology publication *Criteria for Sewage Works Design.*

(3) The 2012 flows are based on the discharge monitoring reports for the year 2012.

TABLE 6-6

Annual Rainfall and Maximum Month Wastewater Flow (2001 to 2012)

Year	Maximum Month Flow (mgd)	Annual Rainfall (in)
2001	0.268	44.06
2002	0.271	51.49
2003	0.219	45.71
2004	0.261	50.45
2005	0.371	58.12
2006	0.494	50.16
2007	0.453	43.77
2008	0.424	41.46
2009	0.405	60.90
2010	0.417	50.43
2011	0.439	44.06
2012	0.460	57.99

Projected BOD_5 and TSS Loadings

Future WWTP maximum month BOD_5 and TSS loadings are estimated by adding the projected maximum month loading from future residential and non-residential sources to the existing maximum month loading. The future BOD_5 and TSS loadings will be based on the current loading of 0.58 lb/EDU/day and 0.53 lb/EDU/day for BOD_5 and TSS respectively. Future annual average BOD_5 and TSS loadings are estimated using the ratio of the maximum month to annual average loadings of these parameters. The ratio of the maximum month to annual average BOD_5 and TSS is 1.3:1 and 1.2:1 respectively. Table 6-7 provides a summary of projected future WWTP influent BOD_5 and TSS loadings.

Projected Nitrogen Loading

Future ammonia loadings are projected forward based on a loading of 0.011 lb/cap/day and 0.031 lb/EDU/day. TKN loading was not measured directly so a TKN/NH_4-N ratio of 1.5:1 was used to project future total nitrogen loadings. Table 6-7 provides a summary of projected future WWTP influent ammonia nitrogen and TKN loadings.

Summary of Loadings

Projected future WWTP loadings are summarized in Table 6-7.

TABLE 6-7

Existing and Projected WWTP Loadings (High Growth Rate Scenario)

Parameter		Year				
		2012	**2018**	**2023**	**2028**	**2033**
New EDUs		(1)	2,728	6,887	9,971	12,729
Annual Average BOD_5	(lb/day)	685	1,833	3,505	4,696	5,755
	(mg/L)	273	273	273	273	273
Max Month BOD_5(2)(3)	(lb/day)	876	2,383	4,557	6,105	7,481
	(mg/L)	302	302	302	302	302
Annual Average TSS	(lb/day)	687	1,335	2,472	4,619	5,219
	(mg/L)	274	274	274	274	274
Max Month TSS	(lb/day)	820	1,735	3,214	6,005	6,785
	(mg/L)	343	343	343	343	343
Annual Average NH_4-N	(lb/day)	108	233	432	807	912
	(mg/L)	44	44	44	44	44
Max Month NH_4-N	(lb/day)	134	289	536	1,001	1,131
	(mg/L)	48	48	48	48	48
Annual Average TKN	(lb/day)	162	310	574	1,072	1,212
	(mg/L)	66	66	66	66	66

TABLE 6-7 – (continued)

Existing and Projected WWTP Loadings (High Growth Rate Scenario)

Parameter		Year				
		2012	**2018**	**2023**	**2028**	**2033**
Max Month TKN	(lb/day)	201	434	804	1,501	1,696
	(mg/L)	72	72	72	72	72

(1) In 2012 it was estimated that the City served 2,556 EDUs.
(2) NPDES permit limits monthly average influent BOD_5 to 1,240 lb/day.
(3) The *Wastewater Treatment Plant Capacity Analysis* (Appendix I) estimated the influent loading capacity as 1,240 lb/day of BOD_5 and TSS each.

Projected Effluent NPDES Permit Limits

The WWTP currently discharges into Lake River, a tributary of the Columbia River. Lake River is currently water quality listed for temperature and fecal coliform. The sampling locations for this listing are upstream of the WWTP discharge. Current, and projected future effluent NPDES permit limits are listed in Table 6-8. The limits are presented for the currently permitted discharge capacity of 0.7 mgd and a future permitted capacity of 1.0 mgd. Projected limits shown on Table 6-8 for ammonia and copper are based on mixing zone studies presented in Appendix D. The City's current NPDES permit indicates that use of the Lake River extended outfall at a WWTP design flow of 1.0 mgd results in monthly average and maximum daily effluent ammonia limits of 1.2 mg/L and 2.9 mg/L, respectively.

TABLE 6-8

Projected Future Effluent NPDES Permit Limits

	Permitted WWTP Flow (mgd)[6]	
	0.7 mgd[1]	**1.0 mgd[1]**
BOD_5 Conc. (monthly avg.)[2]	30 mg/L	30 mg/L
BOD_5 Conc. (weekly avg.)	45 mg/L	45 mg/L
TSS Conc. (monthly avg.)[2]	30 mg/L	30 mg/L
TSS Conc. (weekly avg.)	45 mg/L	45 mg/L
Fecal Coliform Count (monthly avg.)	100 cfu/ 100 mL	100 cfu/ 100 mL
Fecal Coliform Count (weekly avg.)	200 cfu/ 100 mL	200 cfu/ 100 mL
Ammonia Conc. (monthly avg./weekly avg.)	1.4/3.14 mg/L[3]	1.2/2.9 mg/L[3]
Copper Conc. (monthly avg./weekly avg.)	27/39 μg/L[4]	25/37 μg/L[5]
pH	Not outside the range of 6.0 to 9.0	

(1) As stated in NPDES permit No. WA0023272 modified in September of 2009.
(2) The average monthly effluent concentration for BOD_5 and TSS shall not exceed 30 mg/L or 15 percent of the respective monthly average influent concentration.
(3) mg/L as N. See Appendix A, NPDES permit No. WA0023272.
(4) See Appendix D, Correspondence from Bill Fox, February 15, 2007. Assumes Lake River single-port diffuser alternative.
(5) See Appendix D, Mixing Zone Study – Part II (Appendix F-3) (December 2005). Assumes Lake River single-port diffuser alternative.
(6) The year's corresponding to projected increases in NPDES permit limits will depend on the growth rate within the City's sewer service area.

RECEIVING WATER ISSUES

As a requirement of the City's previous NPDES permit, the City completed a two phase mixing zone assessment of Lake River. The first phase was an assessment of the outfall prior to extension and installation of a diffuser. The second phase evaluated the mixing zone characteristics of Lake River relative to projected future flows. The studies included an in-field evaluation to provide validation of the computer models used to project future effluent limits. The first phase of the study is provided in Appendix C and the second phase in Appendix D.

The WWTP discharges from the east bank of Lake River, a tidally influenced tributary of the Lower Columbia River. Due to the presence of a reversing tide, the NPDES permit notes that the mixing zone appears to fit the model of an estuary. However, Ecology has indicated that since the receiving water also exhibits characteristics of a river, Ecology feels obliged to use the more conservative interpretation of a river to determine the mixing zone limits.

The minimum amount of receiving water available in Lake River for effluent dilution year-round is dependent on Lake River flow, tidal flux, and the complex hydrodynamic behavior of the receiving water system. As described in the mixing zone studies appended to this report, the Columbia River flow enters the Lake River channel and moves past the WWTP discharge point at high tides during periods of low seasonal Lake

River flow. The reversing tide flushes this entering volume of water back into the Columbia River, where it moves downstream. This "residual circulation" supplies the majority of dilution water at the outfall when the flow in Lake River from upstream sources is low. The overall effect of these two sources of dilution water is a minimum critical discharge of 400 ft^3/s (cfs) in Lake River. This flow should be the basis of dilution calculations for the Lake River outfall.

Assuming a 400 cfs critical flow in Lake River, mixing zone studies show that the extended outfall in Lake River should provide enough dilution to accommodate a WWTP flow of as much as 1.0 mgd.

Once the treatment plant flows exceeds 1.0 mgd it will become increasingly difficult to treat effluent to a level suitable for discharge into Lake River with the current Ecology approved mixing zone. At that point the City will need to develop an alternate plan for disposal of wastewater beyond 1.0 mgd. Alternatives include extension of an outfall to the Columbia River or connection to another regional treatment facility such as the Salmon Creek WWTP. These alternatives are evaluated further in Chapter 8.

CHAPTER 7

WASTEWATER COLLECTION SYSTEM

INTRODUCTION

The purpose of this chapter is to identify and provide cost estimates for those improvements to the City of Ridgefield wastewater collection system that will be required to remain in regulatory compliance and accommodate growth projections within the Urban Growth Area (UGA). Recommendations for improvements in collection system management in order to protect the investment in the collection system are also provided.

In 2005 the City updated City engineering and design standards to ensure that the following issues were addressed:

- Odor and hydrogen sulfide control, using a system that the City can operate cost effectively.
- System telemetry requirements for a system that is reliable and can be readily expanded and improved as the City grows.
- Construction quality control to ensure that the new system elements are not a source of infiltration and inflow.
- A requirement that grinder pumps rather than STEP systems be used when needed for individual property service.

These standards were further updated in 2008. The current City engineering standards for the sanitary collection system and pretreatment standards for the sanitary sewer collection system are provided in Appendix H.

EXISTING COLLECTION SYSTEM ISSUES

The existing collection system was described in Chapter 5. Chapter 6 provided an analysis of the infiltration and inflow for the existing collection system. Significant conclusions from these two previous chapters are summarized in the following paragraphs.

Much of the existing collection system in the downtown area was constructed of concrete pipe in the 1950s. In general, this part of the collection system is in good condition. The system is limited to an estimated capacity of 0.72 mgd by bottlenecks in the downtown area including the 10-inch pipeline that passes under the Burlington Northern railroad track. This pipeline can be allowed to surcharge and provide an estimated 1 mgd carrying capacity to the treatment plant. The City has bypassed this potential bottleneck by pumping around the downtown gravity system with the T-7 force mains. Wastewater flows from the eastern part of the UGA are consolidated at the Lower Gee Creek

Meadows pump station and pumped directly to the headworks of the treatment plant through the T-7 force mains. Wastewater from the southeastern part of the UGA is also pumped directly to the plant through the Taverner Ridge force main. In addition to bypassing the downtown bottleneck, this strategy also takes advantage of the hydraulic gradient that is available after the wastewater is pumped over the ridge that is on the western edge of the downtown collection system.

The downtown collection system does not exhibit excessive infiltration and inflow as defined by USEPA guidelines. This non-excessive I/I is due to the City's ongoing I/I reduction program, which includes maintenance of storm drains; removal of roof drains from sanitary sewers; repairing leaks in sewers, manholes and pumping stations; smoke testing and televising sewers; replacing leaking manhole covers; and monitoring sewage flows throughout the system. Evaluation of historic video records tapes of the system indicates that there is some root penetration and grease buildup within the downtown sewers. The problems identified do not appear to require a capital expenditure. However, additional attention should be directed to collection system cleaning. A pretreatment ordinance was also included in the City's code in 2005 to strengthen control of fats, oils, and grease (FOG) discharges into the collection system.

EXISTING COLLECTION SYSTEM RELIABILITY

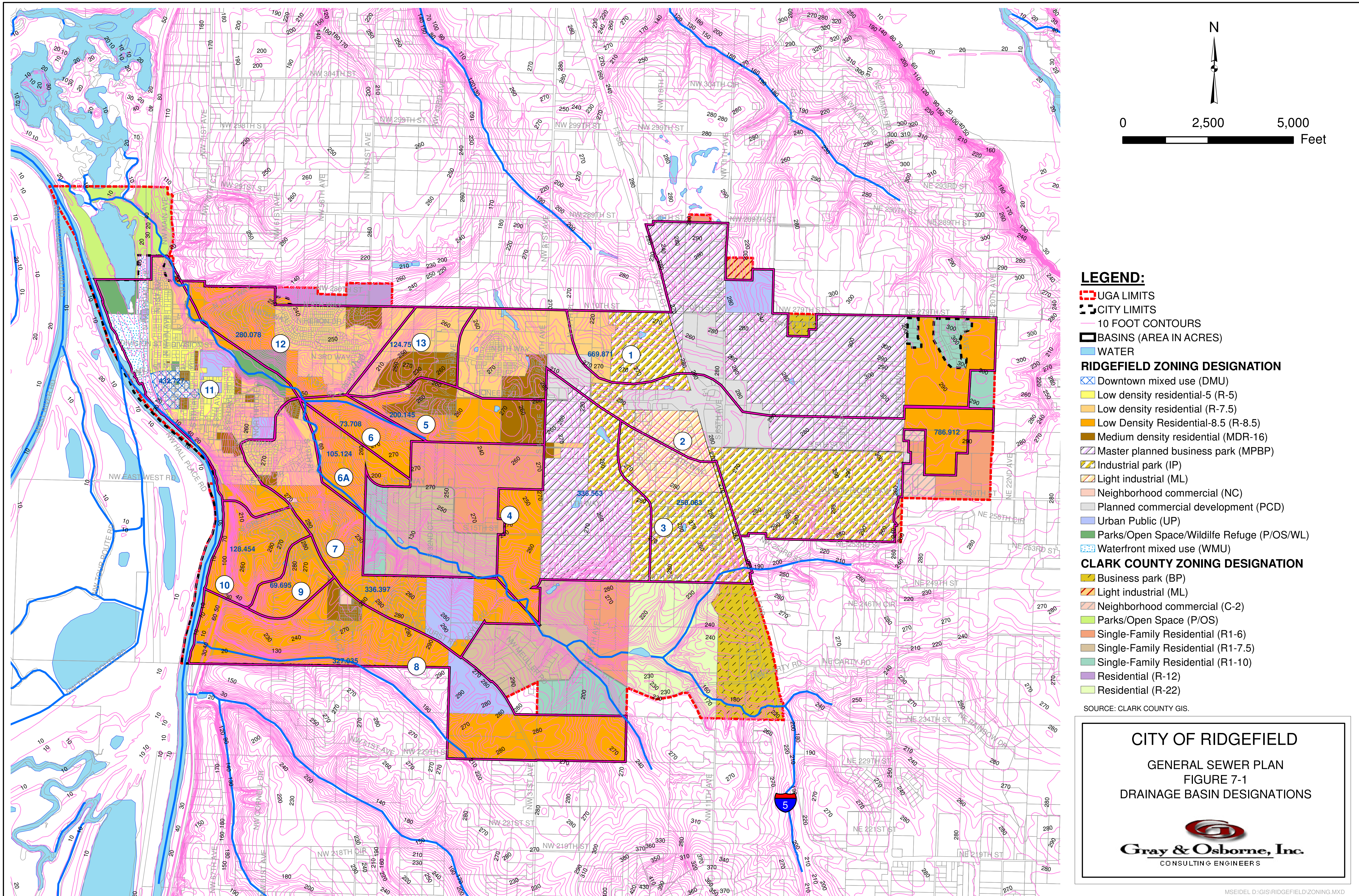
In order to ensure continuity in operations, and minimize the likelihood of sanitary sewer overflow events, each of the City's pump stations is equipped with a standby generator. Furthermore, sensors at each pump station relay data including wet well level and pump status to the SCADA system at the WWTP.

COLLECTION SYSTEM CAPITAL IMPROVEMENT PLAN

The City of Ridgefield has recently undergone a period of rapid growth. The wastewater collection system has been expanded to serve this growth located to the south, north, and east of the existing downtown core. Within the next 10 to 20 years, the City system will consist predominantly of a new collection system constructed according to current City standards by the developers working in Ridgefield. The City will acquire several new developer-designed and-constructed lift stations as well.

System Expansion

For the purposes of sizing major collection system improvements, an evaluation of project wastewater flows in the UGA was conducted. The UGA was broken into drainage basins based on topography and trunk line routes were identified to serve each basin. Figure 7-1 shows the drainage basins and trunk lines that were identified in this evaluation. The population served by each trunk line was identified by evaluation of transportation analysis zones (TAZs). Population was then used to estimate maximum month flow based on 2.79 persons per EDU and 292 gpd/EDU. Annual average flow was derived from maximum monthly flow by multiplying the maximum month flow by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5,000
Feet
LEGEND:
UGA LIMITS
CITY LIMITS
10 FOOT CONTOURS
BASINS (AREA IN ACRES)
WATER
RIDGEFIELD ZONING DESIGNATION
Downtown mixed use (DMU)
Low density residential-5 (R-5)
Low density residential (R-7.5)
Low Density Residential-8.5 (R-8.5)
Medium density residential (MDR-16)
Master planned business park (MPBP)
Industrial park (IP)
Light industrial (ML)
Neighborhood commercial (NC)
Planned commercial development (PCD)
Urban Public (UP)
Parks/Open Space/Wildilfe Refuge (P/OS/WL)
Waterfront mixed use (WMU)
CLARK COUNTY ZONING DESIGNATION
Business park (BP)
Light industrial (ML)
Neighborhood commercial (C-2)
Parks/Open Space (P/OS)
Single-Family Residential (R1-6)
Single-Family Residential (R1-7.5)
Single-Family Residential (R1-10)
Residential (R-12)
Residential (R-22)
SOURCE: CLARK COUNTY GIS.
CITY OF RIDGEFIELD
GENERAL SEWER PLAN
FIGURE 7-1
DRAINAGE BASIN DESIGNATIONS
Gray & Osborne, Inc.
CONSULTING ENGINEERS
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the current ratio average annual flow to maximum month flow. Peaking factors were determined according to the guidelines presented in the Department of Ecology publication *Criteria for Sewage Works Design*. Peak hour flow is calculated as the product of average day flow and the peaking factor. Table 7-1 summarizes the flows for each of the 29 trunk lines identified.

TABLE 7-1

Trunk Line Summary Information

Trunk Line Identification[1]	Residential Population	Peaking Factor	Maximum Month Flow	Average Day Flow	Peak Hour Flow (gpm)
T-9E	995	3.80	118,500	81,000	238
T-9W	995	3.80	118,500	81,000	238
T-9N	974	3.81	116,300	79,500	233
T-9S	331	4.06	269,000	183,900	84
T-10	2111	3.57	772,300	527,900	473
T-11	874	3.84	632,000	432,000	210
T-12E	351	4.05	72,900	49,800	89
T-12W	1426	3.70	244,800	167,300	331
T-12WB	499	3.97	99,200	67,800	124
T-15	636	3.92	101,200	69,200	156
T-16E	689	3.90	88,700	60,600	169
T16W	180	4.16	21,400	14,600	47
T-17	359	4.04	42,600	29,100	91
T-18	449	4.00	53,300	36,400	113
T-19	1621	3.65	193,700	132,400	372
T-21S	721	3.89	92,800	63,400	176
T-22	726	3.89	53,800	36,800	177
T-23N	524	3.96	319,200	218,200	130
T-23S	1219	3.74	189,600	129,600	286
T-24N	1177	3.75	144,100	98,500	278
T-24S	211	4.14	32,300	22,100	55
T-25E	1883	3.61	230,900	157,800	426
T-25S	706	3.89	86,800	59,300	173
T-25W	1265	3.73	682,500	466,500	296
T-26E	370	4.04	44,800	30,600	94
T-26W	471	3.99	322,200	220,200	118
T-27	875	3.84	111,200	76,000	211
T-27W	530	3.96	67,600	46,200	132
T-28[2]	2,321	3.53	181,300	123,900	515

(1) Per Figure 7-2.
(2) Includes CIP projects T-28E and T-28W.

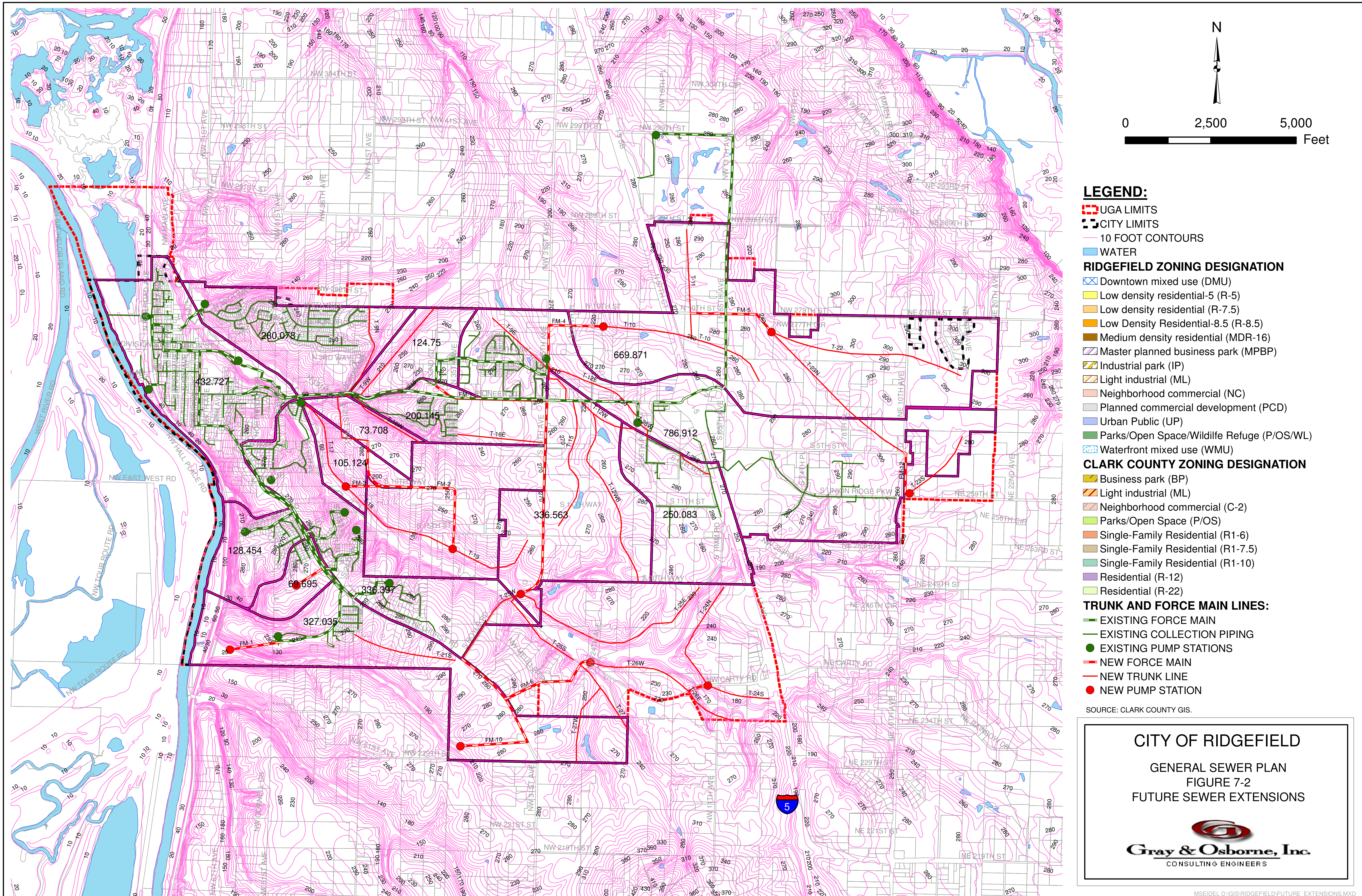
Previous plans for trunk sewers assumed that the sewers would follow natural stream corridors. Due to the need to protect the stream environment, sewers will likely have to be constructed up-slope of the stream rather than at the low point. This means that the sewers may, in some locations, run parallel and on either side of a stream in order to serve adjacent drainage basins.

Figure 7-2 identifies the new trunk lines that were determined within the identified drainage basins and sized using the flows described above. The labels previously used for future trunk lines were retained in order to be consistent with previous sewer plans and the City's GMA plan to the maximum extent possible. The trunk line sizes were estimated assuming the minimum slope recommended by the Ecology "Orange Book" and the City requirement that trunk sewers should be designed so that under ultimate development peak flow they should operate at 50 percent of pipe capacity. Project cost estimates generated for the trunk lines are provided in Table 7-2. It should be noted that diameters, lengths and alignments are conceptual in nature and may change based on more detailed evaluation and survey elevations to be determined at the time of actual design.

TABLE 7-2

City of Ridgefield Project Cost Estimates Gravity Trunk Lines

No.	Description	Project Cost	Construction Cost	Size	Length
T-9E	NW of North 45th Avenue	$ 451,500	$ 361,200	10	2,100
T-9W	East of Reiman Road	$ 753,000	$ 602,400	10	3,500
T-9N	Reiman Road	$ 625,500	$ 500,400	10	2,900
T-9S	Pioneer to South 4th Way	$ 505,500	$ 404,400	15	2,000
T-10	Discovery Point and Union Ridge West	$1,815,000	$1,452,000	27	5,000
T-11	North Discovery Point	$ 991,500	$ 793,200	21	3,200
T-12E	North Ridgecrest	$ 784,500	$ 627,600	8	3,800
T-12W	Ridgecrest	$1,026,000	$ 820,800	15	4,100
T-12WB	Ridgecrest	$1,156,500	$ 925,200	10	5,400
T-15	Ridgecrest	$ 864,000	$ 691,200	10	4,000
T-16E	South 45th Avenue to Cedar Ridge	$ 519,000	$ 415,200	8	2,500
T-16W	Doughnut Hole to Pioneer	$ 459,000	$ 367,200	8	2,200
T-17	West Gee Creek	$ 609,000	$ 487,200	8	2,950
T-21S	Adjacent to New High School Site	$ 642,000	$ 513,600	8	3,100
T-22	Boschma North	$1,195,500	$ 956,400	8	5,800



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2,500
5,000
Feet
LEGEND:
UGA LIMITS
CITY LIMITS
10 FOOT CONTOURS
WATER
RIDGEFIELD ZONING DESIGNATION
Downtown mixed use (DMU)
Low density residential-5 (R-5)
Low density residential (R-7.5)
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Medium density residential (MDR-16)
Master planned business park (MPBP)
Industrial park (IP)
Light industrial (ML)
Neighborhood commercial (NC)
Planned commercial development (PCD)
Urban Public (UP)
Parks/Open Space/Wildlife Refuge (P/OS/WL)
Waterfront mixed use (WMU)
CLARK COUNTY ZONING DESIGNATION
Business park (BP)
Light industrial (ML)
Neighborhood commercial (C-2)
Parks/Open Space (P/OS)
Single-Family Residential (R1-6)
Single-Family Residential (R1-7.5)
Single-Family Residential (R1-10)
Residential (R-12)
Residential (R-22)
TRUNK AND FORCE MAIN LINES:
EXISTING FORCE MAIN
EXISTING COLLECTION PIPING
EXISTING PUMP STATIONS
NEW FORCE MAIN
NEW TRUNK LINE
NEW PUMP STATION
SOURCE: CLARK COUNTY GIS.
CITY OF RIDGEFIELD
GENERAL SEWER PLAN
FIGURE 7-2
FUTURE SEWER EXTENSIONS
Gray & Osborne, Inc.
CONSULTING ENGINEERS
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TABLE 7-2 – (continued)

City of Ridgefield Project Cost Estimates Gravity Trunk Lines

No.	Description	Project Cost	Construction Cost	Size	Length
T-23N	Boschma	$1,372,500	$1,098,000	16	5,300
T-23S	SE UGA to NE 259th	$ 528,000	$ 422,400	12	2,350
T-24N	South 20th Way to NE Carty Road	$ 735,000	$ 588,000	10	3,400
T-24S	I-5 to Carty Road	$ 396,000	$ 316,800	8	1,900
T-25E	South 20th Way to Gee Creek North Fork Confluence	$1,591,500	$1,273,200	15	6,350
T-25S	Gee Creek South Fork Confluence to Royle Road	$ 598,500	$ 478,800	8	2,900
T-25W	Royle Road to Gee Creek	$ 891,000	$ 712,800	24	2,650
T-26E	Gee Creek to Carthy Road	$ 336,000	$ 268,800	8	1,600
T-26W	Carthy Road to Carthy Pump Station (PS#6)	$ 820,500	$ 656,400	16	3,150
T-27	Gee Creek South Fork to Carthy Road	$ 507,000	$ 405,600	10	2,350
T-27W	Southern UGA Limit to Gee Creek	$ 495,000	$ 396,000	8	2,400
T-28E	South 6th Way Sewer	$ 142,500	$ 114,000	10	620
T-28W	Junction Lift Station Inlet Sewer Upgrade	$ 240,000	$ 192,000	10	1,100

Figure 7-2 also shows locations where additional pump stations and associated force mains were identified as necessary. Calculations for estimated flows in existing and proposed trunk lines and force mains are presented in Appendix F.

Table 7-3 provides summary data on the design for eleven new pump stations and associated force mains identified for Basins 1 and 2.

TABLE 7-3

Pump Station/Force Main Design Data

Pump Station Identification	Location	Force Main Diameter	Force Main Length
FM-1	PS #1 to Royal Road	4 in	1,550 ft
FM-2	South 15th to South 4th Way and South 25th	6 in	5,400 ft
FM-3	PS #2 to FM-2	4 in	1,100 ft
FM-4	North 50th Place to North 45th Avenue	12 in	2,900 ft
FM-5	PS #5 to Future T-11	8 in	2,650 ft
FM-6	NW Carty Road to South Royle Road	8 in	4,700 ft
FM-7	Royle Road to N 32nd and Pioneer	12 in	9,350 ft
FM-9	NE Carty to NW 11th	6 in	600 ft
FM-10	NW 229th to NW Carty	4 in	3,400 ft
FM-12	NE 10th, South 10th to South 5th	6 in	1,400 ft
FM-14	Taverner Ridge	4 in	1,000 ft

(1) Based on the difference in ground elevation from the approximate pump station location to the end of the force main.

Table 7-4 provides a project level cost estimate for these pump stations and force mains. The details of the cost estimates are provided in Appendix G.

TABLE 7-4

Pump Station and Force Main Project Costs(1)

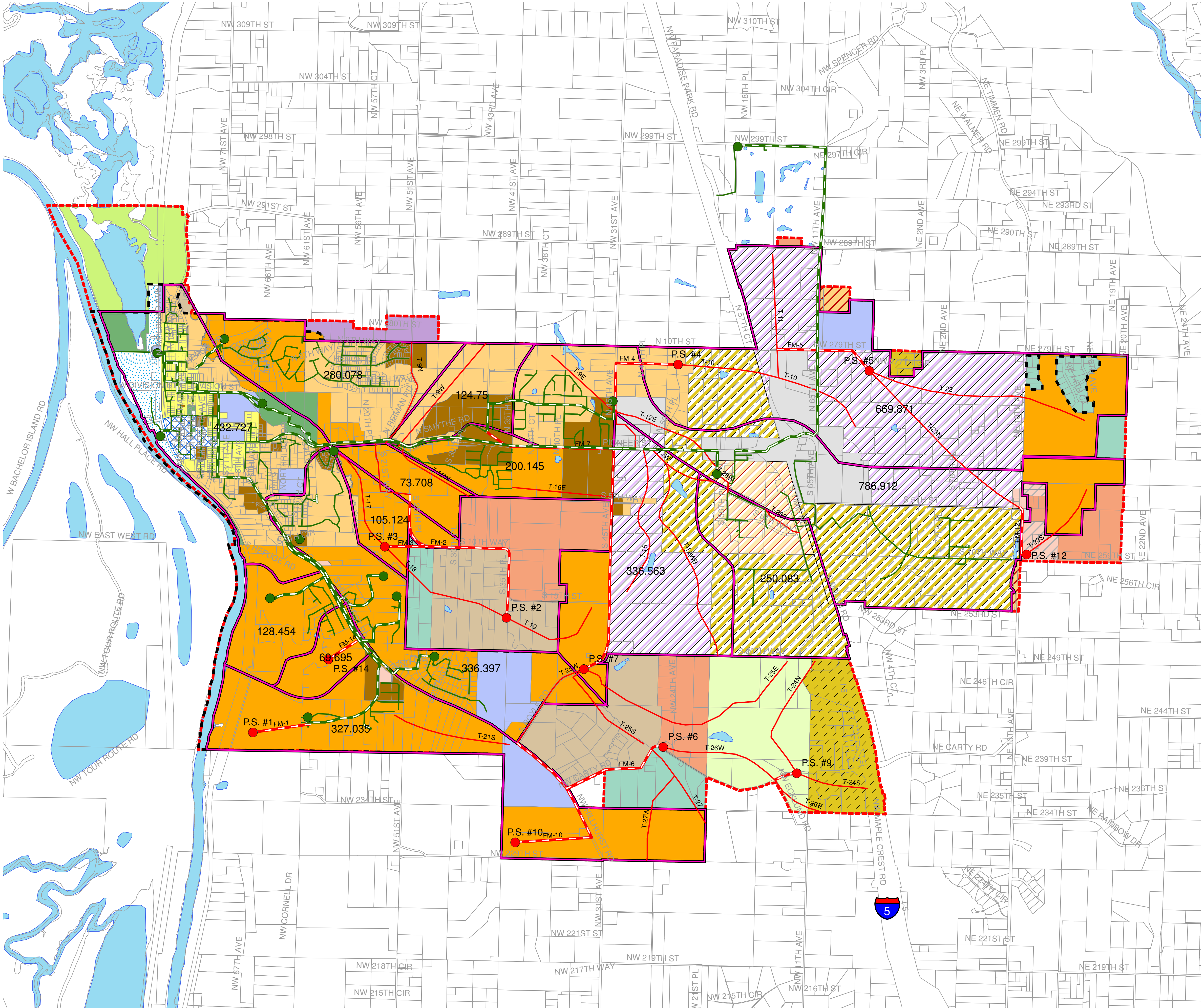
Pump Station Identification	Location	Total Cost(1)(2)
FM-1	PS #1 to Royal Road	$ 676,000
FM-2	South 15th to South 4th Way and South 25th	$ 1,265,000
FM-3	PS #2 to FM-2	$ 648,000
FM-4	North 50th Place to North 45th Avenue	$ 2,376,000
FM-5	PS #5 to Future T-11	$ 1,488,000
FM-6	NW Carty Road to South Royle Road	$ 1,698,000
FM-7	Royle Road to N 32nd and Pioneer	$ 3,150,000
FM-9	NE Carty to NW 11th	$ 871,000
FM-10	NW 229th to NW Carty	$ 790,000
FM-12	NE 10th, South 10th to South 5th	$ 1,035,000
FM-14	Taverner Ridge	$ 640,000

(1) Includes tax, engineering, contingency, and construction costs.
(2) 2010 dollars.

Figure 7-3 shows all of the major trunk lines and pump stations that exist now, are in active design or that are planned to be added to the City system to meet future UGA requirements. This only includes major sewer trunk lines and major pumping stations necessary to serve larger geographic areas defined somewhat by natural drainage patterns and the UGA boundary. Sewers connecting to the trunk sewers to serve individual developments will be constructed by developers as part of development projects.

The increased environmental protection requirements for wetlands and restoration of threatened or endangered species under the Endangered Species Act presents permitting difficulties when stream corridor construction is being considered. Recognizing these difficulties, the City may modify this plan to use additional pump stations and force mains for conveying wastewater when necessary to reduce environmental impacts. All pump stations will be constructed consistent with City standards.

The costs of the collection system improvements identified in this chapter will be shared between the City and the developers whose projects drive the need for the improvements and extensions. Table 7-5 provides a summary of the capital improvement needs for the collection system. For each project, a portion of the eligible cost has been allocated to the City and a portion has been allocated to developers. The allocation is based on several factors including the proximity to existing sewers, construction and permitting issues, and known and anticipated development patterns. The division of costs will change based on developer capacity needs, parcel subdivisions and other factors that cannot be fully predicted at this time.



LEGEND:

- UGA LIMITS
- CITY LIMITS
- WATER

RIDGEFIELD ZONING DESIGNATION

- Downtown mixed use (DMU)
- Low density residential-5 (R-5)
- Low density residential (R-7.5)
- Low Density Residential-8.5 (R-8.5)
- Medium density residential (MDR-16)
- Master planned business park (MPBP)
- Industrial park (IP)
- Light industrial (ML)
- Neighborhood commercial (NC)
- Planned commercial development (PCD)
- Urban Public (UP)
- Parks/Open Space/Wildlife Refuge (P/OS/WL)
- Waterfront mixed use (WMU)

CLARK COUNTY ZONING DESIGNATION

- Business park (BP)
- Light industrial (ML)
- Neighborhood commercial (C-2)
- Parks/Open Space (P/OS)
- Single-Family Residential (R1-6)
- Single-Family Residential (R1-7.5)
- Single-Family Residential (R1-10)
- Residential (R-12)
- Residential (R-22)

TRUNK AND FORCE MAIN LINES:

- EXISTING FORCE MAIN
- EXISTING COLLECTION PIPING
- NEW FORCE MAIN
- NEW TRUNK LINE
- EXISTING PUMP STATIONS
- NEW PUMP STATION

SOURCE: CLARK COUNTY GIS.

CITY OF RIDGEFIELD

GENERAL SEWER PLAN
FIGURE 7-3
FUTURE SEWER SEWER SYSTEM

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TABLE 7-5

Collection System Capital Improvement Plan

Project	Estimated Cost (In Millions $)[1]	Developer Share % [2]	Developer Contribution (In Millions $)	City Share % [2]	City Contribution (In Millions $)
T-9E	0.45	70	0.32	30	0.14
T-9W	0.75	70	0.53	30	0.23
T-9N	0.63	70	0.44	30	0.19
T-9S	0.51	70	0.35	30	0.15
T-10	1.82	70	1.27	30	0.54
T-11	0.99	70	0.69	30	0.30
T-12E	0.78	70	0.55	30	0.24
T-12W	1.03	70	0.72	30	0.31
T-12WB	1.16	70	0.81	30	0.35
T-15	0.86	70	0.60	30	0.26
T-16E	0.52	70	0.36	30	0.16
T-16W	0.46	70	0.32	30	0.14
T-17	0.61	70	0.43	30	0.18
T-18	0.57	70	0.40	30	0.17
T-19	0.62	70	0.44	30	0.19
T-21S	0.64	70	0.45	30	0.19
T-22	1.20	70	0.84	30	0.36
T-23N	1.37	70	0.96	30	0.41
T-23S	0.53	70	0.37	30	0.16
T-24N	0.74	70	0.51	30	0.22
T-24S	0.40	70	0.28	30	0.12
T-25E	1.59	70	1.11	30	0.48

TABLE 7-5 – (continued)

Collection System Capital Improvement Plan

Project	Estimated Cost (In Millions $)[1]	Developer Share % [2]	Developer Contribution (In Millions $)	City Share % [2]	City Contribution (In Millions $)
T-25S	0.60	70	0.42	30	0.18
T-25W	0.89	70	0.62	30	0.27
T-26E	0.34	70	0.24	30	0.10
T-26W	0.82	70	0.57	30	0.25
T-27	0.51	70	0.35	30	0.15
T-27W	0.50	70	0.35	30	0.15
T-28W	0.14	70	0.10	30	0.04
T-28E	0.24	70	0.17	30	0.07
FM-1	0.68	50	0.34	50	0.34
FM-2	1.27	50	0.63	50	0.63
FM-3	0.65	50	0.32	50	0.32
FM-4	2.38	50	1.19	50	1.19
FM-5	1.49	50	0.74	50	0.74
FM-6	1.70	50	0.85	50	0.85
FM-7	3.15	50	1.58	50	1.58
FM-9	0.87	50	0.44	50	0.44
FM-10	0.79	50	0.40	50	0.40
FM-12	1.04	50	0.52	50	0.52
FM-14	0.64	50	0.32	50	0.32
Total	**36.89**		**22.89**		**13.99**

(1) The estimated share for City and developer is based on several factors including proximity to existing sewers, construction and permitting issues and known and anticipated development patterns. Actual City share will be provided through City constructed public works projects and compensation for over sizing of developer built sewer facilities as allowed by City code.

Potential System Improvements to Eliminate Hillhurst Lift Stations

Previously plans have contemplated extensions of gravity trunk sewers along the Gee Creek Drainage and along Lake River to provide gravity sewer to the Hillhurst area of the City. As developments occurred in the area over the last 20 years, a series of lift stations and force mains have been developed to provide sewer service to the area. Challenges with steep slopes, environmental impacts, and the lack of developed right-of-ways has driven this development pattern. If gravity trunk sewers were developed along Gee Creek and Lake River to serve parts of drainage basins 7, 8, 9 and 10, conceivably up to five City lift stations in the area could be taken off-line along with a handful of STEP systems. However, since the challenges that drove the lift station development still remain and most of this area can be served by the existing and planned lift stations, it is unlikely that gravity trunk sewers will be extended to serve this area for the foreseeable future.

CHAPTER 8

WASTEWATER TREATMENT PLANT EVALUATION

INTRODUCTION

Between 2003 and 2007, the City of Ridgefield experienced a period of rapid growth. However, recent years have seen a decline in this growth rate due to the national economic downturn. As discussed in Chapter 6, to address uncertainty in future growth trends, population projections were made according to low, medium, and high growth rate scenarios. Under the projected high growth rate scenario, the existing permitted 0.7 mgd capacity of the wastewater treatment plant (WWTP) will be exceeded very soon. To provide treatment and disposal of projected wastewater flows, the City of Ridgefield will need to either expand its WWTP or provide another means of wastewater disposal to supplement or replace the City's existing WWTP.

Over the last several years, the City has been working with other agencies in Clark County to identify and evaluate regional wastewater conveyance and treatment opportunities. This chapter describes the various alternatives, presents an evaluation of the alternatives, and provides the recommended alternative for the City of Ridgefield wastewater disposal and treatment. The following three alternatives have been considered for treatment and disposal of wastewater generated by the City of Ridgefield.

Alternative 1 – City Owned Conveyance and Treatment

Alternative 2A – Regional Conveyance and Treatment Partnership with City Owned Collection System.

Alternative 2B – Regional Conveyance and Treatment Partnership with Clark Regional Wastewater District (District) Owned Collection System.

ALTERNATIVES DESCRIPTION

A detailed description of each alternative is provided in the following sections. An evaluation of the various alternatives follows the alternative descriptions.

ALTERNATIVE 1 – CITY-OWNED COLLECTION AND TREATMENT

In order to treat projected wastewater flows, the City's wastewater treatment plant would need to be significantly expanded. In this section, a phased expansion of the WWTP is described to provide capacity through 2033 under the high growth rate scenario.

To minimize the potential impact to rate payers, the WWTP improvements were divided into four phases. Phase 1 would expand the current conventional activated sludge facility to allow the plant to treat up to 1.0 mgd maximum month flow. Receiving water studies have indicated that Lake River has the capacity to assimilate a discharge of up to 1.0 mgd maximum month flow (see Appendices C and D).

Expansion of the WWTP beyond 1.0 mgd maximum month flow would require construction of a new effluent pipeline and outfall into the main stem of the Columbia River. Phase 2 of the WWTP improvements would be concurrent with construction of the new outfall, and would provide treatment capacity of 1.8 mgd. The Phase 3 WWTP improvements would provide a treatment capacity of 2.7 mgd. This phase would require acquisition of additional land beyond the current WWTP site. The Phase 4 expansion would provide capacity to treat up to 4.7 mgd. If growth were to occur less rapidly, all four phases of expansion may not necessary within the 20-year horizon. The four phases of WWTP expansion and their corresponding capacities are in Table 8-1 below:

TABLE 8-1

Potential WWTP Expansion Phases

WWTP Upgrade Phase	New WWTP Capacity (MGD)	Year Needed at High Growth(1)	Year Needed at Low Growth(1)
Phase 1	1.0	2014	2020
Phase 2	1.8	2016	2027
Phase 3	2.7	2021	Not Required
Phase 4	4.7	2024	Not Required

(1) The year needed is the year in which the new WWTP capacity would be required.

A description of the major components of each phase follows:

Phase 1 – 1.0 mgd Capacity

The Phase 1 expansion would include the following modifications to the WWTP:

1. Modify the headworks.
2. Modify the existing anoxic basin to include a new aeration basin splitter box.
3. Construct and equip a third aeration basin.
4. Construct and equip a third aerobic digester basin.
5. Remove one blower and install three new aerobic digester blowers.
6. Install an alkalinity adjustment system.

7. Cover aerobic digester No. 1 and install a biofilter.

8. Install a new operations building and laboratory facility.

The total cost of the Phase 1 expansion work is estimated at approximately $4,000,000.

Phase 2 – 1.8 mgd Capacity

1. Construct new effluent pipeline and Columbia River outfall.

2. Construct a new effluent pump station.

3. Construct new Aeration Basins No. 1 and No. 2.

4. Install new aeration basin blowers.

5. Convert existing aeration basins to an aerobic digester.

6. Install sludge dewatering system and solids handling building.

7. Modify UV disinfection system.

8. Construct headworks improvements.

The total cost of the Phase 2 expansion work is estimated at approximately $23,000,000.

Phase 3 – 2.7 mgd Capacity

1. Construct third aeration basin.

2. Construct third secondary clarifier.

3. Construct upgraded lab/office building.

4. Modify UV disinfection system.

The total cost of the Phase 3 expansion work is estimated at approximately $10,000,000.

Phase 4 – 4.7 mgd Capacity

1. Construct three additional aeration basins.

2. Construct fourth secondary clarifier.

3. Construct anaerobic digester facility.

4. Modify UV disinfection system

5. Modify effluent lift station

The total cost of the Phase 4 expansion work is estimated at approximately $26,000,000.

ALTERNATIVE 2A – REGIONAL CONVEYANCE AND TREATMENT PARTNERSHIP WITH CITY OWNED COLLECTION SYSTEM

According to this alternative, a regional entity termed the Discovery Clean Water Alliance (DCWA) would be formed between the City of Ridgefield, the City of Battleground, Clark County, and Clark Regional Wastewater District. The DCWA would acquire regional treatment assets and large scale conveyance systems serving more than one partner and construct additional conveyance infrastructure to allow each of its member agencies to treat and dispose of wastewater at the Salmon Creek WWTP. The DCWA Board of Directors would include a member from each partner agency to provide oversight and direction for administration and operations of the new entity and its assets.

Under this alternative, the City would retain ownership and operational control of its collection system, while the DCWA would assume ownership and operational responsibilities of the City's wastewater treatment plant. Additionally, the DCWA would assume ownership and operation responsibilities of the Clark County Salmon Creek Wastewater System (including the 117th Avenue and 36th Avenue Pump Stations and the Salmon Creek WWTP) and the Battle Ground Force Main that conveys flow from Battle Ground to the Salmon Creek Wastewater System.

Under option 2A, the City's existing WWTP would not be expanded beyond Phase 1 (1.0 mgd). In-lieu of expanding the WWTP beyond 1.0 mgd, flow would be conveyed from Ridgefield to the Salmon Creek Wastewater System. In order to convey flow from the City to the existing Salmon Creek Wastewater System, the City and the DCWA would construct and upgrade a series of pump stations, force mains, and gravity trunk mains from the City of Ridgefield to the Salmon Creek Wastewater System. These conveyance facilities would be collectively referred to as the Discovery Corridor Wastewater Transmission System (DCWTS) shown in Exhibit 8-1 and described in further detail below. Each partner agency would share the costs of construction and operation of regional conveyance and treatment facilities. However, each partner would only provide financial contributions for the facilities they utilize. As such, the City would be solely responsible for the portion of the DCWTS project conveying only City flow from the Pioneer Canyon Pump Station to the 209th Pump Station, and partially responsible for the portions conveying flow from both the City and the District from the 209th Pump Station to the 117th Avenue Pump Station located at the head of the Salmon Creek Wastewater System.

Discovery Corridor Wastewater Transmission System (DCWTS)

The proposed Discovery Corridor Wastewater Transmission System (DCWTS) is shown in Figure 8-1. The DCWTS project connects the City's Pioneer Canyon Pump Station to the District's Legacy Pump Station. Within the District, the project simply accelerates projects already planned for construction and upgrade. The only new infrastructure not previously anticipated by the City or the District is the force main between Pioneer Canyon Pump Station and 209th Street Pump Station. By utilizing to the extent feasible existing and already planned infrastructure, this project provides phased capacity over time as needed to provide long term reliable sewer capacity to the City.

The DCWTS would begin at Ridgefield's Pioneer Canyon Pump Station (located approximately 1/4 mile north of the intersection of 45th Avenue and Pioneer Street). However, the Pioneer Canyon Pump Station is not able to pump flows all the way to the District's system. Therefore, the 209th Street PS, an intermediate PS, would be located at the rest area off Exit 11 on northbound I-5. Initially a 14-inch outside diameter (OD) high density polyethylene (HDPE) force main (FM) would be installed between the two pump stations. Future phases would include installation of a parallel 20-inch OD HDPE FM.

The 209th Street PS would pump flows south and discharge into the District's 20th Avenue Trunk Sewer through one 16-inch OD HDPE FM for Phase 1, with a 22-inch OD HDPE FM to be constructed in the future. As growth occurs along the Discovery Corridor and the Battle Ground Highway, the 209th Street PS would be used as a collection and transmission point for wastewater from these areas.

The 20th Avenue Trunk Sewer conveys flows by gravity to the Legacy PS. This pipeline consists of 10-inch to 18-inch pipes, which would be upsized with Phase 1 and future phases to convey DCWTS flows (or the force main would be extended to discharge directly to the Legacy PS described below).

The District's Legacy PS, located near Legacy Hospital, pumps through an 8-inch FM to the ULID 14 gravity sewer system and through a 16-inch FM to the Highway 99 Trunk Sewer. The Legacy PS would be upgraded in phases to convey DCWTS flows.

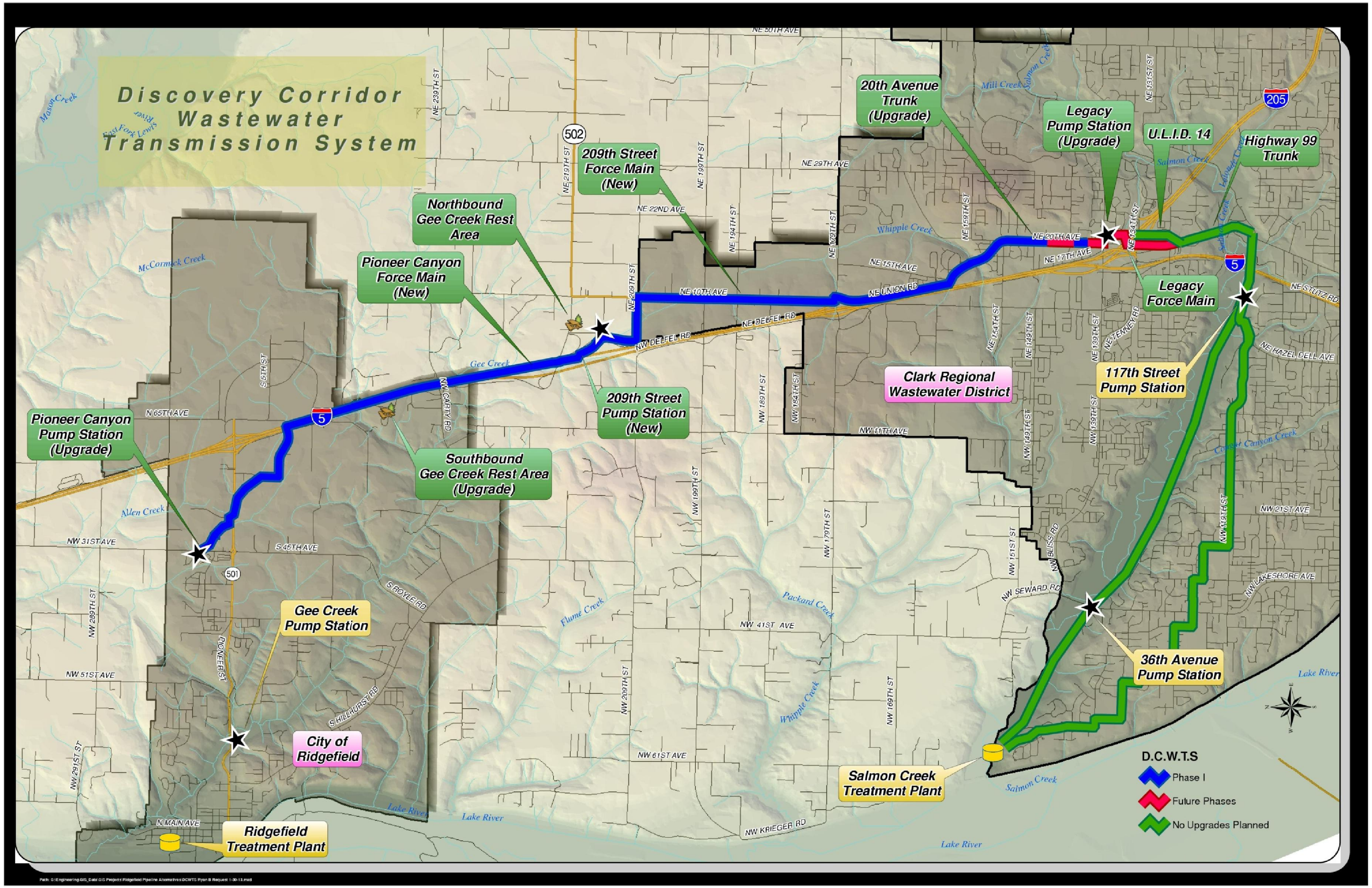
The ULID 14 system would not require upsizing in the future. It discharges flows to the Highway 99 Trunk Sewer, which conveys flows to Clark County's existing Salmon Creek Wastewater System. The Highway 99 Trunk would not need to be upgraded either.

Table 8-2 lists the system components (by phase) included in the DCWTS along with descriptions of each component.

TABLE 8-2

DCWTS Components

Project	Description
Phase 1	
Pioneer Canyon PS, Phase 1	Use existing control building, 150 kW generator, and three 70 hp pumps. Add meter vault, surge tank, and valve vault to route flows to the Pioneer Canyon FM.
Pioneer Canyon FM, Phase 1	Construct 14-inch HPDE to the 209th Street PS. Project also includes a new 4-inch HDPE force main from the Gee Creek SB rest area to the NB rest area, and a gravity trunk sewer in the NB rest area.
209th Street PS, Phase 1	New pump station in Gee Creek Northbound rest area. Station will be run seasonally until flows from Ridgefield warrant year-round operation.
209th Street FM, Phase 1	Construct new 16-inch HDPE force main from 209th Street PS to 20th Avenue trunk sewer.
20th Avenue Trunk Sewer, Phase 1	Upsize three 10-inch and 12-inch segments to 30-inch PVC.
Legacy PS, Phase 1	Use existing 230 kW generator. Modify wet well, replace existing pumps with 70-hp pumps, upgrade site piping. Add odor control building, pigging vault, and chemical storage tank. Replace flow meter.
Phase 2	
Rest Area Pump Station Switchover	Switch to year-round use of 209th Street PS. Abandon NB Rest Area PS, septic tanks, and SB rest area septic tanks.
NE 20th Avenue Trunk	Upsize remaining 15-inch and 18-inch segments of trunk sewer to 30 inch.
Phase 3	
Pioneer Canyon Pump Station Phase 2	Modify pump station for 20-inch force main connection.
Pioneer Canyon FM, Phase 2	Add 20-inch HDPE force main.
209th Street PS, Phase 2	Add third 160-hp pump.
Phase 4	
Pioneer Canyon PS, Phase 3	Replace existing pumps with three new 160 HP pumps. Replace existing control building and upgrade generator to 350 kW.
209th Street FM, Phase 2	Add 22-inch HDPE force main to NE 20th Avenue Trunk.
Legacy PS, Phase 2	Replace 60-hp pumps with new 140-hp pumps.
Phase 5	
209th PS, Phase 3	Add fourth 160-hp pump and replace 400 kW generator with 500 kW generator.
Legacy PS, Phase 3	Add fourth 140-hp pump.
Legacy FM	Replace 8-inch force main with 12-inch HDPE force main to SCWMS.



CITY OF RIDGEFIELD

GENERAL SEWER PLAN
FIGURE 8-1
DISCOVERY CORRIDOR WASTEWATER TRANSMISSION SYSTEM

Gray & Osborne, Inc.
CONSULTING ENGINEERS

The DCWTS would be constructed in multiple phases, as growth in Ridgefield and the District's service area requires increased capacity. Flow triggers have been established to determine when additional phases are needed. Table 8-3 shows a conceptual phasing plan with the flow trigger, system capacity and estimated cost corresponding to each project component described in Table 8-2.

TABLE 8-3

DCWTS Implementation Plan

Project	Cost	Flow Trigger (PH mgd)	System Capacity (PH mgd(1))
Phase 1			
Pioneer Canyon PS, Phase 1	\$0.3M	NA	2.1
Pioneer Canyon FM, Phase 1	\$6.8M	NA	2.1
209th Street PS, Phase 1	\$3.7M	NA	3.1
209th Street FM, Phase 1	\$8.3M	NA	3.1
20th Avenue Trunk Sewer, Phase 1	\$0.9M	1.7	3.6
Legacy PS, Phase 1	\$1.1M	3.4	6.6
Total Phase 1 Cost = \$21.1M			
Phase 2			
Rest Area PS Switchover	\$0.1M	0.65 @ PCPS	NA
NE 20th Avenue Trunk	\$2.4M	3.6	13.8
Total Phase 2 Cost = \$2.5M			
Phase 3			
Pioneer Canyon PS Phase 2	\$0.1M	2.1	4.5(2)
Pioneer Canyon FM, Phase 2	\$2.6M	2.1	4.5(2)
209th Street PS, Phase 2	\$0.4M	3.1	3.7
Total Phase 3 Cost = \$3.1M			
Phase 4			
Pioneer Canyon PS, Phase 3	\$1.6M	4.5	7.2
209th Street FM, Phase 2	\$7.7M	3.7	7.6
Legacy PS, Phase 2	\$1.8M	6.6	9.6
Total Phase 4 Cost = \$11.1M			
Phase 5			
209th Street PS, Phase 3	\$0.6M	7.6	9.4
Legacy PS, Phase 3	\$0.5M	9.6	14.4
Legacy FM	\$1.9M	9.6	14.4
Total Phase 5 Cost = \$3.0M			
Total Cost (All Phases) = \$40.8M			

(1) System capacity refers to the combined pump station and force main capacity for each individual system (i.e., separate system capacities for Pioneer Canyon, 209th, and Legacy systems).
(2) Capacity of Pioneer Canyon system will be limited to 3.8 mgd by 209th system until Phase 4.

Treatment of DCWTS Flows

Under the newly developed DCWA framework (copy of DCWA Interlocal Formation Agreement included in Appendix K), each Partner Agency with sewer customers (i.e., Ridgefield, Battle Ground, and the District) is allocated a share of the total treatment capacity owned by DCWA, including capacity at both the Salmon Creek WWTP and the Ridgefield WWTP. A phased capital improvement program has been developed to provide the additional capacity required to allow Ridgefield's flows to be treated at the Salmon Creek Treatment Plant (SCTP) once the DCWTS project is constructed. These improvements are described in an amendment to the Salmon Creek Treatment Plant Facility Plan and General Sewer Plan (SCTP FP/GSP).

Future improvements to the SCTP will be phased to allow capacity to be added incrementally as flow and loading to the plant increase. Improvements will include the following:

- 2012 upgrades to the dewatering equipment as part of ongoing repair and replacement.
- Phase 5 improvements to add Aeration Basin 7 and a new outfall.
- Phase 6 improvements to add liquids capacity through the entire treatment process, as well as one new anaerobic digester.
- Phase 7 improvements to add primary clarification and aeration basin capacity.
- Phase 8 to improvements to demolish an existing secondary clarifier and add one new liquid stream treatment train (primary clarifier/aeration basin/secondary clarifier).
- Phase 9 improvements to add one more aeration basin and anaerobic digester.

Future Projects in the City of Ridgefield

Since the DCWTS begins at the Pioneer Canyon Pump Station, additional capital projects would be needed in the future to convey City-generated wastewater flows from the west side of the City to the Pioneer Canyon Pump Station. Initially, the City's WWTP would continue to treat all wastewater flow. As flow from the City's Junction Area increases or as the City's WWTP approaches capacity, flow from Pioneer Canyon PS would be diverted to the DCWTS and ultimately conveyed to the Salmon Creek Wastewater Treatment Plant. This could be a seasonal operation for several years until dry weather flows are high enough to operate the DCWTS system year-round.

In order to accommodate wastewater flows resulting from future development not directly tributary to Pioneer Canyon PS, the Gee Creek Meadows lift station would ultimately be modified to pump to the Pioneer Canyon lift station. The capacity of the Gee Creek Meadows lift station would be increased to approximately 3,000 gpm to accommodate flows resulting from future development as well as flow originating from a future pump station located at the WWTP site. Approximately 3,400 feet of parallel 12-inch force main would also need to be constructed to convey wastewater from the Gee Creek Meadows Pump Station to the Pioneer Canyon force main at Smythe Road. The estimated cost for upgrading the Gee Creek Meadows Pump Station and constructing the new force main is $6,000,000.

Ridgefield's WWTP could continue to serve the downtown area indefinitely. However, the plant would likely be abandoned in the future to avoid investing in significant additional upgrades. Once the DCWA elects to decommission the existing WWTP, an approximately 1,000 gpm pump station would be constructed at the WWTP site to pump wastewater from the downtown collection system, the Taverner Ridge force main, and the Heron Ridge force main to the Gee Creek Meadows lift station. Conveyance would be made through the existing parallel 12-inch force mains running from the WWTP to the Gee Creek Meadows lift station. The estimated cost for a new pump station at the WWTP site is approximately $1,500,000.

ALTERNATIVE 2B – REGIONAL TREATMENT PARTNERSHIP WITH DISTRICT OWNED COLLECTION SYSTEM AND CONVEYANCE SYSTEM

In this alternative, the City would cede ownership and operational control of its wastewater treatment facility to DCWA as described in Alternative 2A. However, instead of maintaining its own collection system infrastructure, the City of Ridgefield would also transfer its collection system to the District.

As a result of the collection system transfer, all City customers would become District customers. As such, the DCWTS project would convey only District flow once the transfer is complete and the District would become wholly responsible for constructing the DCWTS project (as mentioned above and defined in detail below). By transferring the collection system to the District the City effectively transfers responsibility, including any financial obligations, of constructing the DCWTS conveyance project. Likewise, all responsibilities to construct, maintain or upgrade other collection system improvements in the City's service area become the responsibility of the District.

It is noted the City and the District are currently pursuing design and Engineering Report approval for the DCWTS. Costs incurred on the project to date are being shared between the City and District and the expectation is that once transfer of the City's collection system infrastructure to the District is complete, City debt associated with current efforts will be also be transferred.

As discussed above, under this alternative, the City's existing WWTP would become a regional facility, owned and operated by the DCWA. However, depending upon how demand materializes prior to construction of the DCWTS, the DCWA may elect to construct the Phase 1 WWTP upgrade to provide the necessary treatment capacity. This project could progress to bid rapidly since the City has completed engineering design for the Phase 1 WWTP Upgrade, the project can be completed within the existing City-owned WWTP site, and the City's existing NPDES permit contains effluent limits corresponding to the 1.0 mgd capacity of the Phase 1 project.

ALTERNATIVES EVALUATION

To evaluate financial and other considerations relating to each alternative identified above, the City created a matrix (Table 8-4) that identified a range of considerations for each alternative. The matrix was used as a tool to communicate the potential implications of each alternative to the City Council, sewer customers and other coordinating agencies. Table 8-5 outlines some of the advantages and disadvantages of each alternative. Tables 8-4 and 8-5 were constructed based on a management options analysis prepared by the City of Ridgefield.

TABLE 8-4

Alternatives Analysis

Consideration	Option 1(1) Ridgefield Go-it Alone	Option 2(1) Ridgefield Full Regional Partner	Option 3(1) District Provides Retail Service
Responsibilities of Agencies			
Responsibility for Retail Connection	City of Ridgefield	City of Ridgefield	District
Responsibility for Local Conveyance	City of Ridgefield	City of Ridgefield	District
Responsibility for Regional Conveyance	NA	City of Ridgefield via the New Regional Entity	NA (regional conveyance becomes local District collection)
Responsibility for Treatment and Discharge	City of Ridgefield	New Regional Entity	New Regional Entity
General Considerations			
Collection System Asset Transfer Mechanism	NA	NA	Interlocal Agreement between the District and Ridgefield
Treatment System Asset Transfer Mechanism	NA	Regional Business Plan Formation Agreement and other 2nd tier agreements.	Regional Business Plan Formation Agreement and other 2nd tier agreements.
Collection System Asset Transfer Mechanism	NA	NA	Interlocal Agreement between the Ridgefield and CRWWD
Treatment System Asset Transfer Mechanism	NA	Regional Business Plan Formation Agreement and other 2nd tier agreements.	Regional Business Plan Formation Agreement and other 2nd tier agreements.
Potential Impacts on Land Use Decisions	No Impact	No Impact	Potential impacts on land use approvals relative to sewer extensions (treatment assumed to be there as needed) will be dependent upon terms of ILA with the District. Impacts anticipated to be similar to procedures with other outside utility providers. City currently works with CPU on land use approvals for developments outside the City's water service boundary and Clark County works with the District on all development in District service area. Often times, road improvements or work on other infrastructure can also drive need for sewer infrastructure.
Customer Billings and Service	City or Ridgefield	City or Ridgefield - City would receive bill from Regional Entity for treatment services and include cost for regional conveyance and treatment in the monthly sewer rate/bill. City would be contacted first and respond to customer comments/complaints/questions regarding sewer.	District - District would send sewer bills to Ridgefield citizens and would be contacted first and respond to customer comments/complaints/questions regarding sewer. Response time to customer concerns could vary due to location of District relative to City service area; however, this could be addressed in the Interlocal Agreement as a Level of Service standard.
Direct Financial Considerations			
System Development Charges (20-year high according to the low growth rate scenario)	Scenario A(2) = $7,700 Scenario B(3) = $10,090	Scenario A(2) = $7,000 Scenario B(3) = $10,090	Scenario A(2) = $7,000 Scenario B(3) = NA
Monthly Rate (20-year high according to the low growth rate scenario)	Scenario A(2) = $95 to $100 Scenario B(3) = $80 to $85	Scenario A(2) = $90 to $95 Scenario B(3) = $80 to $85	Scenario A(2) = $60 to $65 Scenario B(3) = NA
First 5-year Rate Increase	Scenario A(2) = $55 to $88 Scenario B(3) = $55 to $75	Scenario A(2) = $55 to $82 Scenario B(3) = $55 to $76	Scenario A(2) = $55 to $62 Scenario B(3) = NA
City General Fund Implications - Utility Tax	No Impact	No Impact	Loss of $100,000 or 8%
City General Fund Implications - Collection System Indirect	No Impact	No Impact	Loss of $75,000 or 6%
City General Fund Implications - Treatment System Indirect	No Impact	Loss of $115,000 or 9%	Loss of $115,000 or 9%

TABLE 8-4 – (continued)

Alternatives Analysis

Consideration	Option 1(1) Ridgefield Go-it Alone	Option 2(1) Ridgefield Full Regional Partner	Option 3(1) District Provides Retail Service
Effect of Impacts on the General Fund	No Effect	City currently transfers money from Sewer WWTP and Collection system Funds to the General Fund to cover indirect (overhead) costs and support General Fund activities related to the sewer system. Under Option 2, indirect allocations from the WWTP to the General Fund of approximately $115,000 would be lost. To date, there has not been any discussion in the Regional Business Planning effort to replace this revenue to the General Fund.	The City will no longer be able to assess a Utility Tax on the sewer revenues which are currently used to fund supporting activities, facilities, and staff in the general fund. Indirect Allocations from the WWTP and Collections Funds to the General Fund would also be lost. Collectively, loss of these funds would result in a $290,000 (23%) impact to general fund revenues. The City will need to identify mechanisms to replace these revenues, transition costs to other areas, or reduce levels of service in the General Fund. Initial discussions with the District have considered an Interlocal Fee, or Franchise Fee, included in Ridgefield's rates that would be passed on to the City to partially replace General Fund revenues. The Fee could be a declining percentage of the sewer rate over time and stabilizing around 8%, or a combination of a percentage of the sewer rate and a cash payment for the system for a set period of time with the intent that Utility Tax and Collection System Indirect revenues are largely replaced.
Rate Stability	Least stable. Rates subject to high degree of variability depending upon capital program needs relative to number of customers.	Moderately stable. Leasing capacity from District in the Salmon Creek Treatment System enables City to mitigate capital investments with actual growth rates. Could be some rate variability to fund large collection/local conveyance projects.	Most stable. The District is able to leverage its reserves to mitigate the financial requirements for the City and allow it to pay for capital improvements proportionate with actual growth. Discussions with District have included both a Rate Differential and a Rate Convergence factor. The stable $60 to $65 per month rate presented above includes an assumption of a beginning $19 rate differential (to account for the large initial capital investment by the District) and a $1 Rate Convergence for every 400 additional connections to the Ridgefield system. Because the Rate Convergence factor lowers the rate, but the Base Rate increases over time, the overall rate stabilizes around $65 per month under the modeling assumptions made. Note that because of the Interlocal Fee discussed above, the City Rate could never truly converge to the District Rate.
Financial Capacity	Capacity limited to City creditworthiness. City would have the ability to adjust financial policies in accordance with its own commitments to the financial markets and number of customers. Current financial standing may limit ability for large capital investments through the financial markets. No ability to share costs for larger treatment or collection capital investments.	Regional Business Plan effort has established more conservative financial requirements for the new Regional Alliance which result in less operational flexibility but offers better creditworthiness. Increased ability to develop larger capital programs and share costs for treatment and regional conveyance with larger customer base. Local collection system similar to Alternative 1.	City would rely upon financial capacity of District and would follow the conservative regional financial requirements. These result in less operational flexibility but offers better creditworthiness. Increased ability to develop larger capital programs for both treatment and local collection system based on District's larger customer base.
Other Considerations			
Personnel	No change in personnel needs or positions assuming current levels of service.	Currently have approximately 2 FTE in the Sewer WWTP fund. Regional Business Plan assumes a 5-year transition plan with City operating WWTP on a contract basis for minimum of first 5-years. When operation of WWTP is transferred to Regional Entity in future, options may include, but not be limited to, transferring FTEs to Regional Entity, reclassifying and absorbing employees on payroll (budget and need dependent), positions lost through attrition, etc.	2 FTE in Sewer WWTP fund same as Option 2. Currently have approximately 2 FTE in the Sewer Collections fund. District prefers a clean transition of system and operational responsibility. However, District may be open to a transition period where the City would operate the collections system on a contract basis if necessary to allow City ability to consider personnel options.
Representation and Control in Treatment and Conveyance	Levels of Service.	Regional Partner - Vote in both "House" (Flow based) and "Senate" (Member based)	Regional Partner – Contributing WWTP asset to regional Alliance and also have land use authority within a service area similar to the County. Ridgefield would have vote in Senate only (Ridgefield would not be contributing any flow to the system and would therefore not have a "House" vote)
Representation and Control in Retail Collection System	Full Autonomy	Full Autonomy	Dependent on Interlocal Agreement (ILA) with District. Initial discussions have included participation on Joint Advisory Board, Joint Approval for Capital Projects in the Ridgefield area and establishing Levels of Service in the ILA which would allow the City to set priorities for service areas and potentially establish a minimum amount of capital expenditures per year.

TABLE 8-4 – (continued)

Alternatives Analysis

Consideration	Option 1(1) Ridgefield Go-it Alone	Option 2(1) Ridgefield Full Regional Partner	Option 3(1) District Provides Retail Service
Ability to Respond to Economic Development Demands	Limited - For total Ridgefield flows up to 1.0MGD, the City would be able to respond to needs. Beyond this capacity, the City will need to invest in long lead time capital projects which may limit the ability to attract larger developments in the near term.	Moderate to High - Once the Discovery Corridor Wastewater Transmission System (DCWTS) is in place, the City would be able to respond to almost any potential economic development scenario. Still have relatively large local conveyance projects to serve Junction Area that would need to be constructed as part of City's capital program.	Moderate to High - Once the Discovery Corridor Sewer Transmission System is in place, the City would be able to respond to almost any potential economic development scenario. Lower SDC may increase attractiveness to economic development. Timing of Local Conveyance to serve Junction Area would be dependent on ILA (see representation discussion above) and/or District willingness to finance in near term.
Time to Implement Collection System Capital Program to Serve the 20-year Low Growth Scenario	15 to 20 years	15 to 20 years	15 to 20 years
Time to Implement Local Conveyance Capital Program to Serve the 20-year Low Growth Scenario	5 to 10 years	5 to 10 years	5 to 10 years
Time to Implement Regional Conveyance Capital Program to Serve the 20-year Low Growth Scenario	NA	5 years	5 years
Time to Implement Treatment and Disposal Capital Program to Serve the 20-year Low Growth Scenario	15 to 20 years	5 years	5 years
Other Considerations			
Collection System Capital Program Adaptability	High	High	Moderate
Local Conveyance Capital Program Adaptability	Moderate	Moderate	Moderate
Regional Conveyance Capital Program Adaptability	NA	Moderate	Moderate
Treatment and Disposal Capital Program Adaptability	Moderate	Moderate	Moderate
Program Vulnerability (Susceptability to Changes Affecting the Cost of Service)	High – regulatory and economic changes can result in program changes that could exceed affordability (e.g. approvals for outfall to Columbia River, growth scenarios similar to last 5 years, etc.)	Moderate – Regional system can be used to leverage changes across regional system and mitigate impacts to individual partners (e.g. stronger voice with regulators)	Low – Regional system can be used to leverage changes across regional system and mitigate impacts to individual partners (e.g. stronger voice with regulators). ILA with District could limit City's vulnerability to unwanted system changes and District's larger customer base could help to minimize cost increases.
Regulatory Responsiveness	City would represent its individual interests with the regulators. Will have limited ability to negotiate compliance terms and likely compete for environmental carrying capacity.	Can collectively represent interests of the region and work with multiple agencies to meet regulatory compliance needs.	Can collectively represent interests of the region and work with multiple agencies to meet regulatory compliance needs.
Ability to Regain Full Ownership and Operation of System	N/A. City already owns and operates both the local collection/conveyance and treatment systems.	Retail connections and local conveyance system – N/A. City would continue to own and operate. Regional Conveyance and Treatment – Per Regional Business Plan Regional Entity Formation Agreement	For District serviced area within the City, the City could "assume" District property, service and responsibilities of such land to regain system ownership and control of such land (RCW 35.13A). District would want to be made whole for prior investments made to system on behalf of City should City assume District. Would be described in ILA between City and District.

(1) Option 1, Option 2, and Option 3 correspond to Alternative 1, Alternative 2A, and Alternative 2B respectively.
(2) Scenario A represents a scenario where the system development charge is kept at the current amount of $7,700 for Option 1 and $7,000 for Option 2 and Option 3.
(3) Scenario B represents the scenario where the system development charge is increased to $10,090 for Option 1, Option 2, and Option 3.

TABLE 8-5

Summary of Advantages and Disadvantages

Alternative 1	Alternative 2A	Alternative 2B
• "Status Quo" – maintain ownership and operational control of both WWTP and retail collection system. • Rates similar to Option 2 under Low Growth scenario; higher rates than Option 3. Rate increases of 50-80 percent depending on level of SDC to support future capital program. • Ability to set own levels of service. • Direct control of customer response and satisfaction. • No impact to General Fund Revenues. Can continue to collect Utility Tax and support all indirect service costs in General Fund. • No changes or impacts to number of FTEs or positions. • Financially less stable than other options and more susceptible to changes that can impact costs or levels of service. • Capital program will be controlled by our growth rate, number of customers and tolerances for higher rates. Could place more reliance on development community rather than ability to finance important projects when needed for both collection and treatment system. • Could be more difficult to incentivize economic development depending upon regional comparison of rates and SDCs.	• Maintain ownership and operational control of Collection System. Transfer ownership and operational control of WWTP to new Regional Alliance. • Rates similar to Option 1 under Low Growth scenario; higher rates than Option 3. Rate increases of 50 to 75 percent depending on level of SDC to support capital program. • Ability to set own levels of service for collection system. • Direct control of customer response and satisfaction. • Maintain ability to collect Utility Tax and collection system related indirect revenues to support General Fund. • Loss of WWTP related indirect revenues to General Fund • Employee considerations – 2 FTEs, or positions, associated with WWTP. • More financially stable than Option 1 due to regionalization of treatment.	• Transfer ownership and operational control of collection system to District. Transfer ownership and operational control of WWTP to new Regional Alliance. • Potential for full financial leverage of District to stabilize rates and SDCs. Lower rates than Options 1 and 2. Rate increases of 10 to 15 percent to support capital programs. • Loss of autonomy relative to sewer system. Reliance on ILA and District to ensure goals and objectives of City are met. • Negotiate levels of service through ILA to utilize District operation and maintenance efficiencies. • Response times to customer service should be addressed in ILA through agreed upon Level of Service standards. • Loss of Revenue to the General Fund. Could be partially offset through terms in ILA. • Employee considerations – 2 FTEs, or positions, associated with Collections, and 2 FTEs, or positions, associated with WWTP. • Financially stable option with low susceptibility to changes that could impact costs or levels of service. • Benefits of regional partners and large District customer base results in less vulnerability to changing conditions and potential regulatory requirements that could impact costs or levels of service. • Increased economic development potential by providing more predictable and stable rates and SDC. • The language in the transfer agreement (ILA) is very important for both the City and District to ensure positive long-term benefit for both parties. • Joint level of service standards, joint approvals of capital projects, and a joint advisory board are required for decisions relative to the City. • Rate Differential • Interlocal Fees – replacement of revenues to City's General Fund • Rate Convergence Factor • Ability to regain system could be financially unfeasible in the future assuming District makes investments to provide economic development opportunities.

PREFERRED ALTERNATIVE

Based on the evaluation matrix presented in Table 8-4, Alternative 2B provides the preferred alternative for wastewater treatment and disposal for the City of Ridgefield. It provides these services at the lowest projected rate impact to customers and provides the least amount of long-term financial risk in terms of financing new wastewater infrastructure needed to treat projected flow rates. Furthermore, Alternative 2B will allow the resources of the District to be utilized to acquire capital financing and respond to rapid changes in demand for sewerage services brought about by economic development. The primary disadvantage of Alternative 2B is that contributions made to the General Fund from sewer utility taxes will cease along with sewer revenues that had previously been contributed to support administrative functions of the City. However, the Interlocal Collection System Transfer Agreement ("Interlocal") between the City and the District included in Appendix L addresses this revenue issue. The Interlocal between the City and the District is anticipated to be fully executed in June 2013 with official transfer of the City's collection system to the District (i.e., District assumes full responsibility of the system) occurring on January 1, 2014.

CHAPTER 9

FINANCIAL ANALYSIS

This chapter describes how the City can finance the wastewater system improvements described in the previous chapters of this plan. In particular, financing for the capital and operational costs associated with transferring the City's local collection system to the Clark Regional Wastewater District (District) and transferring the City's wastewater treatment plant to the Discovery Clean Water Alliance (DCWA) are described. The financial status of the wastewater utility, the funding required to pay for the scheduled improvements, and the impact of wastewater improvements on wastewater rates are presented herein. Information developed by Clark Regional Wastewater District (District) on the projected rate impacts of completing the Discovery Corridor Wastewater Transmission System (DCWTS) and the District taking over the Ridgefield sewer collection system have also been incorporated herein.

FINANCIAL STATUS OF THE EXISTING WASTEWATER UTILITY

CURRENT WASTEWATER RATES

Wastewater rates and charges for the City are specified in the Ridgefield Municipal Code (RMC) 13.11.010. Bimonthly wastewater rates consist of a base charge that is dependent on the size of the water meter. All customers located outside of the City limits pay a 50 percent surcharge on their total bill. Table 9-1 lists the City's current schedule of rates and charges.

TABLE 9-1

Monthly Wastewater Service Charges(1)

Customer Type and Meter Size	Bimonthly Base Charge(2) (3)
Residential: All sizes	$ 115.02 per EDU(4)(5)
Commercial: 1-inch and smaller	$ 82.53
Commercial: 1-1/2 inch	$ 119.15
Commercial: 2-inch	$ 179.19
Commercial: 3-inch	$ 319.33
Commercial: 4-inch	$ 525.71
Commercial: 6-inch	$1,068.31
Commercial: 8-inch	$1,623.59
Non Metered Customer	$ 115.02 per EDU(5)

TABLE 9-1 – (continued)

Monthly Wastewater Service Charges[1]

Customer Type	Volume Charge[2][3]
Residential	None
Non-residential	$4.57/ccf

(1) Source: Ridgefield Municipal Code Sections 13.11.010.
(2) Customers outside the City's corporate limits also pay a surcharge of 50 percent.
(3) Customers with a septic tank and low pressure sewer also pay a surcharge of 50 percent.
(4) A senior discount of 25 percent may be granted to customers over 60 years of age who meet certain financial criteria and dwell within the City limits.
(5) EDU = Equivalent Dwelling Unit.

CURRENT CONNECTION FEES

The City has currently has a System Development Charge (SDC) of $7,700 per EDU. The City has approved an increase in the SDC to $10,090. However, in an effort to encourage development, the increase to the SDC has not yet been implemented.

HISTORICAL REVENUES AND EXPENDITURES

Table 9-2 presents the City's wastewater utility operating revenues and expenditures from 2012. Table 9-3 presents the City's wastewater utility capital revenues and expenditures from 2012. These tables show that in 2012, the City had a balanced wastewater utility budget. The City reviews historical revenues and expenditures and projected revenues and expenditures each year to develop the following year's budget and determine if any rate adjustments are necessary.

TABLE 9-2

2012 Sewer Operating Fund Revenues and Expenditures

Sewer Operating Fund	
Revenue	
Charges for Goods and Services	$1,275,086.07
Contributed Capital	$679,557.95[3]
Other Revenue	$ 7,808.97
Transfer from Capital Fund[1]	$ 477,127.90
Total Revenue	**$2,439,580.89**
Sewer Collection Expenses	
Personnel	$ 119,643.10
Supplies	$ 117,429.20
Training	$ 1,029.96
Utilities	$ 42,881.86

TABLE 9-2 – (continued)

2012 Sewer Operating Fund Revenues and Expenditures

Sewer Operating Fund	
Operations and Maintenance	$ 11,209.57
Services	$ 12,584.23
Intergovernmental	$ 107,074.28
Capital Outlays	$ 71,165.33
Principal Payments(2)	$ 310,619.52
Interest Payments(2)	$ 166,508.38
Total Sewer Collection Expenses	**$ 960,145.43**
Sewer Treatment Expenses	
Personnel	$ 196,113.97
Supplies	$ 21,752.16
Training	$ 1,159.03
Utilities	$ 24,333.72
Operations and Maintenance	$ 17,715.21
Services	$ 48,045.95
Intergovernmental	$ 234,203.95
Total Sewer Treatment Expenses	**$ 543,323.99**
Total Expenses	**$1,503,469.42**
Net Operating Revenue	**$ 936,111.47**

(1) $477,127.90 was transferred from the Sewer Capital Fund to the Sewer Operating Fund to service capital debts.

(2) The Principal and Interest payment line items constitute service to capital debt paid for with funds transferred from the Sewer Capital Fund.

(3) Contributed capital represents sewer system infrastructure dedicated to the City.

TABLE 9-3

2012 Sewer Capital Fund Revenues and Expenditures

Sewer Capital Fund	
Revenue	
Contributed Capital	$318,150.00
Other Revenue	$ 7,302.88
Total Revenue	**$325,452.88**
Expenses	
Intergovernmental	$ 5,728.04
Transfer to Operating Fund(1)	$477,127.90
Total Expenses	**$482,855.94**
Existing Capital Fund Balance	$669,376.89
Ending Capital Fund Balance	**$511,973.83**

(1) $477,127.90 was transferred from the sewer capital fund to the sewer operating fund to service capital debts.

As can be seen in Tables 9-2 and 9-3, the Sewer utility had net operating revenue of 936,111.47 and net capital expenses equal to 157,403.06 in 2012. Therefore, the sewer utility had a net income of $778,708.41 in 2012.

FINANCIAL ANALYSIS AND PLAN

This section summarizes the financial analysis and plan for the City of Ridgefield. As discussed in Chapter 8, the City of Ridgefield has decided to participate in a regional partnership (the DCWA) which will own and operate the Ridgefield wastewater treatment plant. The City has also elected to transfer to the District its existing sewer collection system, and its portion of the DCWTS project to convey flows to the Salmon Creek Wastewater System. This section considers the costs of both partnerships described in Chapter 8 and the collection system improvements described in Chapter 7.

Becoming a partner in the DCWA and construction of the DCWTS Project is an integral part of the City's effort to accommodate economic growth at the least cost. Regionalization helps to respond to economic development opportunities by leveraging collective interest and resources to accomplish what would otherwise be unaffordable and/or outside of their own authority/control. Furthermore, a regional platform allows jurisdictions to share in and better manage the risk of building too much or too little capacity.

In Ridgefield's case, joining the DCWA and owning a share of the regional assets will provide more and larger blocks of treatment capacity to attract economic development that it could not otherwise support in the near term (10 years). Additionally, partnering with the District allows Ridgefield to capitalize on the larger size and financial resources of the special purpose sewer district in multiple ways, including the support and implantation of the DCWTS Project.

This section addresses the financial considerations directly associated with the initial costs for the City to join the DCWA and implement the DCWTS Project and is organized as follows:

- Capital improvement costs
- Financial capability
- Capital financing plan

CAPITAL IMPROVEMENT COSTS

The new regional sewer utility (DCWA) will be formed by the Partners through an interlocal agreement using an "asset-based" approach. The agreement included in Appendix K, outlines the responsibilities of each member in regards to capital and operational costs associated with regional assets. Under this approach, each Partner "purchases" capacity in the specific assets they plan to use. Therefore, a member's capital cost share is based upon their allocated capacity in a particular piece of infrastructure and their operational cost share is based upon their previous year's flow contribution as measured by average annual flow. Since wastewater infrastructure can take years to plan, permit, design, build and commission (7 to 10 years is common); distribution of capital costs are proportional to projected demand for each jurisdiction. A long term demand forecast is made for *each asset* a Partner plans to use and the Partner pays a commensurate share based on their planned capacity relative to the total capacity used by all Partners. Initially, the City of Ridgefield will use its own plant capacity, and once the DCWTS is complete, it will supplement that plant capacity with treatment capacity at the Salmon Creek WWTP.

The DCWTS Project will be implemented by the City and the District in a number of phases as outlined in Table 9-4. This has been done because the total capital cost to serve the projected "buildout" condition approaches $41 million, which would place a significant financial burden on existing ratepayers. The schedule for each phase will be dependent upon how demands and economic development opportunities evolve. Only Ridgefield and the District currently plan to have capacity in the new DCWTS Project assets. Consequently, initial Project capital costs will be distributed along service area lines, with 35 percent attributed to the City and 65 percent to the District. However, upon execution of the transfer agreement between the City and the District, ownership and operation of all existing and future Ridgefield collection system assets will be transferred to the District, including the DCWTS Project. All DCWTS project related debt will also fall to the District.

TABLE 9-4

DCWTS Project Capital Cost by Phase

Phase	Total Cost[(1)]
1	$21.1M
2	$ 2.5M
3	$ 3.1M
4	$11.1M
5	$ 3.0M
Total	**$40.8M**

Notes: (1) All costs in 2013 dollars.

In addition to capital costs associated with the DCWTS, there will need to be collection system improvement projects completed as described in Chapter 7. Many of these projects will be completed by developers as they extend sewers to serve new developments; however, there will be capital contributions or reimbursements for oversizing trunk sewers and pump stations and there will also be capital projects to be executed in key areas. One of the key areas will be the Junction area where sewers will need to be constructed to take the Junction Lift Station out of service and also to cross I-5 north of Pioneer Street. In addition, as growth necessitates, improvements will need to be made to the Gee Creek Meadows lift station to convey wastewater from the west side of Ridgefield to the Pioneer Canyon Pump Station. In the future, when the Ridgefield WWTP is taken out of service, a new pump station will need to be constructed at the existing WWTP site to convey wastewater to the Gee Creek Meadows Lift Station. The total collection system improvement costs that will be the District's responsibility are summarized in Table 9-5.

TABLE 9-5

Estimated Collection System Capital Costs

Component	Utility Cost
Collection System Improvements (Utility Share)	$14,000,000[(1)]
Gee Creek Meadows Lift Station and Force main	$ 6,000,000
WWTP Lift Station	$ 1,500,000
Total	$ 21,500,000

(1) The estimated cost for collection system improvements is taken from Table 7-5 and considers a high growth scenario. Actual expenditures will depend upon growth.

FINANCIAL CAPABILITY

Wastewater rates have usually been much lower in larger systems because of economies of scale; this is also evident in Clark County as you compare the smaller to larger sewer utilities. Consequently, affordability is one of the key factors for regionalization and transferring the collection system to the District. As more stringent environmental requirements are adopted, affordability problems may become evident for larger utility systems too.

The financial capacity of a utility is largely a factor of its number of customers, median household income (MHI) and outstanding debt. To provide a conservative assessment of financial capability, low growth rate scenarios have been used in the financial analysis. For Ridgefield, their financial capacity is especially sensitive to the magnitude of up front capital costs. This is because the existing number of customers is forecast to increase by about 200 percent in 20 years in the low growth scenario (see Table 9-6). The current customer base represents only 50 percent of the forecasted amount through the 20-year financial planning period. However, Ridgefield is believed to have the largest potential for near-term economic development to stimulate the local economy. Battle Ground and the County do not have capital investments in the DCWTS Project; therefore financial considerations for Battle Ground and Clark County are not discussed further in this chapter.

TABLE 9-6

District and Ridgefield EDU Forecast(1)(2)

Year	2012	2018	2023	2028	2033
District	30,148	32,143	34,708	37,843	40,503
Ridgefield	2,556(3)	2,586(4)	3,289(4)	4,181(4)	5,021(4)

(1) EDU forecasts are taken from the financial model developed by the District.
(2) As noted Ridgefield proportionally grows by about 200 percent but the District actually adds more customers.
(3) 2012 EDUs are computed based on the actual number of residential accounts with a corresponding per EDU flow contribution of 173 gpd.
(4) EDUs for years subsequent to 2013 are computed based on projections from the District model with a per EDU flow contribution of 292 gpd.

Concern for the ability of residents to pay for utility bills is an ongoing issue, particularly under current economic conditions. To assess the ability of ratepayers to pay for infrastructure programs the EPA established a benchmark of two percent of the Median Household Income (MHI) as the maximum threshold for affordability. Rates below this amount are considered affordable. For Ridgefield, rates would need to approach $120/month and about $90/month for the District to reach this benchmark. Since paying for utility services represents a much higher burden on lower income residents, it is not unusual for the MHI affordability indicator to be well under the 2 percent threshold for a system as a whole, but for lower income residents, the financial impact of the rates may range from 4 to 8 percent of MHI. As a result, lower income residents may face difficult financial choices (e.g., late or nonpayment of bills, reduced service levels) in meeting basic service needs. Affordability problems may be evident through increasing arrearages, late payments, disconnect notices, service terminations, and uncollectible accounts, etc. Reduced revenue collections could endanger the utility's financial stability and bond rating as well as create public relations problems. As illustrated in Table 9-7, current rates (excluding local taxes and surcharges) for both Ridgefield and the District are below the 2 percent MHI index established by the EPA.

TABLE 9-7

Current Rates and Sewer Development Charges (SDC) fees

Agency	**Monthly Rate ($/mo)**	**Monthly Rate (% Affordability Threshold)**	**Sewer Development Charges ($ per ERU)**
District	$35.00	25%	$7,550
Ridgefield	$57.51	42%	$7,700

Note: The Ridgefield City Council has approved the increase of the SDC to $10,090. However, this increase has not yet been implemented.

The District and the City plan to finance most of the DCWTS Project capital costs since the sewer infrastructure will meet forecast capacity demands over a 20 to 30-year period. Capital financing also allows them to better distribute the costs to users over time commensurate with the infrastructure service life of 30 to 50+ years. The DCWTS Project capital costs will be financed using a combination of cash reserves and state administered loan funds.

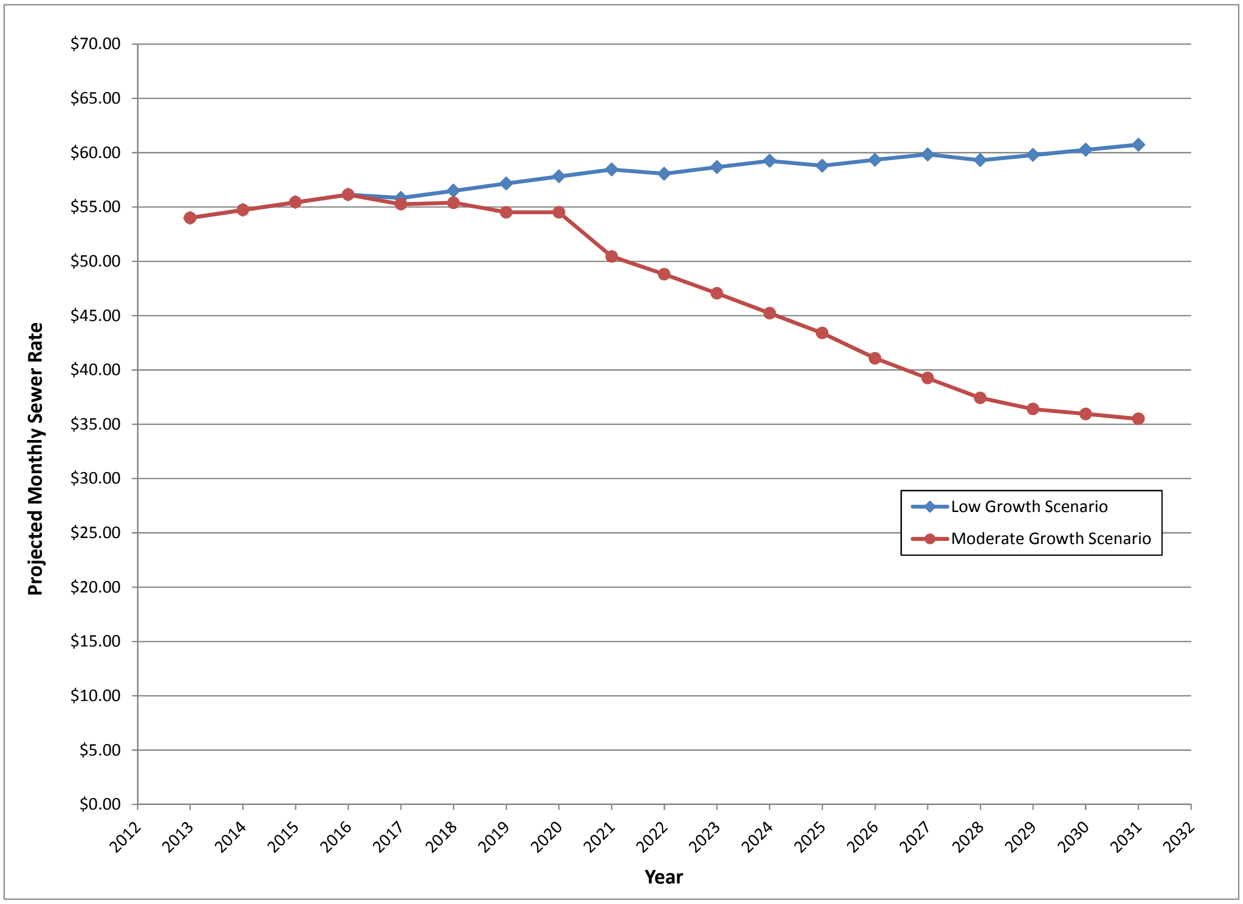
FINANCE PLAN

The District developed a financial model to determine the connection fees and rates required to satisfy projected revenue needs under low and moderate growth scenarios. The input and output data for this financial model is included in Appendix J.

Figure 9-1 presents the projected rate impact from the rate model associated with the City's participation in the DCWTS for low and moderate growth rate scenarios.

FIGURE 9-1

Estimated Monthly Sewer Rates Based on the District Financial Model



Note that according to a low growth rate scenario, monthly sewer rates remain relatively stable over the planning period. However, according to the moderate growth rate scenario, projected monthly rates decline over the planning period, showing that Ridgefield rates approach District rates over time.

As mentioned in Chapter 8 and shown in Table 9-5, the additional costs associated with upgrading the Gee Creek Meadows Pump Station and constructing a new pump station at the WWTP are estimated at $6,000,000 and $1,500,000 respectively. Furthermore, collection system improvements will need to be made to accommodate new development (particularly in the Junction area). An allowance for these improvements has been made in the District's financial model under the line item "ADD-RF collection system CIP" as shown in Appendix J. Therefore, the projected monthly rates shown in Figure 9-1 account for City infrastructure upgrades necessary to serve projected development.

CONCLUSION AND RECOMMENDATIONS

The financing plan described in this chapter shows that by participating in the DCWA and transferring the collection system responsibilities to the District, a larger resource pool is available to fund capital improvements, obtain financing, and respond to development in the service area. With these partnerships, the City of Ridgefield can execute the capital projects described in this plan with reasonable marginal increases to its sewer rate structure.