CITY OF GRANDVIEW

GENERAL SEWER PLAN

Prepared by

Hulbregtse, Louman Associates, Inc.
CIVIL ENGINEERING • LAND SURVEYING • PLANNING
801 North 39th Avenue ◆ Yakima, WA 98902
(509) 966-7000 ◆ FAX (509) 965-3800

PROJECT NO. 08032

January 2009

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INTRODUCTION

The City of Grandview is located in the Lower Yakima Valley, within the eastern part of Yakima County. The City lies along Interstate 82 between the City of Sunnyside, approximately six miles to the northwest, and the City of Prosser, approximately seven miles to the southeast. Incorporated in 1909, Grandview lies north of the Yakima River, between the Rattlesnake Hills to the north and the Horse Heaven Hills to the south. The topography in Grandview is relatively flat, sloping generally from the northeast to the southwest. A few rolling hills exist, mostly in the southern areas of the City. Ground elevations in Grandview vary from 740 feet to 840 feet above mean sea level. Grandview's economy depends largely on the agricultural industry. Fruit and produce grown locally are processed, packaged, and shipped from Grandview industries. The City also has a viable commercial and service business community.

Grandview recognizes the need to improve and expand its sewer system if it is to meet the demands of the system users and to keep pace with other growth-oriented improvements in this vital Yakima County community. Huibregtse, Louman Associates, Inc., was authorized by the City of Grandview to prepare this General Sewer Plan, which represents the culmination of planning and data collection efforts.

REQUIREMENTS

State regulation 173-240-050 WAC specifies that a General Sewer Plan include the following information:

1. Purpose and need for the proposed plan.
2. A discussion of who will own, operate, and maintain the system.
3. The existing and proposed service boundaries.
4. Layout map including existing and proposed sewers, existing and proposed pump stations and force mains, topography and elevations, streams, lakes, and other bodies of water, and location of major water system components.
5. Current and future population.
6. Existing domestic or industrial wastewater facilities within the vicinity of the general plan area.
7. A discussion of any infiltration and inflow problems.
8. A statement regarding provisions for, and adequacy of wastewater treatment.
9. List of all sources of, and quality and quantity of industrial wastewater discharged to the system.
10. Location of private and public wells, or other sources of water supply.
11. Alternatives evaluated.
12. Financial evaluation including the cost per service in terms of both debt service and operation and maintenance costs.
13. A statement regarding compliance with any adopted water quality management plan under the Federal Water Pollution Control Act as amended.
14. A statement regarding compliance with the State Environmental Policy Act (SEPA) and the National Environmental Policy Act (NEPA).

PURPOSE AND OBJECTIVE OF PLAN

This General Sewer Plan has been developed to serve as a guide for the expansion of the City of Grandview's wastewater collection, treatment, and disposal facilities. The following major components are included in this Plan:

- Definition of the planning area, determination of the areas in and around Grandview most likely to grow, and the projected population increases.

- Development of estimates for the current quantity of wastewater and the projected quantity to be generated within the planning area.

- Evaluation of the capacity and condition of the existing sewer system, including lift stations.

- Recommendations for extension of the existing sewer system, including lift stations.

- Development of design standards for extension of sewers and for lift stations.
- Review of the evaluation of the existing treatment and disposal facilities and recommendations for improvements.
- Development of policies for the extension of sewer service.

The sections of this Plan describe the basis for development of planning areas, growth projections, forecast wastewater loadings, and design criteria for recommended improvements. Maps showing the existing sewer system and proposed sewer extensions are included in the back of this Plan.

By regulation, general sewer plans are required to contain maps showing sources of water supply, water storage reservoirs, water treatment plants, and water transmission lines. A map in the back of this Plan shows these water system elements in relation to the existing and future sewer system area.

An equally important reason for developing a general sewer plan is to assure orderly growth of the system while maintaining reliable wastewater collection and treatment service. This Plan is intended to guide sewer utility actions in a manner consistent with other activities taking place in the community.

SUMMARY OF RECOMMENDED IMPROVEMENTS

Improvements to the existing collection and treatment system, and expansion to accommodate future growth are identified within this Plan. The following is a summary of the recommended improvements:

Existing Collection System Improvements

There are no recommended improvements to the existing collection system.

Future Collection System Improvements – Year 2028

There are no recommended improvements to the Year 2028 collection system.

SCHEDULE OF IMPROVEMENTS

There are no recommended improvements to the Year 2028 collection system.

ESTIMATED COSTS AND PROPOSED SEWER SYSTEM FINANCIAL PROGRAM

Year 2028 Collection System

There are no recommended improvements to the Year 2028 collection system.

CHAPTER 1
BASIC PLANNING INFORMATION

1.1 BACKGROUND INFORMATION

Wastewater System Ownership

The City of Grandview, a municipal corporation located within the eastern part of Yakima County as shown on Figure 1-1 - Washington State Vicinity Map, owns and operates its own wastewater collection, treatment, and disposal system. Decisions regarding daily sewer system operations are made by the Public Works Director, and decisions regarding daily treatment facility operations are made by the Wastewater Treatment Plant Superintendent. Financial decisions regarding major wastewater system improvements and establishment of sewer rates are made by the Grandview City Council. The following parties are involved in the operation, maintenance, and planning for the Grandview wastewater collection, treatment, and disposal facilities:

WASTEWATER SYSTEM NAME, OWNER, AND OPERATOR:

City of Grandview Wastewater Collection and Treatment System
City of Grandview
207 West Second Street
Grandview, WA 98930
Phone: (509) 882-9200

Mayor: Norm Childress
City Administrator: Scott Staples
Public Works Director: Cus Arteaga
Wastewater Treatment Plant Superintendent: Dave Lorenz

WASTEWATER SYSTEM CONSULTING ENGINEER:

Huibregtse, Louman Associates, Inc.
801 North 39th Avenue
Yakima, WA 98902
Phone: (509) 966-7000
Project Engineer: Theodore W. Pooler, PE

Geography

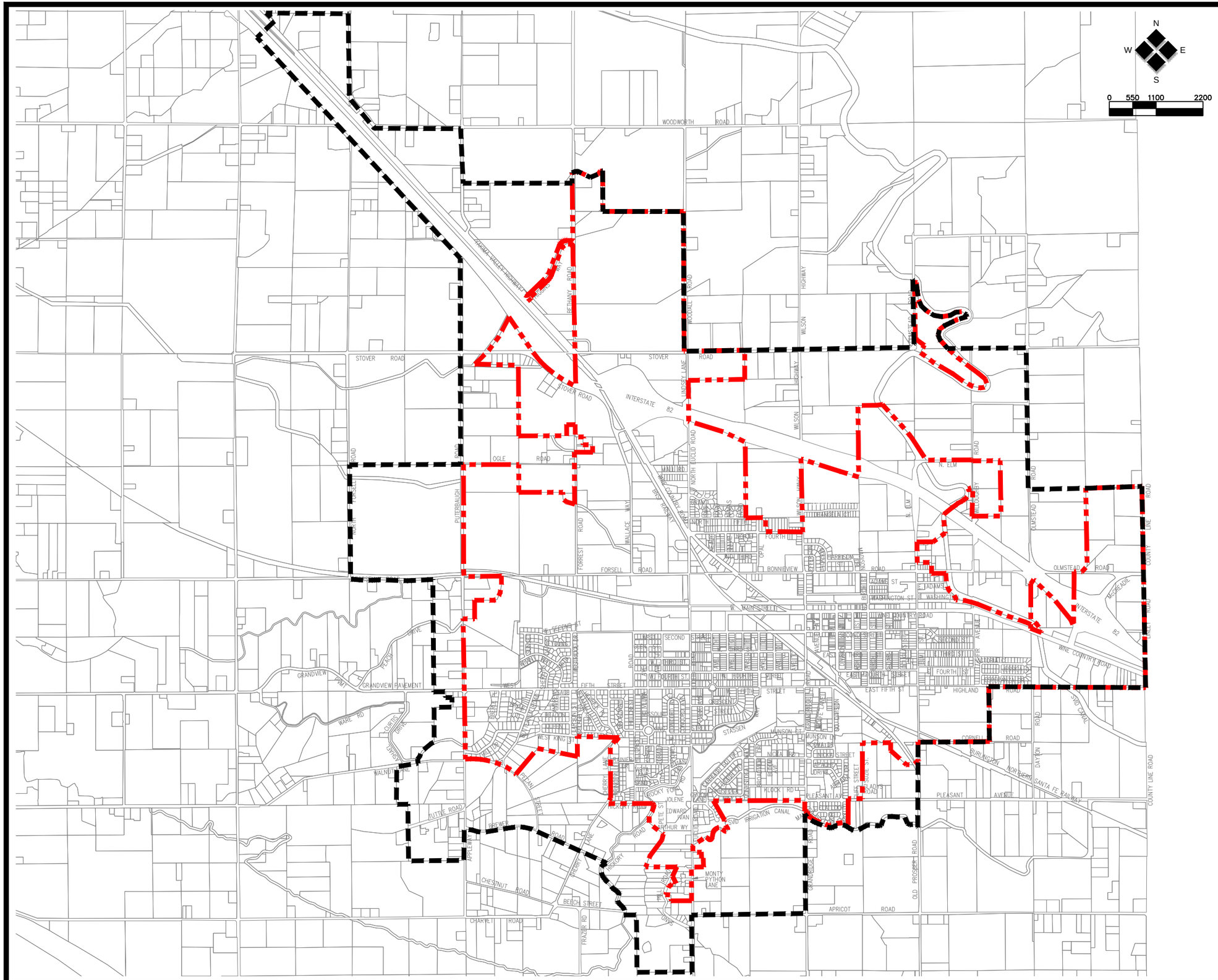
The City of Grandview and its Urban Growth Area are located in the Lower Yakima Valley (the eastern part of Yakima County) in the south-central portion of Washington State, as shown on Figure 1-1. The City lies along Interstate 82 north of the Yakima River, between the City of Sunnyside, approximately six miles to the northwest, and the City of Prosser, approximately seven miles to the southeast. Incorporated in 1909, Grandview lies north of the Yakima River, between the Rattlesnake Hills to the north and the Horse Heaven Hills to the south, with the City varying from 740 to 840 feet in elevation above mean sea level.

In 1995, Grandview completed its Comprehensive Plan as required by the Growth Management Act, and adopted revisions to that Plan in 2008. Grandview's existing sewer service area boundary generally corresponds to the current City Limits, and is shown on Figure 1-2 - Existing and Future Sewer Service Area Boundaries. Grandview's future sewer service area boundary corresponds to its Urban Growth Area (UGA), and is also shown on Figure 1-2.

Like the rest of the Yakima Valley, Grandview and its UGA has a warm and dry climate. The Cascade Mountain Range acts as a barrier between Yakima County and the Pacific Ocean, keeping precipitation low and temperatures warm. The mean temperature range is from a low of 17.8º F in the winter to a high of 89.2º F. The median temperature is 64.7º F and mean annual precipitation is 7.2 inches. With a warm climate and rich soils, Yakima County is a significant agricultural region as well as a recreational area.

Washington State Vicinity Map

Figure 1-1



CITY OF GRANDVIEW

General Sewer Plan Update

EXISTING & FUTURE SEWER SERVICE AREA BOUNDARIES

LEGEND

EXISTING RETAIL SERVICE AREA BOUNDARY (CITY LIMITS)

FUTURE RETAIL SERVICE AREA BOUNDARY (UGA)

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FIGURE 1-2

The economy of Grandview depends largely upon the agricultural industry. Produce grown throughout the Yakima Valley and the Columbia Basin is processed and shipped from facilities within the City, including fruit juice and fruit processors, wineries, and other fruit packing and storage facilities. Much of the employment in Grandview is tied directly to these agricultural facilities.

Wastewater System History

Although the City of Grandview has not maintained historical records of the wastewater system's initial beginning, Table 1-1 provides some information as to the growth of the system.

TABLE 1-1 MAJOR WASTEWATER SYSTEM IMPROVEMENTS

Year	Improvement Description
1959	Wastewater Treatment Facility constructed
1967	Wastewater Lagoon Treatment Facility constructed
late 1970s	Wastewater Treatment & Disposal Sprayfield added
1978	Primary Clarifier added
1996	Wastewater Sprayfield Hydrogeologic Report completed
1997	General Sewer Plan completed
1997	Wastewater Treatment Facilities Engineering Report completed
1998	Expansion and modification of the wastewater treatment facility (aerated lagoon, disinfection, sprayfield improvements)
2000	Butternut Sewage Lift Station improvements
2001	Sludge Dewatering improvements constructed
2001	Stover Road sewer improvements constructed
2002	Bethany Road sewer improvements constructed
2002	1.5 MGD Mechanical Wastewater Treatment Facility constructed
2003	North Grandview sewer improvements constructed
2003	Forcemain to wastewater treatment facility replaced
2007	Additional Sludge Drying Beds constructed

The following modifications to Grandview's collection system were made since the last (1997) General Sewer Plan:

1) A third pump was added to the Forrest Road Lift Station
2) Stover Road Lift Station was constructed
3) West Wine Country Road Lift Station was constructed
4) Euclid Lift Station was upgraded
5) Blehyl Lift Station (private lift station) was constructed.

1.2 RELATED PLANNING DOCUMENTS

Wastewater Plans

In 1997, the City of Grandview completed a General Sewer Plan for the City and its UGA. This document:

1. Described the existing and future sewer service area;

2. Described existing conditions including the condition and location of existing trunk and interceptor sewers, pumping stations, the collection system, and the treatment facilities, current wastewater characteristics, current system operation and maintenance, problem areas, and evaluated the existing system using a computer model;

3. Based upon growth projections, forecasted future domestic and industrial wastewater loadings; and

4. Recommended a wastewater system improvement plan and financial plan.

Wastewater Treatment Facilities Engineering Report

In 1997, the City of Grandview completed a Wastewater Treatment Facilities Engineering Report for the City and its UGA. This document:

1. Described the existing and future sewer service area, population projections, land use issues, and regulatory requirements;

2. Described the existing wastewater treatment facilities;

3. Provided alternatives for the upgrade of the City's wastewater treatment facilities; and

4. Recommended a wastewater treatment upgrade alternative and financial strategy for implementation.

Other Reports and Documents

Since 2004, the City of Grandview has completed numerous wastewater reports and documents required by the City's NPDES Permit. A list of these reports and documents, their dates, and the requiring permit condition is provided in Table 1-2.

TABLE 1-2 OTHER REPORTS AND DOCUMENTS

Year	Permit Condition	Document
2004	S9.	WWTP Receiving Water Study Sampling and Quality Assurance Plan
2004	S11.	Sprayfield Loading Report
2005	S8.	WWTP Spill Prevention and Containment Plan
2005	S11.	Sprayfield Loading Report
2006	S4.G.	Wasteload Assessment
2006	S11.	Sprayfield Loading Report
2007	S4.G.	Wasteload Assessment
2007	S4.F.	Infiltration & Inflow Report
2007	S11.	Sprayfield Loading Report
2007	S4.H.	Wastewater Sprayfield Ground Water Quality Evaluation

2008	S4.G.	Wasteload Assessment
2008	S11.	Sprayfield Loading Report

In September 2008, the City of Grandview completed a Water System Plan, which is currently in the process of being approved by the Washington State Department of Health and the Washington Department of Ecology. It is anticipated that the plan will be approved in January 2009. A map of the existing water system is shown in Map A, located at the back pocket of the report.

Urban Growth Area Comprehensive Plan

The City of Grandview completed and adopted its Comprehensive Plan in 1995. Revisions to the 1995 plan were adopted by the City in 2008.

The City's Comprehensive Plan identifies many of the physical, environmental, and economic elements within the City and its UGA, and attempts to forecast anticipated changes within that geographical area. Understanding and predicting future changes within the City and its UGA are critical in forecasting future demands on the City's wastewater system. As a result, Grandview's Comprehensive Plan was an important tool in development of this General Sewer Plan.

Comprehensive Water Plans

The City's first Comprehensive Water Plan was completed in 1974, which provided Grandview with an in-depth look at their system, its deficiencies, and potential growth. Updates to the City's Comprehensive Water Plan were completed in 1986, 1995, and in 2001. Grandview is in the process of updating this 2001 Plan, and the update should be completed later in 2008.

1.3 NEIGHBORING/ADJACENT WASTEWATER SYSTEMS

No other municipal wastewater systems exist within Grandview's UGA. The nearest municipal wastewater treatment systems include the City of Sunnyside's wastewater treatment system, six miles to the northwest, the Sunnyside Port District's wastewater treatment system, six miles to the northwest, and the City of Prosser's wastewater treatment system, seven miles to the southeast.

1.4 EXISTING SERVICE AREA

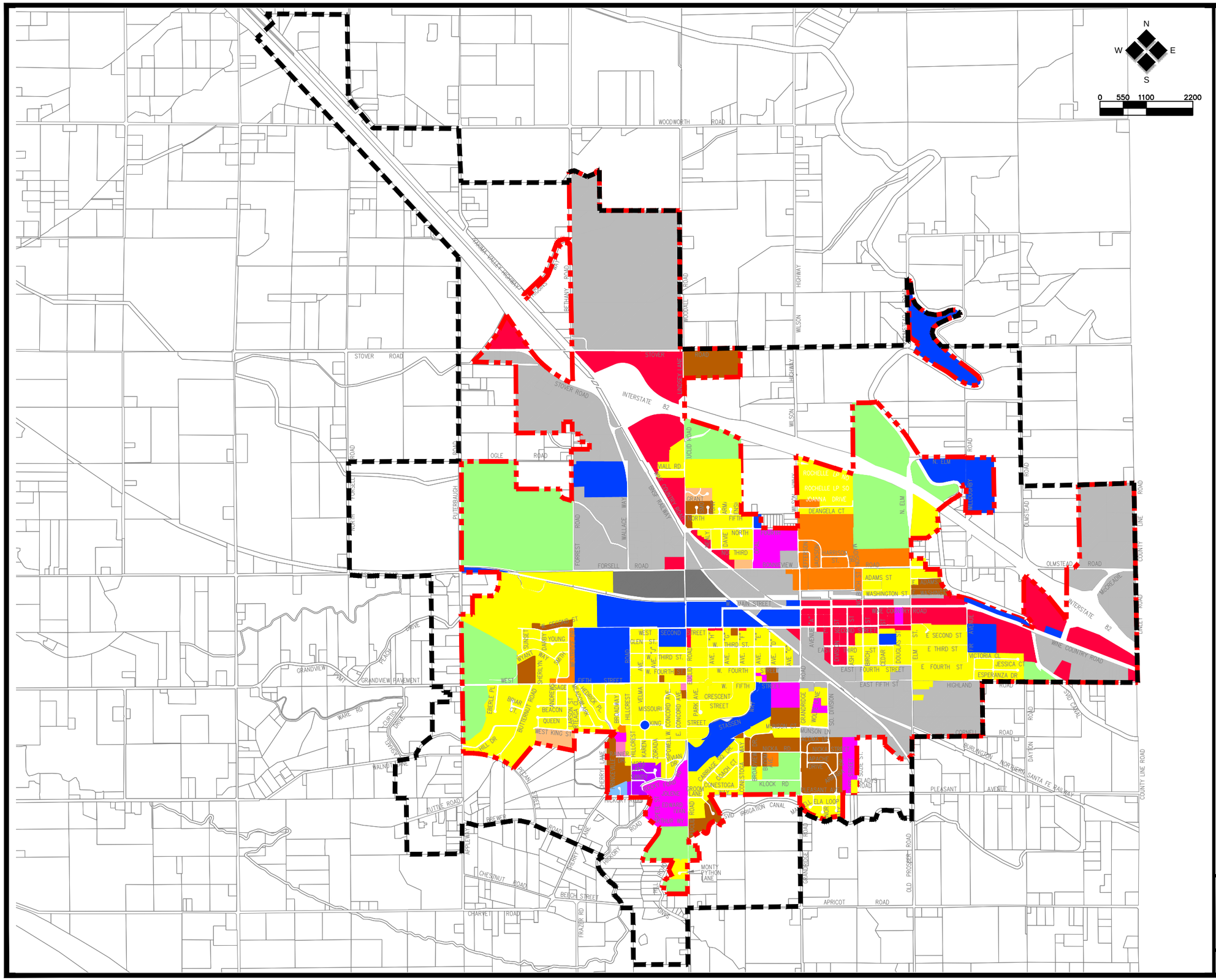
The existing wastewater system serves a combination of residential, commercial, industrial, and public users within the City. The current area within the City Limits is approximately 3,540 acres. Current zoning within the City is presented in Table 1-3, and is shown on Figure 1-3 - Existing Zoning Map.

TABLE 1-3 EXISTING ZONING WITHIN GRANDVIEW CITY LIMITS

Zoning Category	Total Acreage	Percent of Total
Single-Family Residential (R-1)	496.61	14.0%
Single-Family Residential Mobile Home (R-1M)	11.57	0.3%
Duplex Residential (R-2)	77.26	2.2%
Multi-Family Residential – (R-3)	82.73	2.3%
Mobile Home, Platted (MR-1)	0.71	0.0%
Mobile Home Park (MR-2)	71.75	2.0%
Light Commercial (C-1)	2.93	0.1%

Commercial (C-2)	172.87	4.9%
Light Industrial (M-1)	810.74	22.9%
Heavy Industrial (M-2)	32.40	0.9%
Agricultural Forest (AF-1)	399.26	11.3%
Public Facility (PF)	1,379.54	39.0%
PUD	1.84	0.1%
TOTAL	3,540.21	100.0%

Public facility is the largest zoning total within the City, comprising approximately 1,379.54 acres (39.0%) of the land within the City Limits). Of the residential lands, single-family residential lands make up the largest area, approximately 496.61 acres (14.0%) of the total area within the City.



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EXISTING ZONING MAP

LEGEND

- EXISTING RETAIL SERVICE AREA BOUNDARY (CITY LIMITS)
- FUTURE RETAIL SERVICE AREA BOUNDARY (UGA)
- AGRICULTURAL FOREST
- COMMERCIAL LIGHT
- COMMERCIAL
- INDUSTRIAL LIGHT
- INDUSTRIAL HEAVY
- MOBILE HOME, PLATTED
- MOBILE HOME PARK
- PUBLIC FACILITY
- PUBLIC UTILITY DISTRICT
- SINGLE FAMILY
- SINGLE FAMILY-MOBILE HOME
- DUPLEX
- MULTIPLE FAMILY

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FIGURE 1-3

1.5 FUTURE SERVICE AREA

The City of Grandview and Yakima County established the Urban Growth Area (UGA) for Grandview in 1995 as part of the Growth Management Act (GMA) planning process. In 2008, Grandview modified its UGA as part of adopted revisions to its Comprehensive Plan. The UGA represents the projected future area within which the City may be able to provide and maintain services, including sewer service.

Land Use

The UGA includes an area of approximately 1,666 acres that are outside the current City Limits. The land use within the City is presented in Table 1-4, and the land use within the UGA is presented in Table 1-5. The land use within the City is shown on Figure 1-4 – Land Use Within City Limits, and the land use within the UGA is shown on Figure 1-5 – Land Use Within UGA.

TABLE 1-4 FUTURE LAND USE WITHIN GRANDVIEW CITY LIMITS*

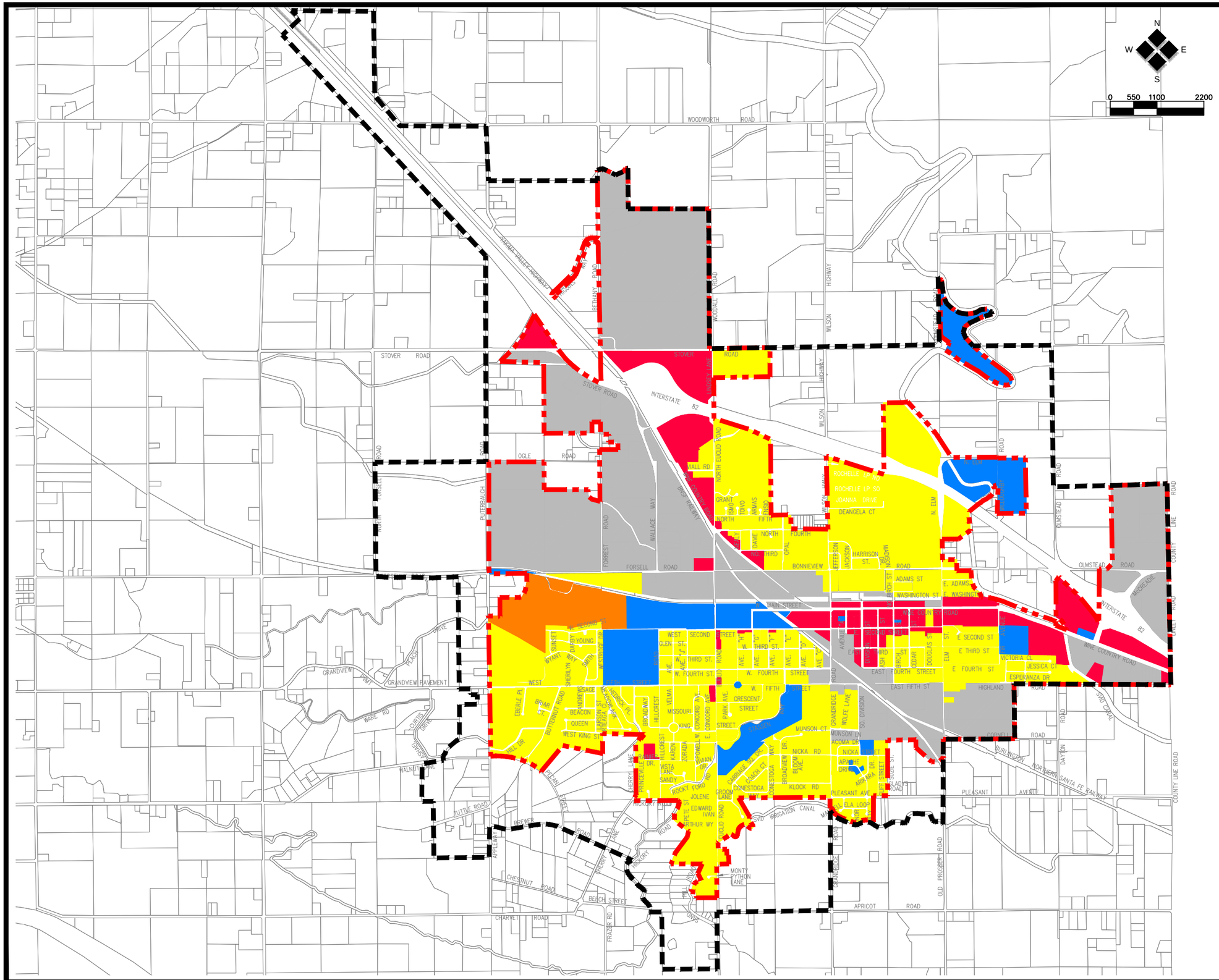
Land Use Category	Total Acreage	Percent of Total
Residential	980	27.9%
Low Density Residential	72	2.1%
Commercial	214	6.1%
Industrial	888	25.3%
Public	1,354	38.6%
TOTAL	3,508	100.0%

* Source: City of Grandview 2008 GMA Plan

TABLE 1-5 FUTURE LAND USE WITHIN GRANDVIEW'S URBAN GROWTH AREA*

Land Use Category	Total Acreage	Percent of Total
Residential	361	21.7%
Low Density Residential	615	36.9%
Commercial	108	6.5%
Industrial	582	34.9%
Public	0	0.0%
TOTAL	1,666	100.0%

* Source: City of Grandview 2008 GMA Plan



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LAND USE MAP WITHIN CITY LIMITS

LEGEND

- EXISTING RETAIL SERVICE AREA BOUNDARY (CITY LIMITS)
- FUTURE RETAIL SERVICE AREA BOUNDARY (UGA)
- INDUSTRIAL
- LOW DENSITY RESIDENTIAL
- COMMERCIAL
- PUBLIC
- RESIDENTIAL

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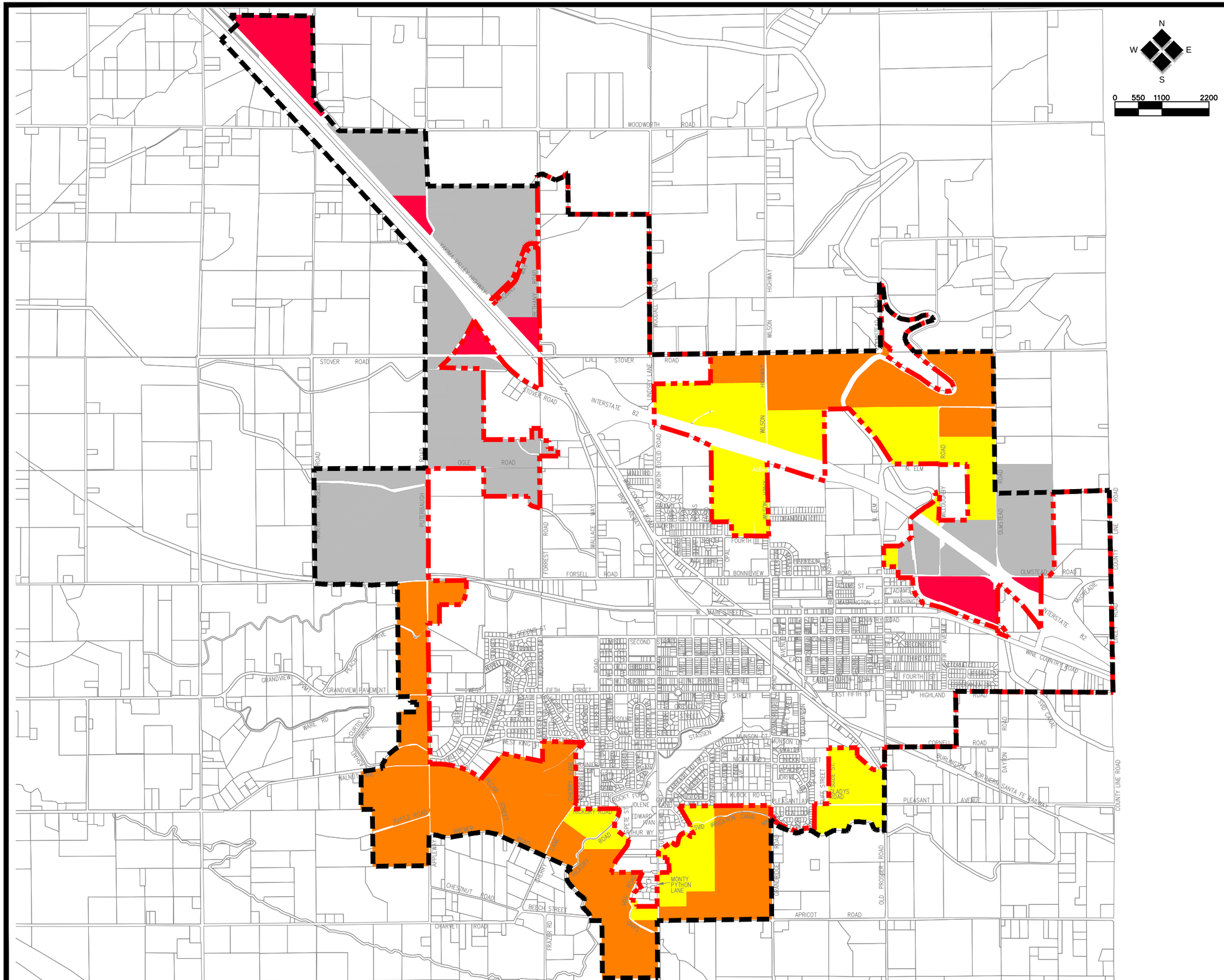
FIGURE 1-4



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LAND USE MAP WITHIN UGA

LEGEND

- EXISTING RETAIL SERVICE AREA BOUNDARY (CITY LIMITS)
- FUTURE RETAIL SERVICE AREA BOUNDARY (UGA)
- INDUSTRIAL
- LOW DENSITY RESIDENTIAL
- COMMERCIAL
- RESIDENTIAL

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FIGURE 1-5

1.6 POPULATION

Current Population

According to the U.S. Census Bureau, the 2000 population of the City of Grandview was 8,377, an increase of 1,208 people since 1990. Grandview's growth rate for the period 1990-2000 was approximately 1.57% per year (16.85% for the ten-year period). The growth rate for this ten-year period was less than the previous ten-year period 1980-1990, which was 2.47% per year (27.68% for the ten-year period). Population trends in the City of Grandview, Yakima County, and the State of Washington for the period 1920 through 2000 are presented in Table 1-6.

TABLE 1-6 POPULATION TRENDS

Year	City of Grandview		Yakima County		State of Washington	
	Population	Percent Change	Population	Percent Change	Population	Percent Change
1910	320		41,709		1,141,990	
1920	1,011	215.9%	63,710	52.7%	1,356,621	18.8%
1930	1,085	7.3%	77,402	21.5%	1,563,396	15.2%
1940	1,449	33.5%	99,019	27.9%	1,736,191	11.1%
1950	2,503	72.7%	135,723	37.1%	2,378,963	37.0%
1960	3,366	34.5%	145,112	6.9%	2,853,214	19.9%
1970	3,605	7.1%	145,212	0.1%	3,413,244	19.6%
1980	5,615	55.8%	172,508	18.8%	4,132,353	21.1%
1990	7,169	27.7%	188,823	9.5%	4,866,692	17.8%
2000	8,377	16.9%	222,581	17.9%	5,894,121	21.1%

Every year, the Washington Office of Financial Management (OFM) develops population estimates for the state, each county, and each city. OFM population estimates for Grandview, Yakima County, and for the State of Washington for the period 2001 through 2007 are presented in Table 1-7.

TABLE 1-7 OFM POPULATION ESTIMATES

Year	City of Grandview		Yakima County		State of Washington	
	Population	Percent Change	Population	Percent Change	Population	Percent Change
2001	8,410	0.4%	224,500	0.9%	5,974,910	1.4%
2002	8,415	0.1%	225,000	0.2%	6,041,710	1.1%
2003	8,475	0.7%	226,000	0.4%	6,098,300	0.9%
2004	8,540	0.8%	227,500	0.7%	6,167,800	1.1%
2005	8,705	1.9%	229,300	0.8%	6,256,400	1.4%
2006	8,840	1.6%	231,800	1.1%	6,375,600	1.9%
2007	9,150	3.5%	234,200	1.0%	6,488,000	1.8%

Future Population

As part of the process of updating its Comprehensive Plan, three population projections were developed for the City of Grandview, “Low”, “Medium”, and “High”. Although Grandview adopted the “Medium” population projection, greater than expected county-wide growth has occurred since those three projections were developed. As a result, the Yakima Valley Conference of Governments has recommended Grandview use the “High” population estimate of 12,279 for the year 2028 in projecting future growth and demand on City services. As a result, the “High” growth projection, an annual growth rate of 1.6473% will be used for the purpose of forecasting future sewer services and future wastewater generation. Grandview’s future population is shown on Table 1-8.

TABLE 1-8 GRANDVIEW POPULATION PROJECTIONS

Year	Future Population	Year	Future Population
2009	9,454	2019	11,132
2010	9,610	2020	11,315
2011	9,768	2021	11,502
2012	9,929	2022	11,691
2013	10,092	2023	11,884
2014	10,259	2024	12,080
2015	10,428	2028	12,279
2016	10,599	2026	12,481
2017	10,774	2027	12,686
2018	10,952	2028	12,895

CHAPTER 2
PAST AND PROJECTED WASTEWATER LOADINGS

2.1 INFLUENT WASTEWATER TRENDS

Background

The City of Grandview provides wastewater collection and treatment services to the residences, businesses, public facilities, and industries within the City's service area. Wastewater from Grandview's food processing industries constitute a significant portion of the total wastewater load to the treatment system and create a substantial demand upon the City's sewage treatment facilities. Current industrial entities include:

Smuckers	Shonan USA
Welch Foods	Cervantes Packing
Stimson Lane	Wild River Foods (ceased operation 7/08)
Kenyon Zero Storage	Gilbert Orchards, LLC
Baker Commodities	Perham Fruit

Municipal and industrial wastewater loadings are discussed later in this chapter.

System Capacity

The Grandview wastewater treatment facility accomplishes secondary wastewater treatment through two separate treatment processes, these being:

- An aerated lagoon / facultative lagoon process with land application of treated wastewater. This system consists of primary clarification, aerated lagoon, a series of facultative lagoons, chlorine disinfection, followed by either land application of treated effluent to City-owned spray-fields, or discharge of treated effluent to non-overflow ponds.

- A mechanical activated sludge process with discharge of treated wastewater to the Yakima River. This system consists of primary clarification, aerated lagoon, anoxic selector tanks, activated sludge, final clarification, ultraviolet disinfection, and discharge of final effluent to the Yakima River.

Grandview's current National Pollutant Discharge Elimination System (NPDES) permit, issued by the Washington Department of Ecology in 2003, includes design criteria for the entire facility (aerated lagoon /facultative lagoon process and mechanical treatment plant), and includes design criteria for the mechanical plant only. The design criteria for Grandview's entire wastewater treatment facility, specified in that permit, are presented in Table 2-1.

TABLE 2-1 ENTIRE WASTEWATER TREATMENT FACILITY DESIGN CRITERIA

Parameter	Design Quantity
Average Flow for the Maximum Month	4.95 MGD
BOD_5 for the Maximum Month	86,000 lbs/day
TSS for the Maximum Month	30,000 lbs/day

The design criteria for Grandview's mechanical plant, specified in that permit, are presented in Table 2-2.

TABLE 2-2 MECHANICAL WASTEWATER TREATMENT PLANT DESIGN CRITERIA

Parameter	Design Quantity
Average Flow for the Maximum Month	1.5 MGD
BOD_5 for the Maximum Month	11,400 lbs/day
TSS for the Maximum Month	11,400 lbs/day

Ammonia (NH_3-N) for the Maximum Month	1,140 lbs/day

Influent Flow Loadings – Entire Facility

Monthly influent wastewater flows to Grandview's entire wastewater treatment facility for the period 2003 through 2007 are presented on Table 2-3. "Summer average flows" represent the average flows for the months of June through August, while "winter average flows" represent the average flows for the months of December through February.

TABLE 2-3 ENTIRE FACILITY MONTHLY INFLUENT WASTEWATER FLOWS
(values are in MGD)

	2003	2004	2005	2006	2007
January	0.93	1.40	1.28	1.35	1.36
February	1.04	1.29	1.39	1.50	1.40
March	0.93	1.31	1.25	1.37	1.41
April	0.97	1.23	1.27	1.00	1.44
May	0.97	1.28	1.22	1.42	1.53
June	1.43	1.84	1.38	1.45	1.76
July	1.10	1.60	1.52	1.32	1.81
August	1.40	2.02	1.78	1.49	1.88
September	2.18	2.55	2.32	1.71	2.27
October	2.71	2.29	2.92	2.01	2.88
November	1.36	1.69	1.44	1.51	1.88
December	1.26	1.29	1.16	1.33	1.68
Annual Average	1.36	1.65	1.58	1.46	1.78
Summer Average	1.31	1.82	1.56	1.42	1.82
Winter Average	0.97	1.32	1.32	1.34	1.36
Maximum Month	2.71	2.55	2.92	2.01	2.88
Maximum Day		3.37	3.53	2.76	3.25

Average monthly influent flows to the entire treatment facility have ranged from a low of 1.36 MGD in 2003 to a high of 1.78 MGD in 2007. Average influent summer flows have ranged from a low of 1.31 MGD in 2003, to a high of 1.82 MGD in 2004 and 2007. Average influent winter flows have ranged from a low of 0.97 MGD in 2002-2003 to a high of 1.36 MGD in 2006-2007. The greatest maximum monthly flow occurred in 2005 when the treatment facility received an average of 2.92 MGD in the month of October. This influent flow represents 59.0% of the design hydraulic capacity (average flow for the maximum month) of Grandview's entire wastewater treatment facility.

Influent Flow Loadings – Mechanical Wastewater Treatment Plant

Influent wastewater flows to Grandview's mechanical plant for the period 2003 through 2007 are presented on Table 2-4. "Summer flows" represent the average flows for the months of June through August, while "winter flows" represent the average flows for the months of December through February.

TABLE 2-4 MECHANICAL PLANT MONTHLY INFLUENT WASTEWATER FLOWS (values are in MGD)					
	2003	2004	2005	2006	2007
January	0.82	1.12	1.23	1.20	1.07
February	0.94	1.22	1.13	1.22	1.07
March	0.84	1.15	1.06	1.09	1.21
April	0.90	1.12	0.82	1.00	1.26
May	0.74	1.11	0.82	0.97	1.29
June	0.77	1.40	0.88	0.97	1.07
July	0.80	1.25	0.86	1.05	1.18
August	0.96	1.49	0.88	1.03	0.71
September	1.31	1.46	0.91	1.15	1.19
October	0.93	1.13	1.41	1.36	1.31
November	1.03	1.38	1.10	1.32	1.40
December	1.12	0.96	1.00	1.19	1.24
Annual Average	0.93	1.23	1.01	1.13	1.17
Summer Average	0.84	1.38	0.87	1.02	0.99
Winter Average	0.90	1.15	1.11	1.14	1.11
Maximum Month	1.31	1.49	1.41	1.36	1.40
Maximum Day	1.36	1.64	1.57	1.68	1.74

Average monthly influent flows to the mechanical plant have ranged from a low of 0.93 MGD in 2003 to a high of 1.23 MGD in 2004. Average influent summer flows have ranged from a low of 0.84 MGD in 2003, to a high of 1.38 MGD in 2004. Average influent winter flows have ranged from a low of 0.90 MGD in 2002-2003 to a high of 1.15 MGD in 2003-2004. The greatest maximum monthly flow occurred in 2004 when the mechanical plant received an average of 1.49 MGD in the month of August. This influent flow represents 99.3% of the design hydraulic capacity (average flow for the maximum month) of Grandview's mechanical plant.

Industrial Flows

Grandview receives industrial wastewater from 10 industrial sources. Grandview has allocated a portion of the treatment facility's hydraulic capacity to each of these industrial sources as shown on Table 2-5. Because these sources are all agricultural / food processing industries, their flow allocation varies throughout the year depending on the product being produced.

TABLE 2-5 INDUSTRIAL WASTEWATER FLOW ALLOCATION
(values are in million gallons per day, MGD)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual Average
Wild River Foods	0.450	0.450	0.450	0.450	0.450	0.450	0.450	0.450	0.450	0.450	0.450	0.450	0.450
Baker Commodities	0.004	0.004	0.004	0.004	0.004	0.004	0.004	0.004	0.004	0.004	0.004	0.004	0.004
Kenyon Zero Storage	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001
Perham Fruit	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001
Smuckers	0.100	0.140	0.140	0.140	0.140	0.140	0.140	0.140	0.140	0.245	0.150	0.081	0.141
Shonan USA	0.145	0.171	0.161	0.150	0.113	0.133	0.226	0.265	0.267	0.197	0.240	0.136	0.184
Snokist Growers	0.011	0.012	0.011	0.010	0.007	0.027	0.007	0.008	0.025	0.024	0.025	0.013	0.015
Cervantes Packing	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001
Stimson Lane	0.005	0.005	0.005	0.005	0.005	0.005	0.008	0.011	0.017	0.032	0.033	0.008	0.012
Welch Foods	0.710	0.714	0.645	0.667	0.645	0.667	0.549	0.323	1.167	1.613	0.667	0.645	0.751
Subtotal	1.428	1.499	1.419	1.429	1.367	1.429	1.387	1.204	2.073	2.569	1.572	1.340	1.560
10% Reserve	0.143	0.150	0.142	0.143	0.137	0.143	0.139	0.120	0.207	0.257	0.157	0.134	0.156
Industrial Total	1.571	1.649	1.561	1.572	1.504	1.572	1.526	1.324	2.280	2.825	1.729	1.474	1.716

Influent Biochemical Oxygen Demand (BOD_5) Loadings – Entire Facility

Monthly influent BOD_5 loadings to Grandview's wastewater treatment facility for the period 2003 through 2007 are presented on Table 2-6. "Summer average loadings" represent the average loadings for the months of June through August, while "winter average loadings" represent the average loadings for the months of December through February.

TABLE 2-6 ENTIRE FACILITY MONTHLY TOTAL INFLUENT BOD_5 LOADINGS
(values are in pounds per day)

	2003	2004	2005	2006	2007
January	10,261	8,792	9,672	13,837	11,195
February	10,807	8,725	9,773	14,286	9,142
March	6,577	10,182	9,101	13,791	11,407
April	7,362	9,612	9,649	6,964	12,154
May	6,626	6,405	8,476	13,477	9,277
June	13,429	16,389	11,394	11,404	14,150
July	7,752	8,247	10,002	9,313	10,174
August	9,855	22,524	7,987	10,712	19,897
September	16,363	27,626	15,731	9,541	20,920
October	25,607	39,152	27,908	12,841	24,668
November	8,439	16,998	12,094	11,120	20,571
December	6,368	6,982	7,178	7,765	15,636
Annual Average	10,787	15,136	11,580	11,254	14,933
Summer Average	10,345	15,720	9,794	10,476	14,740
Winter Average	9,405	7,962	8,809	11,767	9,367
Maximum Month	25,607	39,152	27,908	14,286	24,668
Maximum Day	32,672	55,436	43,882	35,183	28,967

Average monthly influent BOD_5 loading to the entire treatment facility (which includes municipal and industrial BOD_5 loading) has ranged from a low of 10,787 lbs/day in 2003 to a high of 15,136 MGD in 2004. Average influent summer BOD_5 loading has ranged from a low of 9,794 lbs/day in 2005, to a high of 14,740 in 2007. Average influent winter BOD_5 loading has ranged from a low of 7,962 lbs/day in 2003-2004 to a high of 11,767 lbs/day in 2005-2006. The greatest maximum monthly BOD_5 loading occurred in 2004 when the treatment facility received an average of 39,152 lbs/day in the month of October. This influent loading represents 45.5% of the BOD_5 design capacity (loading for the maximum month) of Grandview's entire wastewater treatment facility.

Influent Biochemical Oxygen Demand (BOD_5) Loadings – Mechanical Wastewater Treatment Plant

Monthly influent BOD_5 loadings to Grandview's mechanical plant for the period 2003 through 2007 are presented on Table 2-7. "Summer average loadings" represent the average loadings for the months of June through August, while "winter average loadings" represent the average loadings for the months of December through February.

TABLE 2-7 MECHANICAL PLANT MONTHLY TOTAL INFLUENT BOD_5 LOADINGS
(values are in pounds per day)

	2003	2004	2005	2006	2007
January	6,634	6,847	6,811	10,048	9,745
February	7,416	7,397	6,248	11,101	6,773
March	4,631	7,884	5,525	8,600	6,983
April	4,772	5,875	4,883	4,153	7,167
May	3,913	4,407	4,035	6,723	7,596
June	6,833	10,123	5,732	6,221	7,184
July	6,045	5,817	5,171	6,279	5,787
August	5,628	12,849	3,251	6,855	5,146
September	10,346	13,832	5,123	5,745	7,999
October	9,028	14,834	11,936	8,359	9,450
November	6,254	12,464	8,367	8,290	8,955
December	4,941	4,171	5,137	7,860	7,911
Annual Average	6,370	8,875	6,018	7,519	7,558
Summer Average	6,169	9,596	4,718	6,452	6,039
Winter Average	6,850	6,395	5,744	8,762	8,126
Maximum Month	10,346	14,834	11,936	11,101	9,745
Maximum Day	17,402	24,402	16,510	15,400	18,971

Average influent BOD_5 loading to the mechanical plant ranged from a low of 6,018 lbs/day in 2005 to a high of 8,875 lbs/day in 2004. Average influent summer BOD_5 loadings have ranged from a low of 4,718 lbs/day in 2005, to a high of 9,596 lbs/day in 2004. Average influent winter BOD_5 loadings have ranged from a low of 5,744 lbs/day in 2004-2005 to a high of 8,762 lbs/day in 2005-2006. The greatest maximum monthly BOD_5 loading occurred in 2004 when the mechanical plant received an average of 14,834 lbs/day in the month of October. This influent loading represents 130.1% of the BOD_5 design capacity (loading for the maximum month) of the Grandview mechanical plant.

Industrial Biochemical Oxygen Demand (BOD_5) Loadings

Grandview receives industrial wastewater from 10 industrial sources. Grandview has allocated a portion of the treatment facility's BOD_5 capacity to each of these industrial sources as shown on Table 2-8. Because these sources are all agricultural / food processing industries, their organic discharge strength allocation varies throughout the year depending on the product being produced.

TABLE 2-8 INDUSTRIAL WASTEWATER BOD_5 ALLOCATION
(values are in pounds per day, lbs/day)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual Average
Wild River Foods	10,000	10,000	10,000	10,000	10,000	10,000	10,000	10,000	10,000	10,000	10,000	10,000	10,000
Baker Commodities	500	500	500	500	500	500	500	500	500	500	500	500	500
Kenyon Zero Storage	5	5	5	5	5	5	5	5	5	5	5	5	5
Perham Fruit	5	5	5	5	5	5	5	5	5	5	5	5	5
Smuckers	650	650	650	650	650	650	650	650	650	3,000	2,000	650	958
Shonan USA	2,100	2,930	2,630	2,400	2,000	2,000	2,260	3,000	3,000	2,630	2,570	1,780	2,442
Snokist Growers	23	21	23	22	21	40	39	20	23	23	24	23	25
Cervantes Packing	5	5	5	5	5	5	5	5	5	5	5	5	5
Stimson Lane	194	114	194	84	34	34	34	161	200	1,000	1,160	645	321
Welch Foods	16,130	13,930	15,320	10,830	14,520	10,000	9,680	6,450	15,000	17,740	14,170	10,480	12,854
Subtotal	29,612	28,160	29,332	24,501	27,740	23,239	23,178	20,796	29,388	34,908	30,439	24,093	27,116
10% Reserve	2,961	2,816	2,933	2,450	2,774	2,324	2,318	2,080	2,939	3,491	3,044	2,409	2,712
Industrial Total	32,573	30,976	32,265	26,951	30,514	25,563	25,496	22,876	32,327	38,399	33,483	26,502	29,828

Influent Total Suspended Solids (TSS) – Entire Facility

Monthly influent TSS loadings to Grandview's wastewater treatment facility for the period 2003 through 2007 are presented on Table 2-9. "Summer average loadings" represent the average loadings for the months of June through August, while "winter average loadings" represent the average loadings for the months of December through February.

TABLE 2-9 ENTIRE FACILITY MONTHLY TOTAL INFLUENT TSS LOADINGS
(values are in pounds per day)

	2003	2004	2005	2006	2007
January	3,925	3,444	4,420	9,930	5,955
February	4,840	4,153	4,370	5,479	4,379
March	2,746	3,190	4,055	8,912	7,514
April	3,106	2,554	4,989	2,485	7,542
May	2,710	3,139	4,721	4,761	7,401
June	4,687	5,171	4,627	4,281	11,699
July	2,972	3,883	3,765	3,644	10,476
August	5,348	14,151	11,817	5,033	26,153
September	6,073	20,438	13,641	5,305	17,171
October	8,702	19,232	12,225	8,113	15,444
November	3,153	9,274	6,161	6,410	16,181
December	2,921	5,057	4,044	4,659	11,027
Annual Average	4,265	7,807	6,570	5,751	11,745
Summer Average	4,336	7,735	6,736	4,319	16,109
Winter Average	4,076	3,506	4,615	6,485	4,997
Maximum Month	8,702	20,438	13,641	9,930	26,153
Maximum Day	10,495	30,737	69,537	25,641	24,668

Average monthly influent TSS loading to the entire treatment facility (which includes municipal and industrial TSS loading) has ranged from a low of 4,265 lbs/day in 2003 to a high of 11,745 MGD in 2007. Average influent summer TSS loading has ranged from a low of 4,319 lbs/day in 2006, to a high of 16,109 in 2007. Average influent winter TSS loading has ranged from a low of 3,506 lbs/day in 2003-2004 to a high of 6,485 lbs/day in 2005-2006. The greatest maximum monthly TSS loading occurred in 2007 when the treatment facility received an average of 26,153 lbs/day in the month of August. This influent loading represents 87.2% of the TSS design capacity (loading for the maximum month) of Grandview's entire wastewater treatment facility.

Influent Total Suspended Solids (TSS) Loadings – Mechanical Wastewater Treatment Plant

Monthly influent TSS loadings to Grandview's mechanical plant for the period 2003 through 2007 are presented on Table 2-10. "Summer average loadings" represent the average loadings for the months of June through August, while "winter average loadings" represent the average loadings for the months of December through February.

TABLE 2-10 MECHANICAL PLANT MONTHLY TOTAL INFLUENT TSS LOADINGS
(values are in pounds per day)

	2003	2004	2005	2006	2007
January	1,388	1,467	1,652	1,952	7,318
February	1,380	1,811	1,517	2,615	2,231
March	820	1,611	1,052	1,627	1,736
April	774	1,130	766	1,368	1,765
May	710	926	1,457	1,141	2,195
June	1,522	1,121	961	922	1,972
July	727	1,188	1,657	946	4,704
August	817	3,045	1,284	868	4,684
September	1945	3,665	1,298	978	3,216
October	3,762	4,213	3,610	1,418	1,977
November	1,409	2,371	1,771	1,894	1,518
December	1,308	1,449	1,118	2,193	1,500
Annual Average	1,380	2,000	1,512	1,493	2,901
Summer Average	1,022	1,785	1,301	912	3,787
Winter Average	1,336	1,528	1,539	1,895	3,914
Maximum Month	3,762	4,213	3,610	2,615	7,318
Maximum Day	8,359	8,337	6,792	3,723	18,999

Average influent TSS loading to the mechanical plant ranged from a low of 1,380 lbs/day in 2003 to a high of 2,901 lbs/day in 2007. Average influent summer TSS loadings have ranged from a low of 912 lbs/day in 2006, to a high of 3,787 lbs/day in 2007. Average influent winter TSS loadings have ranged from a low of 1,336 lbs/day in 2002-2003 to a high of 3,914 lbs/day in 2006-2007. The greatest maximum monthly TSS loading occurred in 2007 when the mechanical plant received an average of 7,318 lbs/day in the month of January. This influent loading represents 64.2% of the TSS design capacity (loading for the maximum month) of the Grandview mechanical plant.

Industrial Total Suspended Solids (TSS) Loadings

Grandview receives industrial wastewater from 10 industrial sources. Grandview has allocated a portion of the treatment facility's TSS capacity to each of these industrial sources as shown on Table 2-11. Because these sources are all agricultural/food processing industries, their organic discharge strength allocation varies throughout the year depending on the product being produced.

TABLE 2-11 INDUSTRIAL WASTEWATER TSS ALLOCATION
(values are in pounds per day, lbs/day)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual Average
Wild River Foods	9,000	9,000	9,000	9,000	9,000	9,000	9,000	9,000	9,000	9,000	9,000	9,000	9,000
Baker Commodities	400	400	400	400	400	400	400	400	400	400	400	400	400
Kenyon Zero Storage	5	5	5	5	5	5	5	5	5	5	5	5	5
Perham Fruit	5	5	5	5	5	5	5	5	5	5	5	5	5
Smuckers	260	260	260	260	260	260	260	260	260	1,450	1,000	260	421
Shonan USA	640	670	605	625	780	825	735	1,325	1,370	970	1,270	620	870
Snokist Growers	32	31	22	14	14	48	14	14	23	28	33	32	25
Cervantes Packing	5	5	5	5	5	5	5	5	5	5	5	5	5
Stimson Lane	161	30	48	17	17	17	17	146	146	350	1,000	1,000	246
Welch Foods	3,230	3,040	2,910	3,330	3,230	2,000	3,710	2,580	3,330	3,550	2,330	3,065	3,025
Subtotal	13,738	13,446	13,260	13,661	13,716	12,565	14,151	13,740	14,544	15,763	15,048	14,392	14,002
10% Reserve	1,374	1,345	1,326	1,366	1,372	1,257	1,415	1,374	1,454	1,576	1,505	1,439	1,400
Industrial Total	15,112	14,791	14,586	15,027	15,088	13,822	15,566	15,114	15,998	17,339	16,553	15,831	15,402

2.2 FUTURE WASTEWATER LOADING PROJECTIONS

Forecasts for future loadings for flow, BOD, and TSS to the Grandview Wastewater Treatment Facility for the years 2013, 2018, 2023, and 2028 are presented in Table 2-15. These wasteload projections were developed using the following information and assumptions:

- Future populations are as shown on Table 1-8.
- Grandview's future wastewater loadings as assumed to increase at a rate similar to that of the population, 1.6473% annually.
- 2007 average and maximum month loadings for flow, BOD, and TSS, presented earlier in this chapter, are used as a baseline from which to project future loadings.
- For future total suspended solids loading projections, the 2007 maximum month total suspended solids value of 26,153 lbs/day will be reduced by 5,000 lbs/day because one industrial source exceeded their 2007 total suspended solids discharge contract value by an average of 5,000 lbs/day.

TABLE 2-12 FUTURE WASTEWATER LOADING PROJECTIONS

	Year 2013	Year 2018	Year 2023	Year 2028
Service Population	10,092	10,952	11,884	12,895
Annual Average Flow (MGD)	1.96	2.13	2.31	2.51
Maximum Monthly Flow (MGD)	3.18	3.45	3.74	4.06
Annual Average BOD_5 Loading (lbs/day)	16,471	17,873	19,395	21,046
Maximum Month BOD_5 Loading (lbs/day)	27,209	29,525	32,038	34,765
Annual Average TSS Loading (lbs/day)	12,955	14,057	15,254	16,553
Maximum Month TSS Loading (lbs/day)*	23,328	25,314	27,469	29,807

* 2007 Maximum Month TSS value of 26,153 lbs/day has been reduced by 5,000 lbs/day for the purpose of future total suspended solids loading projections as discussed above.

CHAPTER 3
EXISTING COLLECTION SYSTEM

3.1 GENERAL DESCRIPTION

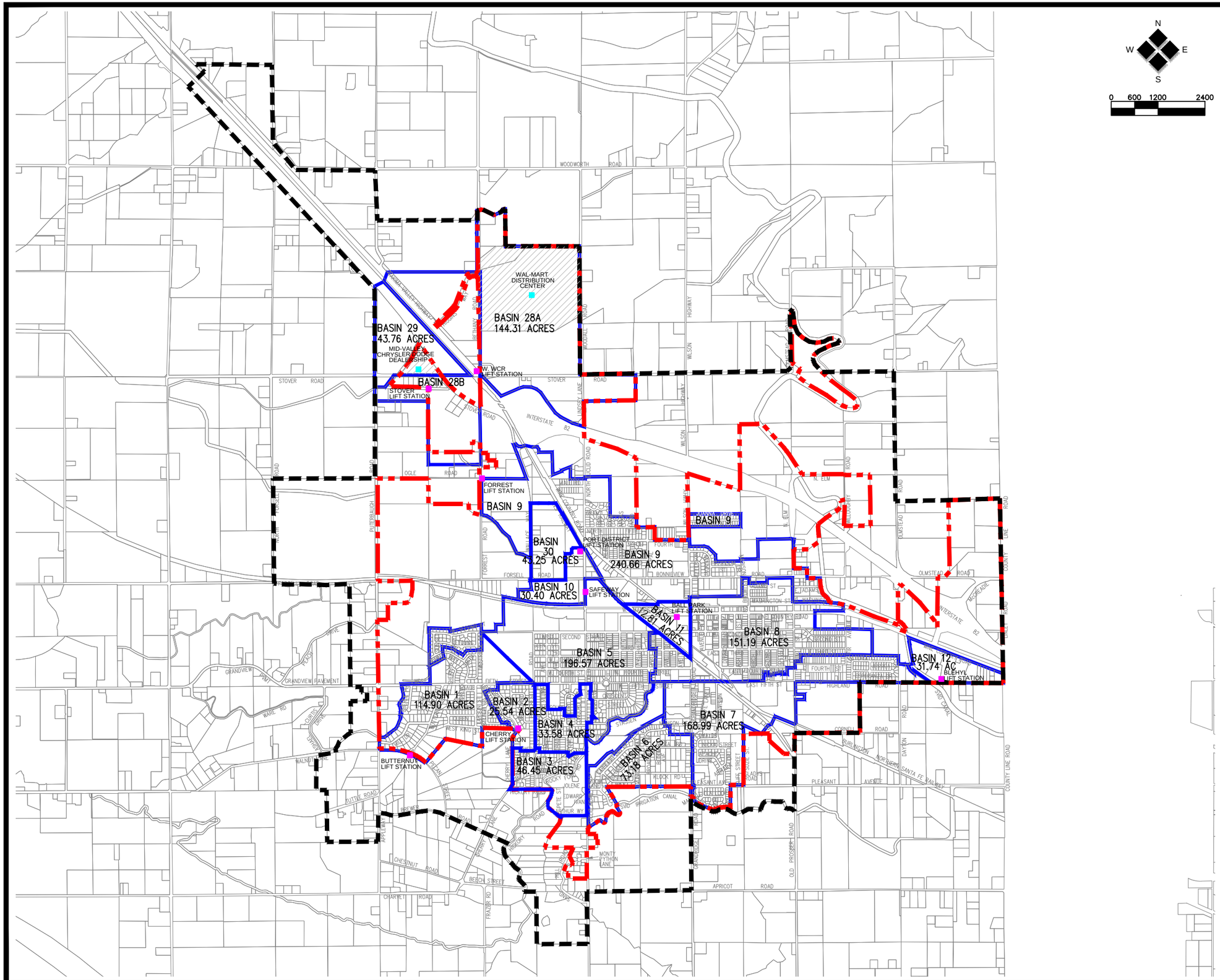
The Grandview wastewater collection system consists of approximately 158,800 linear feet (LF) of pipe, of which about 148,520 LF is gravity sewer pipe. The majority of the pipe is 8-inch diameter. The approximate lengths of various pipe sizes are shown on Table 3-1.

TABLE 3-1 GRANDVIEW SEWER SYSTEM PIPING

Pipe Size	Linear Feet
6-inch	3,000
8-inch	96,137
10-inch	19,340
12-inch	4,320
14-inch	1,620
15-inch	5,280
16-inch	350
18-inch	5,023
21-inch	13,450
TOTAL GRAVITY	148,520
3-inch Forcemain	280
4-inch Forcemain	378
6-inch Forcemain	3,590
12-inch Forcemain	6,030
TOTAL FORCEMAIN	10,278

3.2 COLLECTION SYSTEM BASINS

The existing collection system can be divided into 16 collection system drainage basins. Each basin includes a main trunk line or sewage lift station which conveys wastewater toward the treatment facility. The existing system also includes two point sources. Within Basin 28A, Wal-Mart Distribution Center, and Basin 29, Mid-Valley Chrysler Dodge dealership, located northwest of the City limits, are the only wastewater contributors to the existing collection system (shown on Figure 3-1 - Existing Collection System Basin Boundaries).



CITY OF GRANDVIEW

General Sewer Plan Update

EXISTING COLLECTION SYSTEM BASIN BOUNDARIES

LEGEND

- EXISTING RETAIL SERVICE AREA BOUNDARY (CITY LIMITS)
- FUTURE RETAIL SERVICE AREA BOUNDARY (UGA)
- BASIN AREA BOUNDARY
- 12 — EXISTING BASIN NUMBER
- AREA SERVED UNDER COMMERCIAL BUSINESS
- EXISTING LIFT STATION
- COMMERCIAL BUSINESS

Hulbregtse, Louman Associates, Inc.
CIVIL ENGINEERING • LAND SURVEYING • PLANNING

12-10-08
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FIGURE 3-1

Basin No. 1: The area within Basin 1 has property zoned residential and agricultural, and has land uses which include residential development, agricultural uses, and schools. The basin lies in the southwestern portion of the service area, bounded on the north by the City Limits and Basin 5, on the south and west by the City Limits, and on the east by Basin 2. There are approximately 11,372 LF of 8-inch gravity sewer line, and 53 manholes within this basin. Wastewater from this basin flow to the Butternut Lift Station, where they are pumped through 3,400 LF of 6-inch forcemain to Basin 2. Significant dischargers within this basin include the Grandview High School. The current service area of this basin is approximately 115 acres. The average wastewater flows from this basin, based upon existing land use, and used in the hydraulic analysis, are 0.13 MGD.

Basin No. 2: The area within Basin 2 is zoned residential, and land use is currently residential. The basin lies in the southwestern portion of the service area, bounded on the north and west by Basin 1, on the east by Basin 3, and to the south by the City Limits. There are approximately 3,254 LF of 8-inch gravity sewer line, and 25 manholes within this basin. Wastewater from this basin drain to a manhole upstream of the Cherry Lane Lift Station and gravity feeds to a manhole in Basin 2. The current service area of this basin is approximately 26 acres. The average wastewater flows from this basin, based upon existing land use, and used in the hydraulic analysis, are 0.03 MGD.

Basin No. 3: The area within Basin 3 has property zoned residential, and land use is currently residential. The basin lies in the southwestern portion of the service area, bounded on the north by Basins 1 and 4, on the south and west by the City Limits, and on the east by Dykstra Park. There are approximately 1,280 LF of 6-inch gravity sewer line, 1,700 LF of 8-inch gravity sewer line, 2,600 LF of 10-inch gravity sewer line and 29 manholes within this basin. Wastewater from this basin drain to the City's main 21-inch gravity interceptor sewer crossing Euclid Avenue. The current service area of this basin is approximately 46 acres. The average wastewater flows from this basin, based upon existing land use, and used in the hydraulic analysis, are 0.07 MGD.

Basin No. 4: The area within Basin 4 is zoned almost entirely residential with a small area zoned commercial, and current land uses are mostly residential with some commercial use. The basin lies in the southwestern portion of the service area, bounded on the north by Basin 5, on the south and west by Basin 3, and on the east by Basin 5 and Dykstra Park. There are approximately 820 LF of 6-inch gravity sewer line, 4,150 LF of 8-inch gravity sewer line, 470 LF of 10-inch gravity sewer line, 1,970 LF of 12-inch gravity sewer line, and 42 manholes within this basin. Wastewater from this basin drain to the City's main 21-inch gravity interceptor sewer crossing Euclid Avenue. The current service area of this basin is approximately 34 acres. The average wastewater flows from this basin, based upon existing land use, and used in the hydraulic analysis, are 0.04 MGD.

Basin No. 5: The area within Basin 5 is zoned almost entirely residential, with a small area zoned commercial. Its current land uses are primarily residential development and schools. The basin lies in the west central portion of the service area, bounded on the north by the Union Pacific Railway, on the south by Basins 1 and 4, on the west by Basins 1 and 4 and Dykstra Park, and on the east by Basins 8, 9, 11, and Dykstra Park. There are approximately 900 LF of 6-inch gravity sewer line, 19,393 LF of 8-inch gravity sewer line, 3,020 LF of 10-inch gravity sewer line, 340 LF of 12-inch gravity sewer line, 1,300 LF of 15-inch gravity sewer line, and 96 manholes within this basin. Wastewater from this basin drain to the City's main 21-inch gravity interceptor sewer on the southeast side of Dykstra Park. The current service area of this basin is approximately 197 acres. Significant dischargers within this basin include McClure Elementary School, the Harriet Thompson Elementary School, and the Grandview Middle School. The average wastewater flows from this basin, based upon existing land use, and used in the hydraulic analysis, are 0.18 MGD.

Basin No. 6: The area within Basin 6 is zoned entirely residential, and the current land use is entirely residential (low and high density). The basin lies in the southern portion of the service area, bounded on the north and west by Dykstra Park, on the south by the City Limits, and on the east by unsewered portions of the City. There are approximately 4,000 LF of 8-inch gravity sewer line and 20 manholes within this basin. Wastewater from this basin drain to the City's main 21-inch gravity interceptor sewer on the southeast side of Dykstra Park. The current service area of this basin is approximately 73 acres. The average wastewater flows from this basin, based upon existing land use, and used in the hydraulic analysis, are 0.08 MGD.

Basin No. 7: The area within Basin 7 is zoned residential (low, medium & high density) and industrial, and current land uses include residential, commercial and industrial uses. The basin lies in the southeastern portion of the service area, bounded on the north by Basin 8, on the south and east by the City Limits and unsewered portions of the City, and on the west by Basin 6 and Dykstra Park. There are approximately 13,385 LF of 8-inch gravity sewer line, 4,270 LF of 10-inch gravity sewer line, 1,620 LF of 14-inch sewer line, 350 LF of 16-inch gravity sewer line, and 71 manholes within this basin. Wastewater from this basin drains to the City's main 21-inch gravity interceptor sewer on the southeast side of Dykstra Park. Significant dischargers within this basin are Kenyon Zero Storage and Cervantes Packing. The current service area of this basin is approximately 169 acres. The average wastewater flows from this basin, based upon existing land use, and used in the hydraulic analysis, are 0.62 MGD.

Basin No. 8: The area within Basin 8 is zoned residential, commercial and industrial, and current land uses include residential development, commercial uses, industry and parks. The basin lies in the eastcentral portion of the service area, bounded on the north by Basin 9, on the south by Basin 7, on the west by Basin 5, and on the east by Basin 12. There are approximately 18,370 LF of 8-inch gravity sewer line, 3,770 LF of 10-inch gravity sewer line, 990 LF of 12-inch gravity sewer line, and 68 manholes within this basin. Wastewater from this basin drain to Basin 5 at Avenue 'E' and West Fifth Street. The current service area of this basin is approximately 151 acres. Significant dischargers within this basin include the old Perham Fruit facility and Smith Elementary School. The average wastewater flows from this basin, based upon existing land use, and used in the hydraulic analysis, are 0.14 MGD.

Basin No. 9: The area within Basin 9 is zoned residential, commercial, and industrial, and current land uses include residential development, commercial uses, industry and agricultural uses. The basin serves the entire northern portion of the service area, bounded on the north by unsewered portions of the City, on the south by Basins 8 and 11, on the west by Basin 10, and on the east by the City Limits. There are approximately 21,106 LF of 8-inch gravity sewer line, 1,130 LF of 10-inch gravity sewer line, 1,020 LF of 12-inch gravity sewer line, 1,900 LF of 15-inch gravity sewer line, and 106 manholes within this basin. Wastewater from this basin drain to the Forrest Road Lift Station. The current service area of this basin is approximately 241 acres. Significant dischargers within this basin include Shonan USA and Snokist Fruit. The average wastewater flows from this basin, based upon existing land use and significant dischargers, and used in the hydraulic analysis, are 0.31 MGD.

Basin No. 10: Basin 10 is almost entirely a sewer system serving industrial point sources and carrying lift station discharges, and only serves a small geographic area within the center of the City. Wastewater from this basin drain to the City's main 21-inch gravity interceptor sewer on the southeast side of Dykstra Park. The basin lies in the east central portion of the service area, bounded on the north and west by Basin 9, and on the east and south by Basin 5. There are approximately 4,010 LF of 21-inch gravity sewer line, 6,030 LF of 12-inch forcemain, and 18 manholes within this basin. The current service area of this basin is approximately 30 acres. Significant dischargers into this system include Forrest Road Lift Station (serving all of Basin 9, Shonan USA and Snokist Fruit), the Safeway Lift Station, A.F. Murch, and the Thompson Elementary School. The average wastewater flows from this basin, based upon the point source inputs, and used in the hydraulic analysis, are 0.07 MGD.

Basin No. 11: Basin 11 is a sewer system serving primarily industrial point sources and carrying lift station discharges, and only serves a small geographic area within the center of the City. Wastewater from this basin drain to the City's main 21-inch gravity interceptor sewer on the southeast side of Dykstra Park. The basin lies in the central portion of the service area, bounded on the north and by Basin 9, on the south and by Basin 8, and on the west by Basin 5. There are approximately 950 LF of 8-inch gravity sewer line, 4,080 LF of 12-inch gravity sewer line, 2,080 LF of 15-inch gravity sewer line, 280 LF of 3-inch forcemain, and 30 manholes within this basin. The current service area of this basin is approximately 13 acres. Significant dischargers into this system include the Ballpark Road Lift Station (which serves primarily the Yakima Valley Community College), Welch's #2, Kenyon Zero Storage and Welch's #1. The average wastewater flows from this basin, based upon the point source inputs, and used in the hydraulic analysis, are 0.25 MGD.

Basin No. 12: Basin 12 is a sewer system serving primarily commercial point source and carries lift station discharges, and only serves a small geographic area within the center of the City. Wastewater from this basin drain to Basin 7 through a private liftstation and drains to manhole in Basin 7. There are approximately 1,879 LF of 8-inch gravity sewer line, 378 LF of 4-inch forcemain, and 7 manholes within this basin. The current service area of this basin is approximately 32 acres. Significant dischargers into this system is Bleyhl's Equipment & Supply store. The average wastewater flows from this basin, based upon the point source inputs, and used in the hydraulic analysis, are 0.004 MGD.

Basin No. 28A: Basin 28A is a sewer system serving primarily an industrial point source (Wal-mart Distribution Center) and discharges wastewater to the West Wine Country Road Lift Station. Wastewater from this basin is pumped to a manhole located in Basin 9. The current service area of this basin is approximately 113 acres. The average wastewater flows from this basin, based upon the point source inputs, and used in the hydraulic analysis, are 0.030 MGD.

Basin No. 28B: This basin lies in the north central portion of the future service area and contains approximately 140 acres. The area is bounded on the north and east by Basin 31; on the south by Basins 13 & 32; and on the west by the UGA Boundary. No wastewater is currently generated in this basin and therefore does not provide any loading to the existing collection system. Future wastewater flows will be discussed in Chapter 4 of this report. Wastewater from this basin will flow into the Stover Road Lift Station, which pumps to a manhole in Basin 32 and gravity feeds to the Forrest Lift Station. Wastewater from the Forrest Road Lift Station is pumped to Basin 5.

Basin No. 29: Basin 29 is a sewer system serving primarily an commercial point source (Mid Valley Chrysler Dodge Jeep car dealership) and discharges wastewater to the Stover Road Lift Station. Wastewater from this basin is pumped to a manhole located in Basin 32, which then gravity feeds to the Forrest Road Lift Station and is pumped to a manhole in Basin 5. The current service area of this basin is approximately 9 acres. The average wastewater flows from this basin, based upon the point source inputs, and used in the hydraulic analysis, are 0.001 MGD.

Basin No. 30: This basin lies in the north-central portion of the future service area and contains approximately 43 acres. The area is bounded on the north by the Basin 9; on the south by Basin 10; on the west by Basins 9 & 32; and on the east by Basins 9 & 10. Currently, this basin generates insignificant wastewater flows to the existing collection system. Future wastewater flows will be discussed in Chapter 4 of this report. Wastewater from this basin will flow into Basin 9.

All of the collection system basins feed wastewater into the Grandview main interceptor sewer, commonly referred to as the "Outfall" line. Wastewater from all the basins empty into the Outfall line which conveys the wastewater to the Euclid Pump Station. The Outfall line consists of approximately 5,023 LF of 18-inch gravity sewer line, 7,800 LF of 21-inch gravity sewer line, and 36 manholes.

3.3 LIFT STATIONS

The existing wastewater collection system contains 7 sewage lift stations which help convey wastewater to the treatment facility. The Safeway Lift Station located on North Euclid Road, south of West Bonnieview Road is a private lift station with little or no flows.

1. Butternut Lift Station: This duplex pump station is located near the corner of Butternut Road and Pecan Street in the southwest corner of the City. All wastewater from Basin 1 flows to this station and are discharged through 3,400 LF of 6-inch forcemain, where they enter Basin 3. The duplex pump station contains two HOMA pumps, each powered by a 15 hp motor designed to pump 300 gpm at 90 feet of total dynamic head.

2. Cherry Lane Lift Station: This duplex pump station is located on Cherry Lane at the City Limits. All wastewaters from Basin 2 flow to this station and are discharged through 190 LF of 6-inch forcemain, where they enter Basin 3. The duplex pump station contains Paco pumps, each powered by a 3 hp motor designed to pump 200 gpm at 25 feet of total dynamic head.

3. Ballpark Lift Station: This duplex pump station is located on Main Street near the Westside Park, and currently provides service for part of Basin 11 which includes a fast food restaurant and Yakima Valley Community College. Wastewater from this station are discharged through 280 LF of 3-inch forcemain. The duplex pump station contains two Myers Pentair pumps, each powered by a 0.5 hp motor designed to pump 40 gpm at 20 feet of total dynamic head.

4. West Wine Country Road Lift Station: This duplex pump station is located near the corner of West Wine Country and Bethany Roads, and provides service for all of Basin 28A. Wastewater from this station are discharged through 2,218 LF of 6-inch forcemain into Basin 9, where it gravity feeds to the Forrest Road Lift Station located in Basin 9. The duplex pump station contains two HOMA pumps each powered by a 29 hp constant-speed motor designed to pump 600 gpm at 110 feet of total dynamic head.

5. Stover Road Lift Station: This duplex pump station is located near the corner of Stover and Puterbaugh Roads, and provides service for all of Basin 29 & 28B. Wastewater from this station are discharged through 2,220 LF of 6-inch forcemain into Basin 31, where it gravity feeds through a 10-inch line and a series of 4 manholes before it reaches the Forrest Road Lift Station located in Basin 9. The duplex pump station contains two HOMA non-clog submersible pumps each powered by a 13 hp constant-speed motor designed to pump 350 gpm at 75 feet of total dynamic head.

6. Forrest Road Lift Station: This triplex pump station is located near the corner of Forrest and Ogle Roads, and provides service for all of Basin 9. Wastewater from this station are discharged through 6,030 LF of 12-inch forcemain into Basin 10. The triplex pump station contains three Crane pumps each powered by a 40 hp constant-speed motor designed to pump 1,400 gpm at 80 feet of total dynamic head.

7. Euclid Lift Station: All wastewater collected by the Grandview collection system flows to the Euclid Pump Station (also known as the River Lift Station) which is located on the north side of the Yakima River at the Euclid Bridge. Wastewater collected by the City of Grandview's sanitary sewer system flows through the main interceptor, a 21-inch diameter gravity sewer, through the headworks structure and to the lift station's wet well. Sewage in the wet well is then pumped to the wastewater treatment plant through a 24-inch diameter High Density Polyethylene (HDPE) force main installed in 2003. The forcemain is approximately 3,300 feet long and raises 59 feet from the lift station to the treatment plant. When the forcemain was installed across the Yakima River, a second spare 20-inch ductile iron pipe was also installed across the river. The station consists of a wet well and concrete block structure housing the pumping, electrical, and control equipment, and is equipped with three 150 HP variable speed pumps, each with a capacity of 4,300 gpm against 95 feet of total dynamic head. Under standard operation, one pump is always the standby pump, operating only if one of the other pumps fail. Electrical power, rated at 460 volts, is supplied by Pacific Power from a main line along Euclid Road. A diesel generator set is installed in the station to automatically provide power if the normal power supply is interrupted.

In addition to the items mentioned above, the Euclid Lift Station has a 100,000 gallon emergency overflow basin and an 8,000 GPM engine-driven emergency bypass pump (Cornell pump connected to a Cummins diesel motor). In 2004, emergency repairs to the river crossing were completed. The repairs included the installation of a liner in the east (downstream) 20-inch ductile iron pipe crossing the river.

Bleyhl Lift Station, located in Basin 12, only serves the Bleyhl Equipment & Supply store (private lift station). However, a latecomers agreement executed on August 7, 2000, between the City of Grandview and Bleyhl Farm Service, Inc., allowed future connections to the lift station by specific parcels listed in the agreement. These parcels are currently located outside of the Urban Growth Area and shown in Chapter 4 on Figure 4-1 – Future Collection System Basin Boundaries. This duplex pump station is located on Highland Road, slightly west of the eastern City limits. All wastewater from Basin 12 flow to this station and are discharged through 370 LF of 4-inch forcemain to a manhole in Basin 7. The duplex pump station contains Hydromatic pumps, each powered by a 2 hp motor designed to pump 80 gpm at 16.6 feet of total dynamic head.

The Port District Lift Station, located in Basin 10, north of the Safeway Lift Station is operated by the Port of Grandview. The Port District has approximately 100 acres of land within the City limits zoned for immediate industrial development. Wastewater generated from industrial development and activity will be discharged to the Port District Lift Station and be pumped to a manhole in Basin 5.

Table 3-2 provides summary information on the City's seven existing sewage lift stations.

TABLE 3-2 SEWAGE LIFT STATION SUMMARY INFORMATION				
Station No.	Year Built	Station Type	Pump Brand, Type, Model	Pump Capacity (each)
1	1948	Duplex	HOMA Submersible Pumps (AMX434-1/150 4A)	300 gpm
2	1958	Duplex	PACO Submersible Pumps	200 gpm
3	1972	Duplex	Myers Pentair Submersible Pumps	40 gpm
4	2004	Duplex	HOMA Submersible Pumps (AK434-270-29P)	600 gpm
5	2000	Duplex	HOMA Submersible Pumps (AMX444-240-15E(EX)	350 gpm
6	2002	Triplex	CRANE Wet Pit Mounted Vertical Centrifugal Pumps	1,400 gpm
7	2002	Triplex	Cornell Vertical Mount Centrifugal Pumps (8NH-2-2)	4,300 gpm

3.4 EXISTING SEWER SYSTEM HYDRAULIC ANALYSIS

A hydraulic analysis of the existing Grandview collection system was performed to evaluate the capacity of the system and to identify specific hydraulic loading problem areas within the existing system. The computer-assisted analysis involves utilizing information such as pipe sizes and slopes to develop a model of the main trunk lines of the sewer system. Following model development, the process involves:

- Assigning wastewater flows from each basin into the collection system based upon existing land use and land use unit flow rates;
- Inputting average industrial point source flows at their known discharge locations;
- Assuming a roughness coefficient (Mannings “n”) of 0.013 for all pipelines in the analysis;
- Assuming lift station discharges would continue as peak flows through the basin without the effects of dampening within the gravity flow line;
- Using the following peaking factor equation, suggested by Metcalf & Eddy, to analyze the collection system at peak flows.

$$Q_{Peak} = K\,(Q_{Average})^{0.9}$$

where Q represents flow in MGD, and K represents the peaking factor.

The peaking factor value for K was determined based upon wastewater treatment facility flow records.

Unit Flow Rates

The hydraulic analysis is based on unit flow rates from different land uses within the 12 collection system basins. The type of activity is taken from land use maps, and the flow rates discussed below are assigned based upon that activity.

Residential: Wastewater flow rates from the residential areas are based upon Washington Department of Ecology's "Criteria for Sewage Works Design," which recommends an average unit flow rate of 100 gallons/person/day. Grandview's land use map identifies three densities of residential development: low, medium, and high. Flow rates (in million gallons per day per acre) used in the hydraulic analysis for the residential areas are as follows:

Residential Low.....0.0012 MGD/Acre
Residential Medium & Mobile Homes.....0.0015 MGD/Acre
Residential High.....0.0018 MGD/Acre

Commercial: For general business (commercial) wastewater flow rates, *Wastewater Engineering: Treatment, Disposal, Reuse* (Metcalf & Eddy, Third Edition, 1991) suggests a range from 0.0008 to 0.0015 MGD/Acre. For the purpose of this hydraulic analysis, the value of 0.001 MGD/Acre is used.

Industrial: For medium industrial developments, Metcalf & Eddy suggest a range from 0.0015 to 0.0030 MGD/Acre. For the purpose of this hydraulic analysis, the value of 0.003 MGD/Acre is used. It should be noted that individual industries may discharge wastewater at higher rates, depending on the industrial process. Where measured, individual wastewater discharge rates from specific industries were input into the hydraulic analysis at their known locations.

Schools: Wastewater flow rates from school areas are based on a unit flow rate of 0.0005 MGD/Acre.

Public: Wastewater flow rates from public areas such as parks are based on a unit flow rate of 0.0005 MGD/Acre.

A summary of the basin area, land use type, and predicted average flow is presented in Table 3-3.

Map B in the back pocket of this report shows the hydraulic analysis nodes and pipe layout of City of Grandview's existing sewer collection system.

TABLE 3-3 COLLECTION SYSTEM BASINS

Basin No.	Total Acreage	Land Use Type	Predicted Average Flow (MGD)
1	114.9	Low, Medium-Density Residential and Public	0.128
2	25.54	Low Density Residential	0.032
3	46.45	Low, Medium, and High Density Residential, Public and Commercial	0.066
4	33.58	Low and High Density Residential and Commercial	0.040
5	196.57	Low and High Density Residential, Commercial and Public	0.175
6	73.18	Low, Medium, and High Density Residential and Agricultural	0.076
7	168.99	Low, Medium, and High Density Residential and Industrial	0.616
8	151.19	Low, Medium, and High Density Residential, Public, Industrial and Commercial	0.140
9	240.66	Low, Medium, and High Density Residential, Public, Industrial and Commercial	0.306

10	30.4	Commercial and Industrial	0.070
11	12.81	Public, Commercial and Industrial	0.249
12	31.74	Agricultural, Commercial and Industrial	0.004
28A	257.67	Industrial (Northern boundary of city limits)	0.03*
28B	139.99	Industrial	---
29	42.51	Commercial (Northern boundary of city limits)	0.001**
30	43.25	Industrial	---
TOTAL	1,609.43		1.93

* Loading is based on the Wal-Mart Distribution Center flows to the existing collection system and occupies 113.36 acres. The remainder basin area is vacant or developments with little or no contributions to the existing collection system.

** Loading is based on Mid-Valley Chrysler Dodge car dealership flows to the existing collection system and occupies 8.75 acres. The remainder basin area is vacant.

Collection System Hydraulic Analysis Results

The hydraulic analysis modeled the existing sewer network under existing conditions for normal and peak flow. It was assumed all lift stations were in operation at the same time. Data from the hydraulic analysis predicted average flows of 1.93 MGD, and peak flows of 3.25 MGD. The predicted average flows of 1.93 MGD is slightly greater than the 1.78 MGD wastewater flows experienced in 2007 at the Grandview wastewater treatment facility but less than the monthly maximum of 2.88 MGD for the same year. The peaking factor used in the hydraulic analysis was adjusted so the peak hourly flows of 3.25 MGD (peak factor of 1.80) matched those currently experienced at the Grandview wastewater treatment facility.

Based on the hydraulic analysis of the existing collection system, no pipe capacities are exceeded at peak hourly flows.

Lift Stations Hydraulic Analysis Results

Another element of the hydraulic analysis was the review of the lift station capacities and their ability to meet the system demands. Information on the lift stations was presented earlier in this chapter. Results of the collection system hydraulic analysis were compared with the maximum station capacity. Since a majority of the stations are duplex pumping stations, the capacity is based on the ability of the station to lift wastewater with only one pump in operation. The results of the comparison of station capacity with current modeled peak flow are presented in Table 3-4.

TABLE 3-4 CURRENT SEWAGE LIFT STATION PEAK FLOWS

Lift Station	Station Capacity*	Current Modeled Peak Flow
Butternut	300 gpm	196 gpm
Cherry Lane	200 gpm	21 gpm
Ballpark	40 gpm	3 gpm
West Wine Country Road	600 gpm	53 gpm
Stover Road	350 gpm	3 gpm
Forrest Road	2,000 gpm	471 gpm

Euclid Road	8,400 gpm	2,259 gpm
* Capacity with largest pump out of service.		

Based on the comparisons, it appears all pump stations have sufficient capacity to meet the existing system demands when only a single pump is in operation.

Force Main Hydraulic Analysis Results

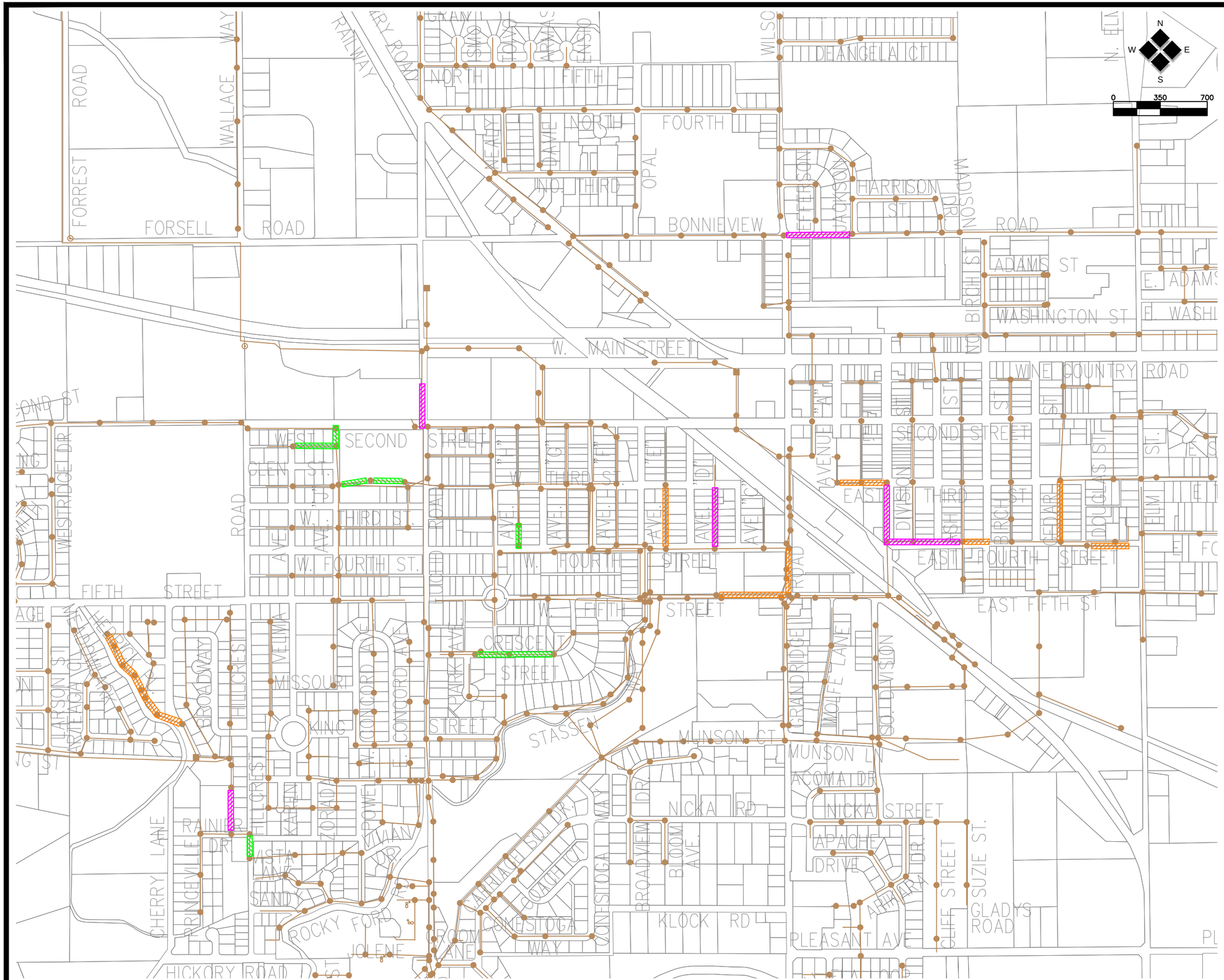
Another element of the hydraulic analysis was the review of the force mains and their ability to meet the system demands. The force main hydraulic analysis was similar to the analysis of lift stations, using projected peak flow rates from the model and from actual known pumping rates. The desired velocity within a force main is between 2 and 8 feet per second. Velocities below 2 feet per second tend to lead to deposition of solids in the pipe line, while velocities above 8 feet per second can create excessive pumping costs. Current force main velocities are shown in Table 3-5. All seven existing force mains have the capacity to accommodate the current peak flows from the lift stations. Projections for future force main adequacy will be discussed in the following chapter.

TABLE 3-5 CURRENT FORCE MAIN VELOCITIES				
Lift Station Force Main	Current Pumping Rate*	Force Main Diameter (in inches)	Desired Velocity	Current Velocity*
Butternut	300 gpm	6 inch	2 to 8 feet/second	3.40 ft/sec
Cherry Lane	200 gpm	6 inch	2 to 8 feet/second	2.27 ft/sec
Ballpark	40 gpm	3 inch	2 to 8 feet/second	1.82 ft/sec
W. Wine Country Rd.	600 gpm	6 inch	2 to 8 feet/second	6.81 ft/sec
Stover Road	350 gpm	6 inch	2 to 8 feet/second	3.97 ft/sec
Forrest Road	1,400 gpm	12 inch	2 to 8 feet/second	3.97 ft/sec
Euclid Road	4,300 gpm	24 inch	2 to 8 feet/second	3.05 ft/sec

* Pumping rate and velocity with largest pump in operation.

3.5 COLLECTION SYSTEM MAINTENANCE PROBLEMS

In the past, Grandview has had some re-occurring maintenance issues with the collection system due to clogs, grease, gravel and minor root problems. In 2002, Grandview's Public Works Department implemented a City-wide sewer rodding program that identified areas prone to such problems and addresses them every 3, 6, and 12 months. The City currently has 18 sections of sewer pipe that have significant root or grease problems. These known areas are shown on Figure 3-2 – Existing Collection System High Maintenance Areas.



CITY OF GRANDVIEW

General Sewer Plan Update

EXISTING COLLECTION SYSTEM HIGH MAINTENANCE AREAS

LEGEND

- ROOT PROBLEMS
- GREASE PROBLEMS
- DEBRIS/GRAVEL PROBLEMS

Hulbregtse, Louman Associates, Inc.

CIVIL ENGINEERING • LAND SURVEYING • PLANNING

12-10-08
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FIGURE 3-2

3.6 COLLECTION SYSTEM INFILTRATION / INFLOW

Infiltration

Infiltration is defined as groundwater entering a sewer system by means of defective pipes and side sewers, pipe joints, and manhole walls. The volume of infiltration is dependent upon ground water levels and upon the condition of the sewer system. Infiltration in Grandview fluctuates seasonally (greater between April and September) due to irrigation raising groundwater levels. The U.S. Environmental Protection Agency (EPA) considers infiltration to be excessive if non-storm sewage flows are greater than 120 gallons per capita per day.

Influent wastewater flow data indicates infiltration is not a significant source of flow into the Grandview sanitary sewer collection system. The average non-industrial influent winter flow (December through February) and the average non-industrial influent summer flow (June through August) for the period 2003 through 2007 are shown on Table 3-6. This table presents the ratio of average winter to average summer non-industrial influent flows.

TABLE 3-6 AVERAGE SUMMER AND WINTER MUNICIPAL FLOWS

	2003	2004	2005	2006	2007	Average
Average Summer Flows (MGD)	0.611	0.934	0.839	0.741	0.941	0.813
Average Winter Flows (MGD)	0.504	0.688	0.613	0.569	0.739	0.623
Summer : Winter Ratio	1.21	1.36	1.37	1.30	1.27	1.31

Presented on a per capita basis, the average non-industrial influent winter flows and the average non-industrial influent summer flows for the period 2003 through 2007 are shown on Table 3-7.

TABLE 3-7 PER CAPITA AVERAGE SUMMER AND WINTER MUNICIPAL FLOWS
(values are in gallons per person per day)

	2003	2004	2005	2006	2007	Average
Average Summer Flows	72	109	96	84	103	93
Average Winter Flows	59	81	71	64	81	71

Neither the summer per capita flows nor the winter per capita flows approach or exceed 120 gallons per capita per day, the value EPA considers as excessive infiltration (cited in *I/I Analysis and Project Certification*). Summer per capita domestic flows averaged approximately 22 gallons higher for the five-year period than winter per capita domestic flows. This may be due to normal higher summer water use for bathing and clothes washing, and may also include some minor side sewer infiltration caused by yard watering. Although influent non-industrial summer wastewater flows are greater than winter flows, they do not exceed, and in fact do not approach, the 120 gallons per capita per day value considered to be excessive by EPA. Three of the five per capita summer influent flow values are below 100 gallons, which is considered as the design basis for new sewage works in WDOE's *Criteria For Sewage Works Design* (December 1998). Because the majority of Grandview's sewers are not newly constructed, flows greater than 100 gallons per person per day would be expected if infiltration was occurring. Even Grandview's maximum month non-industrial influent flows for the period 2003 through 2007, shown on Table 3-8, do not exceed the excessive infiltration value of 120 gallons per capita per day.

TABLE 3-8 MAXIMUM MONTHLY NON-INDUSTRIAL FLOWS 2003 - 2007

	2003	2004	2005	2006	2007	Average
Maximum Month Domestic Flow (MGD)	0.823	0.957	0.915	0.889	1.045	0.926
Maximum Month per Capita Flow (gpcd)	97	112	105	101	114	106

Inflow

Inflow is defined as surface water or runoff that enters the collection system through constructed openings such as manhole covers, storm sewer cross-connections, and yard, basement, or roof drains.
Inflow is directly related to storm (rainfall) or flooding events, and results in an immediate increase in sewage flows following the event. EPA considers inflow to be excessive when average daily flows exceed 275 gallons per capita per day (cited in *I/I Analysis and Project Certification*) during periods of excessive rainfall (excluding major commercial and industrial flows).

No weather station that records precipitation exists in Grandview. However, recording stations exist in Sunnyside (approximately 7 miles northwest of Grandview) and in Prosser (approximately 7 miles southeast of Grandview). Table 3-9 shows the average monthly precipitation in Sunnyside for the period 1948 through 2007) and the average total monthly precipitation in Prosser (for the period 1931 through 2007).

TABLE 3-9 AVERAGE MONTHLY PRECIPITATION

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Sunnyside	0.94	0.60	0.52	0.55	0.52	0.51	0.17	0.28	0.39	0.56	0.91	1.01
Prosser	0.98	0.73	0.62	0.59	0.61	0.66	0.21	0.27	0.38	0.73	0.99	1.15
Average	0.96	0.67	0.57	0.57	0.57	0.59	0.19	0.28	0.39	0.65	0.95	1.08

From the data presented in Table 3-9, precipitation is greatest during the months of November, December, January, and February. The per capita domestic flows for those months during the period 2003 through 2007 are presented in Table 3-10.

TABLE 3-10 PER CAPITA DOMESTIC FLOWS
(values are non-industrial flows in gallons per day)

	Monthly Precipitation (inches)	2003	2004	2005	2006	2007
November	0.95	97	82	76	72	62
December	1.08	77	79	64	67	103
January	0.96	47	81	75	62	63
February	0.67	54	82	71	64	76
Average	0.92	69	81	72	66	76

Never do the domestic per capita wet weather flows approach or exceed the 275 gallon value considered to be excessive by EPA. Even the maximum month per capita flows, shown on Table 3-8, never exceed or approach the 275 gallons per capita per day value.

Another way to investigate inflow is to examine daily flows during precipitation events. If inflow is occurring in Grandview, one would expect to observe it as a jump in influent flow during or just following significant precipitation events. As previously stated, no precipitation-recording weather station exists in Grandview. For the purpose of investigating inflow during precipitation events, data from Sunnyside and Prosser is used. If precipitation occurs in both Sunnyside and in Prosser on the same day, it is probably a fair assumption that precipitation also occurred in Grandview that's same day.

Table 3-11 shows wastewater flow and precipitation data from three storm events in 2005 and 2006. The table presents the following information:

- Precipitation totals recorded in Sunnyside from the same days;
- Precipitation totals recorded in Prosser from the same days;
- Total influent flow data (combined industrial and domestic flows) from days before, during, and after significant precipitation events; and
- Total influent flow expressed as gallons per capita per day from the same days.

TABLE 3-11 PRECIPITATION AND WASTEWATER INFLUENT FLOWS

Month	Day		Sunnyside Precipitation (inches)	Prosser Precipitation (inches)	Total Influent Flow (MGD)	Total Per Capita Flow (gal/capita/day)
Nov 2005	19	Sat	0.00	0.00	1.10	126
	20	Sun	0.06	0.01	0.91	105
	21	Mon	0.11	0.02	1.25	144
	22	Tues	0.04	0.04	1.31	150
	23	Wed	0.04	0.01	0.92	106
	24	Thurs	0.36	0.12	0.76	87
	25	Fri	0.63	0.30	0.64	74
	26	Sat	0.00	0.00	0.61	70
May 2006	18	Thurs	0.00	0.00	1.51	171
	19	Fri	1.00	0.17	1.50	170
	20	Sat	0.51	0.15	0.94	106
	21	Sun	0.15	0.10	1.06	120
	22	Mon	0.37	0.06	1.30	147
	23	Tues	0.05	0.06	1.93	218
	24	Wed	0.00	0.00	1.75	198
June 2006	9	Fri	0.00	0.00	1.33	150
	10	Sat	0.00	0.00	1.03	117
	11	Sun	0.00	0.00	1.06	120
	12	Mon	0.00	0.05	1.71	193
	13	Tues	0.74	0.45	1.65	187
	14	Wed	0.01	0.00	1.71	193
	15	Thurs	0.00	0.00	1.61	182

During the November 2005 precipitation event, the heaviest rainfall occurred on Thursday November 24 and on Friday November 25. Influent flows on these two days were 0.76 MGD (87 gallons per capita) and 0.64 MGD (74 gallons per capita). Total influent flow was slightly lower on the following day, but was significantly greater on the days proceeding the heaviest precipitation, ranging from 0.91 MGD to 1.31 MGD (105 gallons per capita to 150 gallons per capita).

During the May 2006 precipitation event, the heaviest rainfall occurred on Friday May 19, Saturday May 20, and on Monday May 22. Influent flow on these three days was 1.50 MGD (170 gallons per capita), 0.94 MGD (106 gallons per capita), and 1.30 MGD (147 gallons per capita). Total influent flow was

generally greater on the days proceeding and following the heaviest precipitation, ranging form 1.51 MGD to 1.93 MGD (171 gallons per capita to 218 gallons per capita).

The June 2006 precipitation event was similar, with influent flows before and after the event being greater than flows the day of the event.

The data presented in Table 3-11 does not show a correlation between higher influent flows and precipitation events. However, records of daily industrial flows are not kept, thus it is not possible to remove the daily industrial flow contributions from the total daily flows to determine if the non-industrial portion of the total flows are influenced by inflow. It is possible that some inflow is occurring in Grandview, but evidence of that inflow may be "masked" by the magnitude of the daily variation in wastewater influent flow. It is important to note that even with industrial flows included in the total daily flows, peak day per capita influent flows were always substantially less than the 275 gallons per capita per day value cited in *I/I Analysis and Project Certification*.

Infiltration / Inflow Conclusions

The following conclusions can be made based on the examination of infiltration and inflow to the Grandview wastewater collection system:

- During the five-year period 2003 through 2007, annual average per capita domestic wastewater flows have ranged from 68 gallons per capita per day to 90 gallons per capita per day.

- The average maximum month domestic per capita flow for the five-year period averaged 106 gallons per capita per day.

- Infiltration is not thought to be a significant source of flow into the Grandview sanitary sewer system. Grandview's maximum month domestic flows for the period 2003 through 2007 do not exceed nor approach 120 gallons per capita per day, the value EPA considers as excessive infiltration.

- Inflow is not thought to be a significant source of flow into the Grandview sanitary sewer system. Grandview's maximum month domestic flows for the period 2003 through 2007 do not exceed nor approach 275 gallons per capita per day, the value EPA considers as excessive inflow.

- Grandview may experience some inflow, related to precipitation events, but the effect of any possible inflow is probably masked by the influence of industrial wastewater discharges into the collection system. However, any inflow related to precipitation events must be minor, as storm-related peak-day flows do not exceed the value of 275 gallons per capita per day, the value EPA considers to be excessive inflow.

CHAPTER 4
FUTURE COLLECTION SYSTEM

4.1 GENERAL DESCRIPTION

Forecasting expansion of the future sewer collection system is dependent upon the type, nature, and location of future growth within the City of Grandview and its UGA. Development of the future collection system is based upon the future land use goals (developed for Grandview by the Yakima Valley Council of Governments as part of the 2001 GMA Comprehensive Plan, as adopted by the City in 2008 (Figure 1-5), and the future sewer system service population. The sewer service population by the year 2028 is projected to be 12,895.

One of the goals of this General Sewer Plan is to serve as a guide for growth of the City of Grandview's wastewater collection system as it expands beyond the current City Limits into the UGA. To accomplish this goal, the following tasks were undertaken and accomplished:

- The existing collection system was modeled under existing conditions for normal and peak flows (Chapter 3).
- In keeping with the basin approach developed in Chapter 3 of this Plan, future collection system basins were developed for unsewered areas within the City Limits and UGA.
- Flows for the future drainage basins were estimated using future land use and unit flow rates. For the purposes of this Plan, future land use within the City and UGA is assumed to be as presented on Figure 1-4 and Figure 1-5.
- Flows from the future basins were modeled in the collection system. Additional flows from the future drainage basins were routed through the existing pipelines to examine system capacity and determine potential problem areas.
- Needed improvements to the existing system were developed to accommodate the additional flows, with a portion of the flow being carried through proposed alternate pipelines.

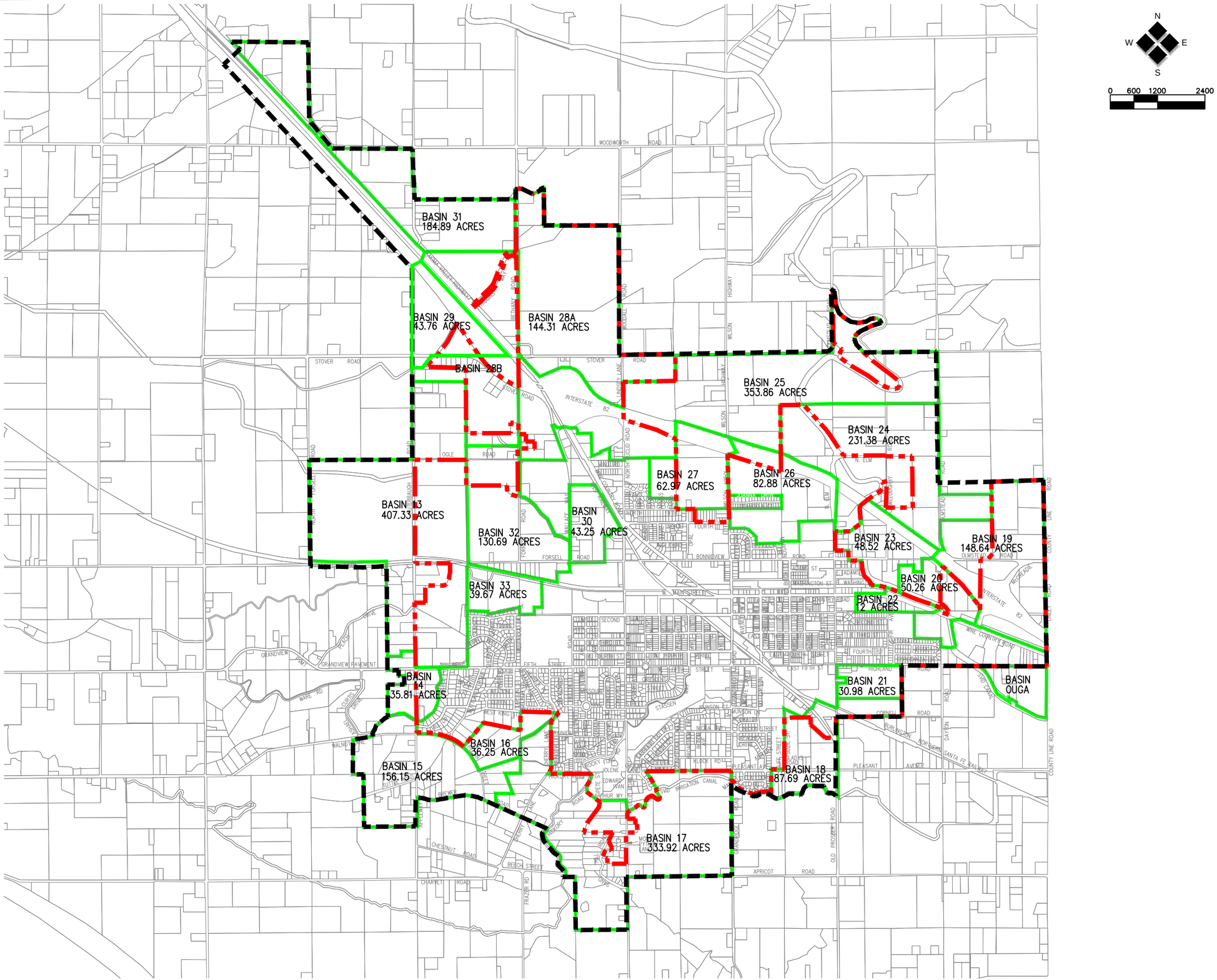
Map C in the back pocket of this report shows the layout of City of Grandview's future sewer collection system within the UGA. The actual location of the future collection system may change depending on the timing and location of actual development

4.2 FUTURE COLLECTION SYSTEM BASINS

Using the collection system basin approach described in Chapter 3, the future collection system within the UGA is divided into an additional 22 collection system basins, with future land use as shown on Figure 1-4 and Figure 1-5. The future collection system basins are shown on Figure 4-1 - Future Collection System Basin Boundaries, and discussed below. The future collection system within each basin is presented on Map C in the back pocket.

Basin No. 13: The area within Basin 13 has a future land use of light industrial and residential (low and medium density residential) and contains approximately 407 acres. It lies in the western portion of the future service area bounded to the north by Basin 28B; on the south by Basins 1 & 14; on the west by the UGA boundary; and on the east by Basins 1 28B, 32 & 33. Wastewater from this area would flow to future Basin 29 and then to a new lift station on Stover Road, where it would be pumped to the main trunk of Grandview's collection system. It would then be pumped by the Forrest Lift station and force main into the future Basin 5. The average wastewater flow generated within this basin as a result of complete development is expected to be 0.77 MGD.

Basin No. 14: The area within Basin 14 has a future land use of residential (low and medium density residential). It lies in the southwest portion of the UGA and contains approximately 36 acres. The area is bounded to the north by Basin 13; on the south by Basin 15; on the east by Basin 1; and on the west by the UGA Boundary. Wastewater from this basin would gravity flow to a proposed lift station to be located at Basin 15, where the wastewater is transmitted to the main trunk of Grandview's collection system through a new force main. The average wastewater flow generated within this basin as a result of complete development is expected to be 0.06 MGD.



CITY OF GRANDVIEW

General Sewer Plan Update

FUTURE COLLECTION SYSTEM BASIN BOUNDARIES

LEGEND

- EXISTING RETAIL SERVICE AREA BOUNDARY (CITY LIMITS)
- FUTURE RETAIL SERVICE AREA BOUNDARY (UGA)
- BASIN AREA BOUNDARY
- 13 FUTURE BASIN NUMBER

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FIGURE 4-1

Basin No. 15: The area within Basin 15 has a future land use comprised of residential (medium density residential). It lies in the southwest portion of the UGA and contains approximately 156 acres. The area is bounded on the north by Basins 1 & 14; on the south and west by the UGA Boundary; and on the east by the Basins 3 & 17. Average wastewater flows generated within this basin, as a result of complete development, are expected to be 0.23 MGD. Wastewater from this basin will flow into a new lift station which receives wastewater from Basins 14 and 16, and be pumped through a new force main into the main trunk of Grandview's collection system.

Basin No. 16: The area within Basin 16 has a future land use of residential (medium density residential). This basin lies in the southwest portion of the UGA, and consists of 36 acres. The area is bounded on the north by Basins 1 and 2; on the south by Basins 15 & 17; on the west by Basin 15; and on the east by Basins 3 & 17. Average wastewater flows generated within this basin, as a result of complete development, are expected to be 0.05 MGD. Wastewater from this basin will flow into Basin 15 and then will be pumped to the main trunk of Grandview's collection system.

Basin No. 17: The area within Basin 17 has a future land use area designated as residential (low and medium density residential). This basin lies in the southeast portion of the future service area and contains approximately 334 acres. The area is bounded on the north by Basins 3, 6 & 16; on the south by the UGA Boundary; on the west by Basins 15, 16 and the UGA Boundary; and on the east by the UGA boundary. Average wastewater flows generated within this basin, as a result of complete development, are expected to be 0.50 MGD. Wastewater from this basin will flow into the main trunk of Grandview's collection system.

Basin No. 18: The area within Basin 18 has a future land use area of residential and light industrial. This basin lies in the southeastern portion of the future service area and contains approximately 88 acres. The area is bounded on the north by Basins 7 & 21; on the south and east by the UGA Boundary; and on the west by Basin 7. Average wastewater flows generated within this basin, as a result of complete development, are expected to be 0.16 MGD. Wastewater from this basin will flow into Basin 7.

Basin No. 19: The area within Basin 19 has a future land use area of industrial and commercial. This basin lies in the eastern portion of the future service area and contains approximately 149 acres. The area is bounded on the north by Basin 24 and the UGA Boundary; on the south by Basin 12 & the UGA Boundary; on the east by the UGA Boundary; and on the west by Basins 12, 20, 23 & 24. This basin would gravity flow into Basin 7. The average wastewater flow generated within this basin as a result of complete development is expected to be 0.41 MGD.

Basin No. 20: The area within Basin 20 has a future land use as light industrial. This basin lies in the eastern portion of the future service area and contains approximately 50 acres. The area is bounded on the north by Basin 23; on the south by Basins 7, 12 & 19; on the east by Basins 12 and 19; and on the west by Basins 7, 8, 19 & 22. The average wastewater flow generated within this basin as a result of complete development is expected to be 0.05 MGD. Wastewater from this basin will flow into Basin 8.

Basin No. 21: The area within Basin 21 has a future land use designated as light industrial. This basin lies in the eastern portion of the future service area and contains approximately 31 acres. The area is bounded on the north by Basin 7; on the south by Basin 18; on the east by the UGA Boundary; and on the west by Basin 7. The average wastewater flow generated within this basin as a result of complete development is expected to be 0.09 MGD. Wastewater from this basin will flow into Basin 7.

Basin No. 22: This basin lies in the eastern portion of the future service area and contains approximately 12 acres. The area is bounded on the north by Basins 20 and 23; on the south by Basins 8 and 20; on the west by Basin 8; and on the east by Basin 20. Average wastewater flows generated within this basin, as a result of complete development, are expected to be 0.01 MGD. Wastewater from this basin will flow into Basin 8.

Basin No. 23: This basin lies in the northeast portion of the future service area and contains approximately 49 acres. The area is bounded on the north and east by the UGA boundary; on the south by Basins 9, 20 and 22; and on the west by Basin 9. Average wastewater flows generated within this basin, as a result of complete development, are expected to be 0.17 MGD. Wastewater from this basin will flow into Basin 9.

Basin No. 24: This basin lies in the northeast portion of the future service area and contains approximately 231 acres. The area is bounded on the north by Basin 25; on the south by Basins 9, 19, 23 and 26; on the west by Basins 9, 25 and 26; and on the east by Basins 23 and the UGA Boundary. Average wastewater flows generated within this basin, as a result of complete development, are expected to be 0.35 MGD. Wastewater from this basin will flow into Basin 9.

Basin No. 25: This basin lies in the northeast portion of the future service area and contains approximately 354 acres. The area is bounded on the north by the UGA Boundary; on the south by Basins 9, 24, 26, 27 and 30; on the west by Basins 28A, 28B and 32, and on the east by the UGA Boundary. Average wastewater flows generated within this basin, as a result of complete development, are expected to be 0.54 MGD. Wastewater from this basin will flow into Basin 9.

Basin No. 26: The area within Basin 26 is designated as residential. This basin lies in the northcentral portion of the UGA and contains approximately 83 acres. The area is bounded on the north by Basins 24 & 25; on the south by Basin 9; on the west by Basins 9 & 27, and on the east by Basin 24. The average wastewater flow generated within this basin as a result of complete development is expected to be 0.13 MGD. Wastewater from this basin will flow to Basin 9.

Basin No. 27: The area within Basin 27 is designated as residential. This basin lies in the northcentral portion of the UGA and consists of 63 acres. The area is bounded on the north by Basin 25; on the south and west by Basin 9; and on the east by Basin 26. The average wastewater flow generated within this basin as a result of complete development is expected to be 0.10 MGD. Wastewater from this basin will flow to Basin 9.

Basin No. 28A: This basin lies in the north central portion of the future service area and contains approximately 258 acres. The area is bounded on the north by the UGA Boundary; on the south by Basin 25; on the east by Basin 25 and the UGA Boundary; and on the west by Basins 28B & 31. Average wastewater flows generated within this basin, as a result of complete development, are expected to be 0.34 MGD. Wastewater from this basin will flow into a manhole in Stover Road and then to a new lift station in Basin 29. Wastewater from this basin will flow into the main trunk of Grandview's collection system. Appoximately 113 acres of this basin is currently being served by the existing system.

Basin No. 28B: This basin lies in the north central portion of the future service area and contains approximately 140 acres. The area is bounded on the north and east by Basin 31; on the south by Basins 13 & 32; and on the west by the UGA Boundary. Average wastewater flows generated within this basin, as a result of complete development, are expected to be 0.41 MGD. Wastewater from this basin will flow into a new lift station located in Basin 29, which pumps to the main trunk of Grandview's collection system. A portion of this basin is already served by the existing collection system.

Basin No. 29: This basin lies in the northwestern portion of the future service area and contains approximately 43 acres. The area is bounded on the north, south and east by Basin 28B; and on the west by the UGA Boundary. Average wastewater flows generated within this basin, as a result of complete development, are expected to be 0.10 MGD. Wastewater from this basin will flow into Basin 29 to a new lift station. Wastewater from this basin will flow into the main trunk of Grandview's collection system. Approximately 9 acres of this basin is currently being served by the existing system.

Basin No. 30: This basin lies in the north-central portion of the future service area and contains approximately 43 acres. The area is bounded on the north by the Basin 9; on the south by Basin 10; on the west by Basins 9 & 32; and on the east by Basins 9 & 10. Average wastewater flows generated within this basin, as a result of complete development, are expected to be 0.13 MGD. Waste-

water from this basin will flow into Basin 9. A portion of this basin is already served by the existing collection system.

Basin No. 31: This basin lies in the western portion of the future service area and contains approximately 185 acres. The area is bounded on the north and west by the UGA boundary; on the south by Basin 28B; and on the east by Basin 28A. Average wastewater flows generated within this basin, as a result of complete development, are expected to be 0.44 MGD. Wastewater from this basin will flow into a manhole in Basin 28B, which gravity feeds to the West Wine Country Road Lift Station. Wastewater from the West Wine Country Road Lift Station will be pumped via force main to a new lift station in Basin 29. Wastewater from this basin will flow into the main trunk of Grandview's collection system.

Basin No. 32: This basin lies in the western portion of the future service area and contains approximately 131 acres. The area is bounded on the north by Basins 9 & 28B; on the south by Basins 5 & 33; on the west by Basin 13; and on the east by Basins 10 & 30. Average wastewater flows generated within this basin, as a result of complete development, are expected to be 0.38 MGD. Wastewater from this basin will flow into Basin 9.

Basin No. 33: This basin lies in the western portion of the future service area and contains approximately 40 acres. The area is bounded on the north by Basin 32; on the south by Basins 1 & 5; on the west by Basin 13; and on the east by Basin 5. Average wastewater flows generated within this basin, as a result of complete development, are expected to be 0.06 MGD. Wastewater from this basin will flow into Basin 5.

A summary of the future basins, their areas, projected flows at complete development, and discharge locations is presented in Table 4-1.

TABLE 4-1 FUTURE DRAINAGE BASINS

Basin No.	Acreage		Projected Flows	Discharge Location
13	Agricultural Residential Industrial Public	110.28 80.23 215.06 1.76	0.77 MGD	To Basin 29 and then to Main Trunk Line
14	Agricultural Residential	14.82 20.99	0.06 MGD	To Basin No. 15.
15	Residential	156.15	0.23 MGD	To Main Trunk Line
16	Residential	36.25	0.05 MGD	To Basin No. 15
17	Agricultural Residential	21.95 311.97	0.50 MGD	To Main Trunk Line
18	Residential Industrial	60.49 27.20	0.16 MGD	To Basin No. 7.
19	Commercial Industrial	17.79 130.85	0.41 MGD	To Basin No. 7.
20	Commercial Public	49.04 1.22	0.05 MGD	To Basin No. 8.
21	Residential Industrial	2.19 28.79	0.09 MGD	To Basin No. 7.
22	Commercial	12.00	0.01 MGD	To Basin No. 8.
23	Commercial Industrial Residential	12.34 32.44 3.74	0.17 MGD	To Basin No. 9.

24	Agricultural 42.08 Residential 119.82 Industrial 38.13 Public 31.35	0.35 MGD	To Basin No. 9.
25	Agricultural 22.62 Residential 250.90 Commercial 16.94 Industrial 35.28 Public 28.12	0.54 MGD	To Basin No. 9.
26	Agricultural 36.89 Residential 45.99	0.13 MGD	To Basin No. 9.
27	Agricultural 15.24 Residential 47.73	0.10 MGD	To Basin No. 9.
28A*	Residential 19.24 Industrial 91.93 Commercial 33.14	0.34 MGD	To Basin 29 and then to Main Trunk Line
28B*	Industrial 133.55 Commercial 6.44	0.41 MGD	To Basin 29 and then to Main Trunk Line
29*	Industrial 33.76	0.10 MGD	To Main Trunk Line
30*	Industrial 43.25	0.13 MGD	To Basin No. 9.
31	Commercial 58.65 Industrial 126.24	0.44 MGD	To Basin 28A to Basin 29 and then to Main Trunk Line
32	Agricultural 56.07 Residential 12.72 Industrial 61.90	0.38 MGD	To Basin No. 9.
33	Residential 39.67	0.06 MGD	To Basin No. 32.
TOTAL	2,795.2	5.48 MGD	

* A portion of this basin is served by the existing collection system.

Figure 4-2 - Future Collection System at Ultimate Buildout, shows the layout of the future collection system within the UGA. The actual location of the future collection system may change depending on the timing and location of actual development.

4.3 FUTURE SEWER SYSTEM HYDRAULIC ANALYSIS

A hydraulic analysis of the existing Grandview collection system was performed to identify problems that would be created by projected wastewater flows resulting from the full development (ultimate buildout) of property within the City and the UGA. Like the analysis presented in Chapter 3, analysis of the future system involves inputting information regarding pipe slopes, making assumptions about pipe friction losses, assigning wastewater flows to the existing 14 collection system basins, and assigning wastewater flows to the future 20 collection system basins. The hydraulic capacity of the existing and proposed future collection system is based on the location and size of the future collection system as shown on Figure 4-2. As done in Chapter 3, the process involves:

- Assigning wastewater flows from each existing and future basin based upon future land use and land use unit flow rates within the basin. The same unit flows used in the analysis of the existing collection system are used in the analysis of the future collection system. In many cases, flows from future basins are directed to enter and flow through existing basins (as described earlier in this chapter and summarized in Table 4-1) and into the existing collection systems within those basins;

- Inputting future industrial wastewater flows (20 year) for existing industries at their known discharge locations assuming an annual growth rate similar to the City's (2% per year);

- Assuming a roughness coefficient (Mannings "n") of 0.013 for all pipelines in the analysis;

- Assuming lift station discharges would continue as peak flows through the basin without the effects of dampening within the gravity flow line;

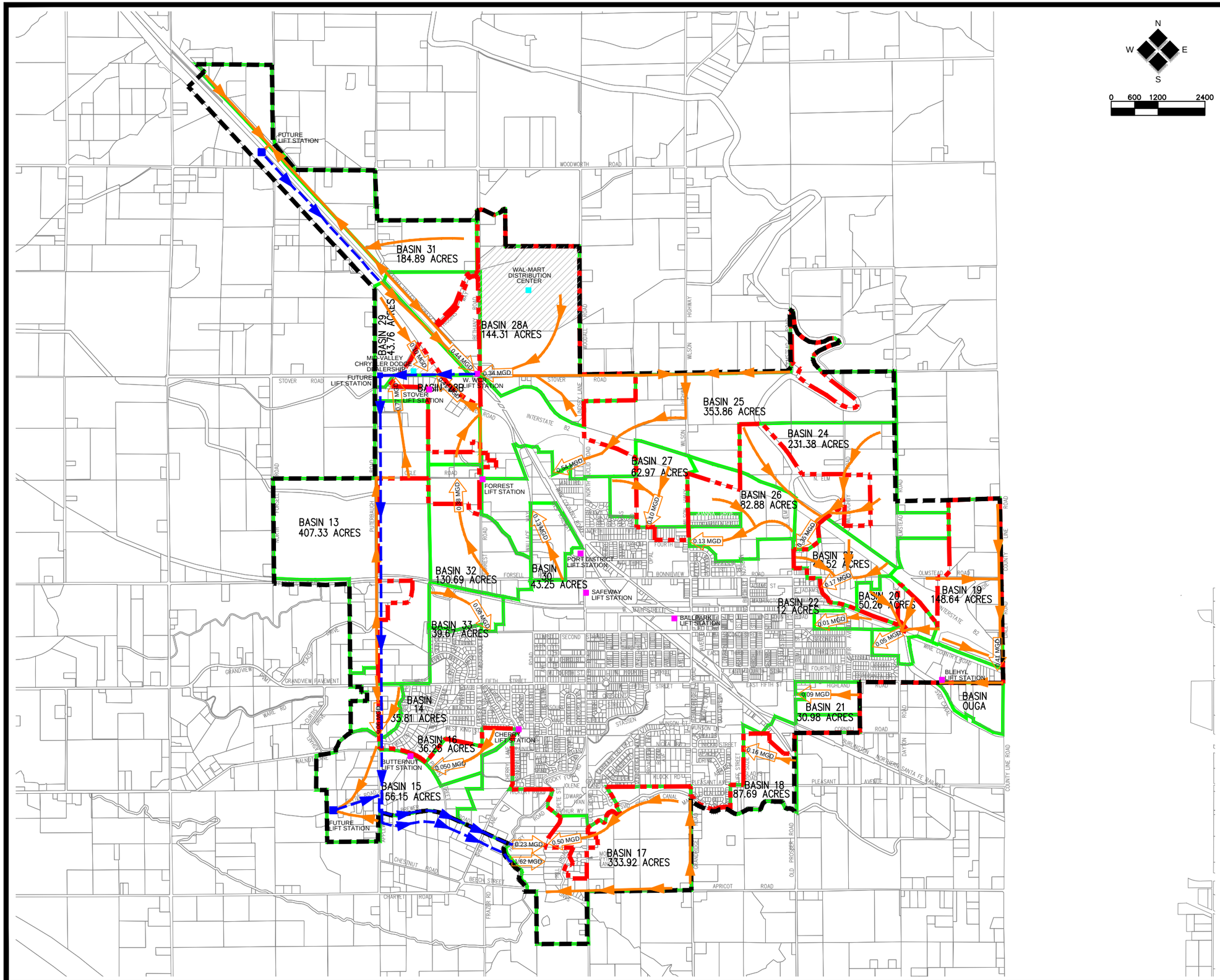
- Using the same equation used to analyze the existing collection system at peak flows.

$$Q_{Peak} = K\ (Q_{Average})^{0.9}$$

where Q represents flow in MGD, and K represent the peaking factor.

The same peaking factor value for K used to analyze the existing collection system is used to evaluate peak flows in the future.

Calibration of the model, done in the previous hydraulic analysis, was not done in this case, because the population at complete development of the service area is unknown. Therefore, it was assumed the unit flows used to model the existing system would be suitable to predict full development conditions.



CITY OF GRANDVIEW

General Sewer Plan Update

FUTURE COLLECTION SYSTEM AT ULTIMATE BUILDOUT

LEGEND

- EXISTING RETAIL SERVICE AREA BOUNDARY (CITY LIMITS)
- FUTURE RETAIL SERVICE AREA BOUNDARY (UGA)
- 13 — FUTURE BASIN NUMBER
- ULTIMATE BUILDOUT BASIN AREA BOUNDARY
- NEW LIFT STATION
- EXISTING LIFT STATION
- FORCE MAINS
- TRUNK SEWERS
- 0.74 MGD — AVERAGE DESIGN FLOW FROM ULTIMATE BUILDOUT (IN MGD)

NOTES:

1. PROPOSED SEWER EXTENSIONS ARE INTENDED TO PROVIDE GENERAL GUIDANCE FOR DEVELOPMENT OF THE SEWER SYSTEM WITHIN THE URBAN GROWTH AREA. ACTUAL LOCATIONS AND SIZES OF PIPELINES WILL DEPEND ON THE SCHEDULE AND LOCATION OF DEVELOPMENT. IMPROVEMENTS WITHIN THE EXISTING SYSTEM NEEDED TO ACCOMMODATE UGA GROWTH SHOULD BE MADE AS GROWTH OCCURS, OR IN CONJUNCTION WITH OTHER CAPITAL FACILITY IMPROVEMENTS, AS APPROPRIATE.

2. DRAINAGE BASIN BOUNDARIES ARE SHOWN TO INDICATE THE GENERAL ROUTING OF FLOWS USED IN THE HYDRAULIC ANALYSIS. AS AREAS DEVELOP, PIPELINES SHOULD BE ROUTED TO THE SYSTEM IN ACCORDANCE WITH THE BASIN BOUNDARIES SO THE ASSUMPTIONS MADE IN THE HYDRAULIC ANALYSIS REMAIN VALID.

3. DESIGN FLOWS SHOW LOCATIONS WHERE SEWAGE FLOWS FROM ULTIMATE BUILDOUT OF THE UGA ARE INTRODUCED INTO THE EXISTING SYSTEM. THE GIVEN AVERAGE FLOW SHOULD BE ADJUSTED TO PEAK FLOW AND USED FOR DESIGN OF THE PIPELINE EXTENSION.

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FIGURE 4-2

Unit Flow Rates

The hydraulic analysis is based on unit flow rates from different land uses within the existing and future collection system basins. The unit flow rates, identical to the ones used in the hydraulic analysis of the existing system in Chapter 3 are assigned to the various basins based upon those future land use designations. Those unit flow rates are:

Residential Low	0.0012 MGD/Acre
Residential Medium	0.0015 MGD/Acre
Residential High	0.0018 MGD/Acre
Commercial	0.0010 MGD/Acre
Industrial	0.0030 MGD/Acre
Schools	0.0005 MGD/Acre
Public	0.0005 MGD/Acre

Collection System Hydraulic Analysis Results

The hydraulic analysis examined the existing and proposed future sewer network at normal and peak flows generated by the complete development and buildout within both the City and the UGA. Flows from the future collection basins were modeled and routed through the existing collection system to examine system capacity and determine potential problem areas. Results of this hydraulic analysis, and ultimate UGA buildout, identified twenty-one potential problems within the existing collection system (see Map B - Hydraulic Analysis Pipe and Node Map). Those twenty-one areas requiring corrective action are shown and labeled on Figure 4-3 - Collection System Deficiencies At Ultimate Buildout, and are described as follows:

Basin 32: Future Basin 32 was modeled with the addition of wastewater from future Basins 13, 25, and 30. With the addition of wastewater from the ultimate buildout, the model predicts the following areas of overloading:

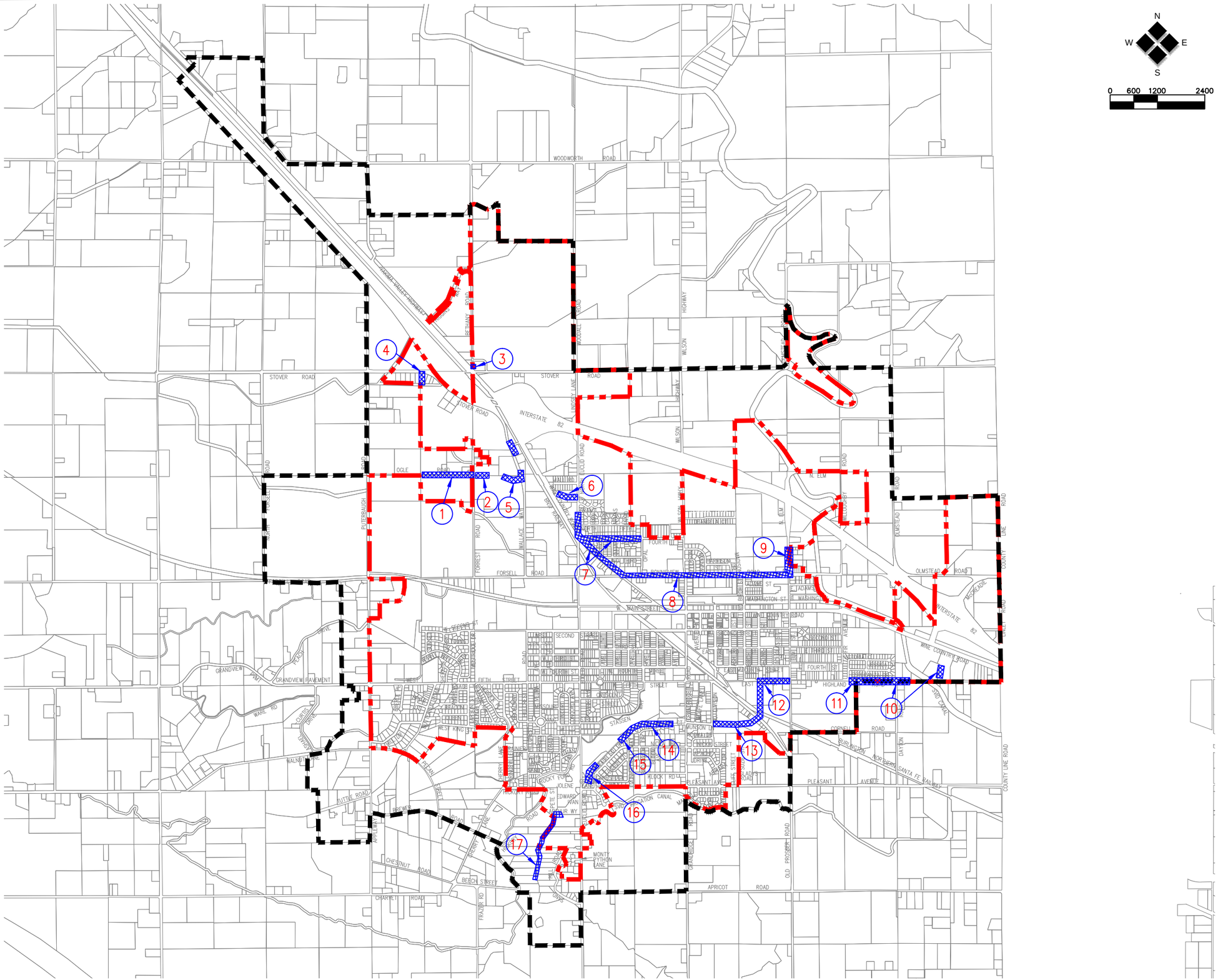
1. The existing sewer from manhole N-127 to the Forrest Lift Station (WW-02) will be overloaded, and this length of sewer could be replaced with an 18-inch pipe, or a parallel 15-inch sewer could be constructed.

2. The existing sewer from manhole N-2 to the Forrest Lift Station (WW-02) will be overloaded, and this length of sewer could be replaced with an 18-inch pipe, or a parallel 15-inch sewer could be constructed.

Basin 28B: Future Basin 28B was modeled with the addition of wastewater from the future Basin 29. With the addition of wastewater from the ultimate buildout, the model predicts the following areas of overloading:

3. The existing sewer from manhole N-137 to the West Wine Country Road Lift Station (WW-07) will be overloaded, and this length of sewer could be replaced with a 15-inch pipe, or a parallel 12-inch sewer could be constructed.

4. The existing sewer from manhole N-131 to the Stover Road Lift Station (WW-01) will be overloaded, and this length of sewer could be replaced with a 12-inch pipe, or a parallel 10-inch sewer could be constructed.



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COLLECTION SYSTEM DEFICIENCIES AT ULTIMATE BUILDOUT

LEGEND

- EXISTING RETAIL SERVICE AREA BOUNDARY (CITY LIMITS)
- FUTURE RETAIL SERVICE AREA BOUNDARY (UGA)
- (1) AREA NUMBER CORRESPONDING TO TEXT DISCUSSION
- UNDER CAPACITY

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FIGURE 4-3

Basin 9: Existing Basin 9 was modeled with the addition of wastewater from the future Basins 13, 23, 26, 27, 30 and 32. With the addition of wastewater from the ultimate buildout, the model predicts the following areas of overloading:

5. The existing sewers from manhole N-3 to manhole N-5, east of the Forrest Lift Station (WW-02) will be overloaded, and this length of sewer could be replaced with an 18-inch pipe, or a parallel 15-inch sewer could be constructed.

6. The existing sewers from manhole N-11 to the N-13 east of the Forrest Lift Station (WW-02) will be overloaded, and this length of sewer could be replaced with a 12-inch pipe, or a parallel 10-inch sewer could be constructed.

7. The existing sewers from manhole N-16 to manhole N-21 and manhole N-53 to N-56 located on West Wine Country Road will be overloaded, and this length of sewer could be replaced with a 12-inch pipe, or a parallel 8-inch sewer could be constructed.

8. The existing sewers from manhole N-21 to the N-26 and manhole N-27 to manhole N-41 located on Bonnieview Road will be overloaded, and this length of sewer could be replaced with a 10-inch pipe, or a parallel sewer with 8-inch pipe could be constructed.

9. The existing sewers from manhole N-41 to manhole N-93 located on North Elm Street will be overloaded, and this length of sewer could be replaced with a 10-inch pipe, or a parallel sewer with 8-inch pipe could be constructed

Basin 7: Existing Basin 7 was modeled with the addition of wastewater from the existing Basin 12 and future Basins 18, 20 and 21. With the addition of wastewater from the ultimate buildout, the model predicts the following areas of overloading:

10. The existing sewers from manhole G-28 to manhole G-31 and manholes G-31 to G-33 located on Highland Road will be overloaded, and this length of sewer could be replaced with a 10-inch pipe, or a parallel 8-inch sewer could be constructed.

11. The existing sewers from manhole G-24 to manhole G-27 and manholes G-27 to manhole G-28 located on Highland Road will be overloaded, and this length of sewer could be replaced with a 10-inch pipe, or a parallel 8-inch sewer could be constructed.

12. The existing sewers from manhole G-9 to manhole G-13 located south of East Fifth Street will be overloaded, and this length of sewer could be replaced with a 12-inch pipe, or a parallel 10-inch sewer could be constructed.

13. The existing sewers from manhole G-5 to manhole G-8 and manhole G-5 to manhole F-9 located on Munson Lane will be overloaded, and this length of sewer could be replaced with a 12-inch pipe, or a parallel 10-inch sewer could be constructed.

14. The existing sewers from manhole F-5 to manhole F-2 located on Munson Lane will be overloaded, and this length of sewer could be replaced with an 18-inch pipe, or a parallel 15-inch sewer could be constructed.

Basin 6: Existing Basin 6 was modeled with the addition of wastewater from the existing Basins 5, 7, 8 and 11. With the addition of wastewater from the ultimate buildout, the model predicts the following areas of overloading:

15. The existing sewers from manhole O-31 to manhole O-32 and manholes O-29A to O-30 located south of Dykstra Park will be overloaded, and this length of sewer could be replaced with a 27-inch pipe, or a parallel 24-inch sewer could be constructed. This line is considered the main outfall line to the treatment plant.

16. The existing sewers from manhole O-28 to manhole O-29 located south of Dykstra Park and will be overloaded, and this length of sewer could be replaced with a 27-inch pipe, or a parallel 21-inch sewer could be constructed.

Basin 3: Existing Basin 3 was modeled with the addition of wastewater from existing Basin 2. With the addition of wastewater from the ultimate buildout, the model predicts the following areas of overloading:

17. The existing sewers from manhole O-38 to manhole O-43 will be overloaded, and this length of sewer could be replaced with a 30-inch pipe, or a parallel 27-inch sewer could be constructed. This line is considered the main outfall line to the treatment plant.

Lift Stations Hydraulic Analysis Results

The capacity of the existing lift stations and their ability to meet existing system demands was discussed in Chapter 3. With the complete development of the UGA, it is desirable to continue to use the existing stations to the extent possible. It will also be necessary to construct two new lift stations, one new lift station to serve the southwest portion of the future collection system and another lift station to serve the northwest portion of the future collection system.

The lift station hydraulic analysis was similar to the analysis of the collection system, using the same unit area flow rates and peaking factor equations. Projected flows for the complete development and buildout condition are compared in Table 4-2 with the existing lift station capacities.

TABLE 4-2 COMPLETE DEVELOPMENT SEWAGE LIFT STATION PEAK FLOWS

Station No.	Station	Current Station Capacity*	Modeled Ultimate Buildout Peak Flow
1	Butternut	300 gpm	343 gpm
2	Cherry Lane	200 gpm	21 gpm
3	Ballpark	40 gpm	3 gpm
4	W. Wine Country Rd.	600 gpm	650 gpm
5	Stover Road	350 gpm	3 gpm
6	Forrest Road	2,000 gpm	2,599 gpm
7	Euclid Road	8,400 gpm	7,885 gpm
8	New Basin 15 Lift Station		300 gpm
9	New Basin 31 Lift Station		700 gpm
10	New Basin 28B Lift Station		1,500 gpm

*Capacity with largest pump in service.

Lift Stations 1, 4, and 6 do not have sufficient capacity to pump the projected peak design flows for the complete development of the UGA. Therefore, these lift stations will need to be expanded in the future. Timing of those improvements will depend on the rate of growth and the sequence of development in the community. Projections for sewer system growth for the next 20 years and resulting lift station expansion will be discussed in the following chapter.

Lift stations 8, 9 and 10 will be needed to further distribute projected flows from the outermost basins to the collection system.

Force Mains Hydraulic Analysis Results

The ability of the existing force mains to meet existing system demands was discussed in Chapter 3. It is desirable to continue to use the existing force mains as long as possible. The force main hydraulic analysis was similar to the analysis of lift stations, using the projected peak flow rates from the model. Projected forcemain velocities for the complete development condition are compared in Table 4-3 with the desired force main velocities.

TABLE 4-3 COMPLETE DEVELOPMENT FORCE MAIN VELOCITIES

Force Main No.	Complete Development Pumping Rate*	Force Main Diameter	Desired Velocity	Complete Development Velocity*
1	343 gpm	6 inch	2 to 8 feet/second	3.89 ft/sec
2	200 gpm	6 inch	2 to 8 feet/second	2.27 ft/sec**
3	40 gpm	3 inch	2 to 8 feet/second	1.82 ft/sec**
4	650 gpm	6 inch	2 to 8 feet/second	7.38 ft/sec
5	350 gpm	6 inch	2 to 8 feet/second	3.97 ft/sec**
6	2,599 gpm	12 inch	2 to 8 feet/second	7.37 ft/sec
7	7,885 gpm	24 inch	2 to 8 feet/second	5.59 ft/sec

* Pumping rate and velocity with one pump in operation.
** Identical to existing velocity as the existing lift station has adequate capacity.

All force main velocities were within the maximum desired velocity of 8 feet per second at ultimate buildout.

CHAPTER 5
YEAR 2028
COLLECTION SYSTEM

5.1 GENERAL DESCRIPTION

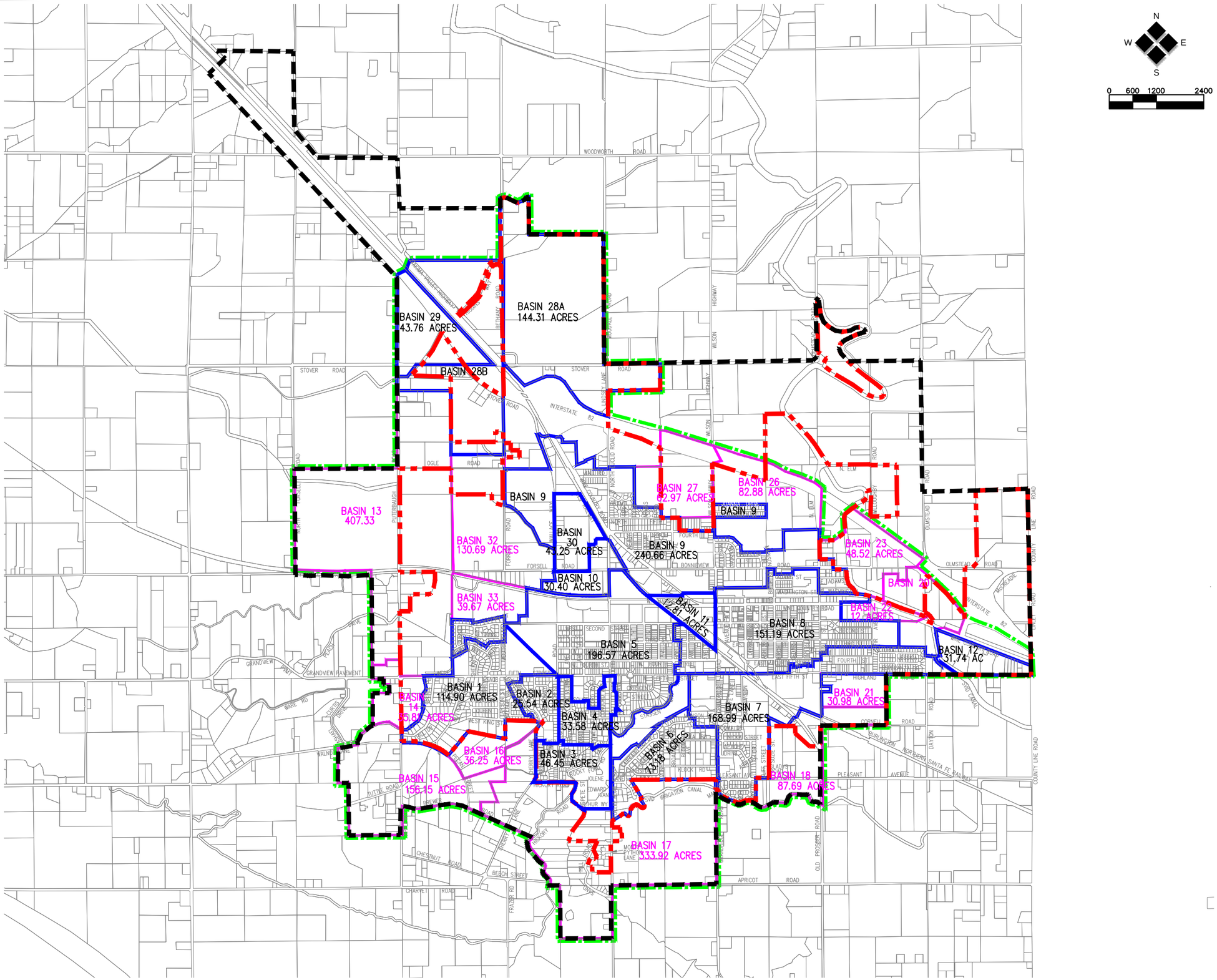
Chapter 3 of this Plan discussed, analyzed, and evaluated Grandview's existing sewer collection system based upon current wastewater flows. Chapter 4 of this Plan discussed, analyzed, and evaluated the collection system necessary to accommodate the full development with the City and the UGA. This chapter will analyze and evaluate Grandview's collection system necessary to accommodate projected future growth for the next 20 years (through the year 2028). The following approach was used:

- Future collection system basins developed in Chapter 4 for unsewered areas within the Grandview City Limits and the UGA were again used.
- Future flows were projected, based upon future land use and unit flow rates. For the purposes of this Plan, future land use within the City and UGA is assumed to be as presented on Figure 1-4.
- Rather than assuming complete development within the City and the UGA, year 2028 flows are based on serving the population of 12,895 as presented in Chapter 1 of this Plan. Assumptions are made as to where the future population will locate within the City and the UGA.
- Flows from the future basins were modeled and routed through the existing pipelines to examine system capacity and determine potential problem areas.
- Needed improvements to the existing system were developed to accommodate the additional flows, with a portion of the flow being carried through proposed alternate pipelines.

Map D in the back pocket of this report shows the layout of the future collection system within the year 2028 service area. The actual location of the future collection system may change depending on the timing and location of actual development.

5.2 YEAR 2028 COLLECTION SYSTEM BASINS

The 22 future collection system basins presented in Chapter 4 are used to develop the year 2028 sewer service area. For the purposes of this Plan, it is assumed the future growth to be served by Grandview's collection system will be south of Interstate 82, and is shown on Figure 5-1 - Year 2028 Collection System Basin Boundaries. The year 2028 sewer service area differs from the sewer service area at full development with the exclusion of Basin Nos. 19, 24, 25, and 31. It is assumed that less than 100% of the area within each of the year 2028 basins will be developed. In addition basin in-fill within existing basins 3, 7, 9 and 12 will also add to the 2028 loading. A summary of the year 2028 basins, their areas, percent of development served, and discharge locations are presented in Table 5-1.



CITY OF GRANDVIEW

General Sewer Plan Update

YEAR 2028 COLLECTION SYSTEM BASIN BOUNDARIES

LEGEND

- EXISTING RETAIL SERVICE AREA BOUNDARY (CITY LIMITS)
- FUTURE RETAIL SERVICE AREA BOUNDARY (UGA)
- EXISTING BASIN AREA BOUNDARY
- FUTURE 2028 BASIN AREA
- YEAR 2028 BASIN AREA BOUNDARY
- 13 FUTURE BASIN NUMBER
- 25 EXISTING BASIN NUMBER

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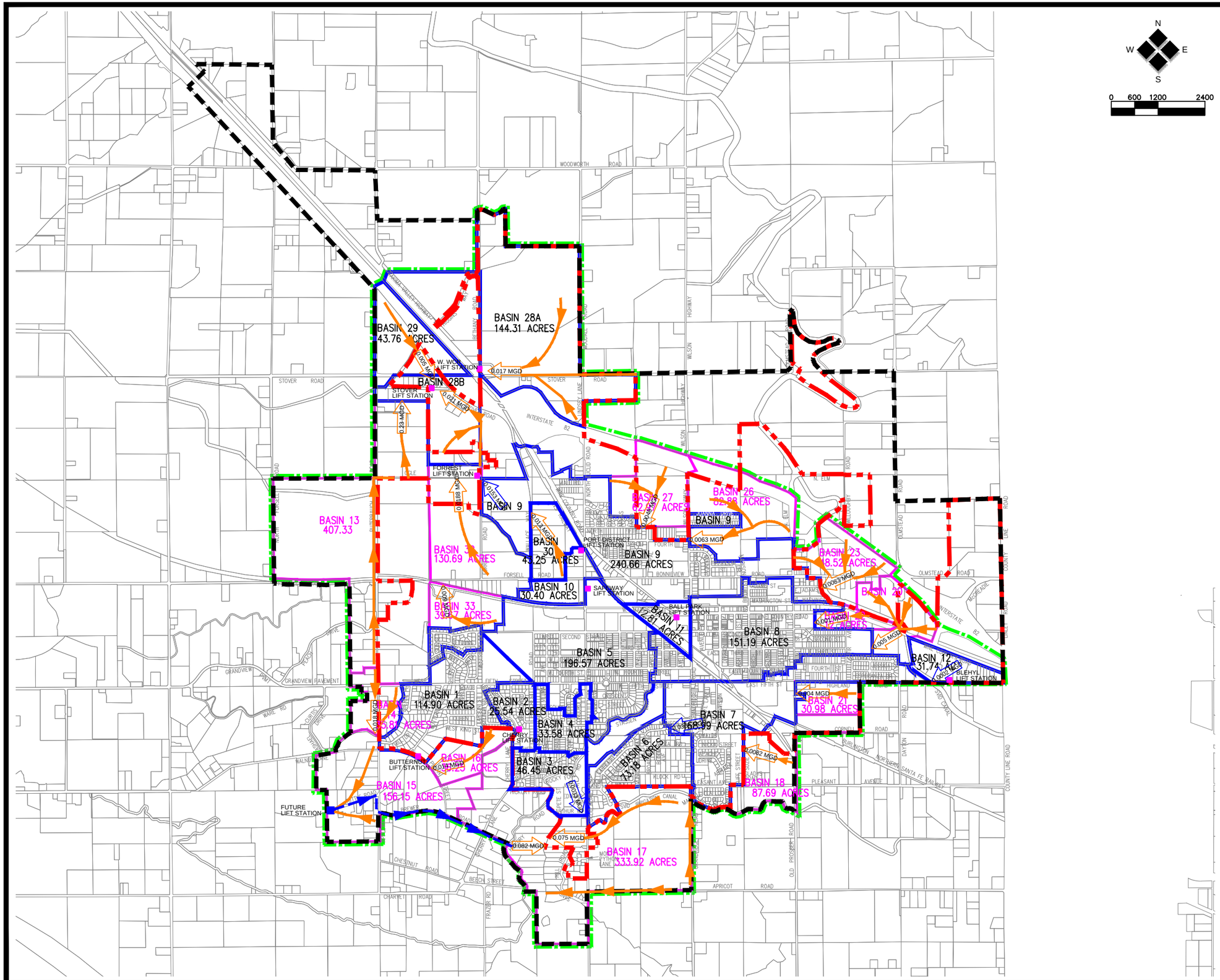
FIGURE 5-1

TABLE 5-1 FUTURE DRAINAGE BASINS				
Basin No.	Acreage	% Area Served	Projected Flows	Discharge Location
3*	46.45	10	0.0033	To Main Line on Euclid Road
7*	168.99	10	0.0308	To Main Line on Euclid Road
9*	240.66	10	0.0153	To Basin No. 9.
12*	31.74	10	0.0002	To Basin No. 7.
13	Industrial 292.43 Public 1.78 Residential 115.81	30	0.230	To Basin No. 5.
14	Residential 39.11	30	0.018	To Basin No. 16.
15	Residential 156.15	35	0.082	To Basin No. 3.
16	Residential 36.25	25	0.014	To Basin No. 3.
17	Residential 333.92	15	0.075	To Basin No. 3.
18	Industrial 26.04 Residential 56.67	5	0.008	To Basin No. 7.
20	Commercial 49.20 Public 1.29	10	0.005	To Basin No. 8.
21	Industrial 28.78 Residential 2.20	5	0.004	To Basin No. 7.
22	Commercial 11.40	5	0.001	To Basin No. 8.
23	Industrial 47.46 Commercial 12.33 Residential 7.35	5	0.008	To Basin No. 9.
26	Residential 83.79	5	0.006	To Basin No. 9.
27	Residential 63.38	5	0.005	To Basin No. 9.
28A**	Residential 19.24 Industrial 91.93 Commercial 33.14	5	0.017	To Basin No. 9.
28B**	Industrial 133.55 Commercial 6.44	5	0.021	To Basin No. 5.
29**	Industrial 33.76	5	0.005	To Stover Road Lift Station and then to Basin No. 5.
30**	Industrial 43.25	10	0.013	To Basin No. 9.
32	Residential 12.70 Industrial 118.67	5	0.019	To Basin No. 5.
33	Residential 39.75	15	0.009	To Basin No. 5.
TOTAL	2,385.61		0.59 MGD	

* Development of additional unoccupied areas within existing basin.
** A portion of this collection system is served by the existing basin.

Figure 5-2 – Future Collection System at Year 2028, shows the layout of the future collection system within the UGA. The actual location of the future collection system may change depending on the timing and location of actual development.



CITY OF GRANDVIEW

General Sewer Plan Update

FUTURE COLLECTION SYSTEM AT YEAR 2028

LEGEND

- EXISTING RETAIL SERVICE AREA BOUNDARY (CITY LIMITS)
- FUTURE RETAIL SERVICE AREA BOUNDARY (UGA)
- 7 — EXISTING BASIN NUMBER
- 13 — FUTURE BASIN NUMBER
- YEAR 2028 BASIN AREA
- EXISTING BASIN AREA BOUNDARY
- YEAR 2028 BASIN AREA BOUNDARY
- NEW LIFT STATION
- EXISTING LIFT STATIONS
- FORCE MAINS
- TRUNK SEWERS
- 0.74 MGD — AVERAGE DESIGN FLOW FOR YEAR 2028 (IN MGD)
- 0.74 MGD — ADDITIONAL FLOW FROM EXISTING BASIN INFILL (IN MGD)

NOTES:

1. PROPOSED SEWER EXTENSIONS ARE INTENDED TO PROVIDE GENERAL GUIDANCE FOR DEVELOPMENT OF THE SEWER SYSTEM WITHIN THE URBAN GROWTH AREA. ACTUAL LOCATIONS AND SIZES OF PIPELINES WILL DEPEND ON THE SCHEDULE AND LOCATION OF DEVELOPMENT. IMPROVEMENTS WITHIN THE EXISTING SYSTEM NEEDED TO ACCOMMODATE UGA GROWTH SHOULD BE MADE AS GROWTH OCCURS, OR IN CONJUNCTION WITH OTHER CAPITAL FACILITY IMPROVEMENTS, AS APPROPRIATE.

2. DRAINAGE BASIN BOUNDARIES ARE SHOWN TO INDICATE THE GENERAL ROUTING OF FLOWS USED IN THE HYDRAULIC ANALYSIS. AS AREAS DEVELOP, PIPELINES SHOULD BE ROUTED TO THE SYSTEM IN ACCORDANCE WITH THE BASIN BOUNDARIES SO THE ASSUMPTIONS MADE IN THE HYDRAULIC ANALYSIS REMAIN VALID.

3. DESIGN FLOWS SHOW LOCATIONS WHERE SEWAGE FLOWS FROM YEAR 2028 BUILDOUT OF THE UGA ARE INTRODUCED INTO THE EXISTING SYSTEM. SEE ULTIMATE BUILDOUT FOR PIPLINE DESIGN FLOWS.

4. EXISTING BASINS 3, 7, 9 & 12 CONTAINED AREAS OF VACANT LAND USED IN THE CALCULATION OF THE YEAR 2028 INFILL LOADING.

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FIGURE 5-2

5.3 FUTURE SEWER SYSTEM HYDRAULIC ANALYSIS

The hydraulic analysis of the existing Grandview collection system was performed to determine what problems could be created by projected wastewater flows resulting from the year 2028 development of property within the City and the UGA. Like the analysis presented in Chapters 3 and 4, analysis of the year 2028 system involves inputting information regarding pipe slopes, making assumptions about pipe friction losses, assigning wastewater flows to the existing 12 collection system basins, and assigning wastewater flows to the additional 13 collection system basins and the in-fill areas within the existing collection system basins. As done in Chapters 3 and 4, the process involves:

- Assigning wastewater flows from each existing and year 2028 basin based upon future land use and land use unit flow rates within the basin. The same unit flows used in the analysis of the existing collection system are used in the analysis of the future collection system. Flows from the year 2028 basins are presented in Table 5-1. In many cases, flows from future basins are directed to enter and flow through existing basins (as described earlier in this chapter and summarized in Table 5-1) and into the existing collection systems within those basins;

- Inputting year 2028 industrial wastewater flows for existing industries at their known discharge locations assuming an annual growth rate similar to the City's (2% per year);

- Assuming a roughness coefficient (Mannings "n") of 0.013 for all pipelines in the analysis;

- Assuming lift station discharges would continue as peak flows through the basin without the effects of dampening within the gravity flow line;

- Using the same equation used to analyze the existing collection system at peak flows.

$$Q_{Peak} = K\,(Q_{Average})^{0.9}$$

where Q represents flow in MGD, and K represent the peaking factor.

The same peaking factor value for K used to analyze the existing collection system is used to evaluate peak flows in the future.

Calibration of the model, done in the existing system (Chapter 3) hydraulic analysis by comparing projected year 2028 flows with those predicted by the model, was done. The total year 2028 flow of 2.51 MGD was computed by the modeling program, which compares well to the 2.51 MGD projected flow for year 2028 found in Chapter 2 of this report.

In Chapter 4, a hydraulic analysis of Grandview's existing collection system using projected flows for ultimate buildout was analyzed. The purpose of analyzing the collection system at full build-out is to provide some foresight when estimating pipe size requirements to alleviate potential future problems with the collection system at Year 2028. Current pipe manufacturing technologies, primarily PVC and HDPE products, allow for pipelines to be installed in the ground and remain functional for several decades without the need for replacement (provided the pipe has sufficient capacity for the collection system needs). As such, collection system pipe requiring replacement due to capacity issues in year 2028 will be analyzed against the ultimate buildout to determine the pipe size upgrade required to accommodate the flows at ultimate buildout.

Unit Flow Rates

The hydraulic analysis is based on unit flow rates from different land uses within the existing and year 2028 collection system basins. The unit flow rates, identical to the ones used in the hydraulic analysis of the existing system in Chapter 3, are assigned to the various basins based upon those future land use designations. Those unit flow rates are:

Residential .....0.0015 MGD/Acre
Commercial.....0.0010 MGD/Acre
Industrial .....0.0030 MGD/Acre
Schools .....0.0005 MGD/Acre

Public .....0.0005 MGD/Acre

Collection System Hydraulic Analysis Results

The hydraulic analysis examined the existing and proposed year 2028 sewer network at normal and peak flows generated by the projected year 2028 development and buildout within both the City and the UGA. Flows from the year 2028 collection basins were modeled and routed through the existing collection system to examine system capacity and determine potential problem areas. Results of this hydraulic analysis, and year 2028 buildout, identified no potential problems within the existing collection system.

There were no pipe capacity deficiencies noted for the year 2028 development.

Lift Stations Hydraulic Analysis Results

The capacity of the existing lift stations and their ability to meet existing system demands was discussed in Chapter 3. The year 2028 lift station hydraulic analysis was similar to the analysis of the collection system, using the same unit area flow rates and peaking factor equations. Projected flows for the year 2028 development and buildout condition are compared in Table 5-2 with the existing lift station capacities.

TABLE 5-2 YEAR 2028 DEVELOPMENT SEWAGE LIFT STATION PEAK FLOWS

Station No.	Station	Current Station Capacity*	Modeled Year 2028 Peak Flow
1	Butternut	300 gpm	240 gpm
2	Cherry Lane	200 gpm	21 gpm
3	Ballpark	40 gpm	3 gpm
4	W. Wine Country Rd.	600 gpm	53 gpm
5	Stover Road	350 gpm	368 gpm
6	Forrest Road	2,000 gpm	941 gpm
7	Euclid Road	8,400 gpm	2,862 gpm

*Capacity with largest pump out of service.

All the current lift stations have sufficient capacity to accommodate for the year 2028 projected flows.

Force Mains Hydraulic Analysis Results

The ability of the existing force mains to meet existing system demands was discussed in Chapter 3. It is desirable to continue to use the existing force mains as long as possible. Year 2028 force main hydraulic analysis was similar to the existing flow analysis of lift stations, using the projected peak flow rates from the model. Projected forcemain velocities for the year 2028 development condition are compared in Table 5-3 with the desired force main velocities.

TABLE 5-3 YEAR 2028 DEVELOPMENT FORCE MAIN VELOCITIES

Force Main No.	Year 2028 Development Pumping Rate*	Force Main Diameter	Desired Velocity	Year 2028 Development Velocity*
1	300 gpm	6 inch	2 to 8 feet/second	3.40 ft/sec**
2	200 gpm	6 inch	2 to 8 feet/second	2.27 ft/sec**
3	40 gpm	3 inch	2 to 8 feet/second	1.82 ft/sec**

4	600 gpm	6 inch	2 to 8 feet/second	6.81 ft/sec**
5	368 gpm	6 inch	2 to 8 feet/second	4.18 ft/sec
6	1,400 gpm	12 inch	2 to 8 feet/second	3.97 ft/sec**
7	4,300 gpm	24 inch	2 to 8 feet/second	3.05 ft/sec**

* Pumping rate and velocity with one pump in operation.
** Identical to existing velocity as the existing lift station has adequate capacity.

All force main velocities were within the maximum desired velocity of 8 feet per second at year 2028.

CHAPTER 6
TREATMENT AND DISPOSAL FACILITIES

6.1 EXISTING WASTEWATER TREATMENT FACILITIES

The Grandview Wastewater Treatment Facility is located south of the City of Grandview, on the south side of the Yakima River, just east of Euclid Road. Originally constructed at this location in 1967, the facility currently incorporates two separate treatment processes, one that utilizes a mechanical treatment process with discharge of treated effluent to the Yakima River, and one that utilizes a lagoon treatment process with discharge of treated effluent via land application. Both processes share the Euclid Road Lift Station (which pumps wastewater from the City across the Yakima River to the treatment facility), a primary clarifier, and an aerated lagoon.

Wastewater pumped from the Euclid Lift Station flows into the primary clarifier. Information on the primary clarifier is provided in Table 6-1.

TABLE 6-1 PRIMARY CLARIFIER	
Primary Clarifier (1 each)	
Diameter	80 Feet
Depth	12 Feet
Overflow Rate: Average Day Maximum Day	 320 Gallons per Day/Square Foot 1,330 Gallons per day/Square Foot

The clarifier effluent flows to a diversion box where it can be routed to Aerated Lagoon No. 1, or can be routed to Aerated Lagoon A.

Constructed in 1998, Aerated Lagoon No. 1 has a surface area of 6 acres, an average depth of 12 feet, and a volume of 17 million gallons. Within the lagoon, wastewater is aerated by 8 floating 75 hp surface aerators. Information on Aerated Lagoon No. 1 is provided in Table 6-2.

TABLE 6-2 AERATED LAGOON NO. 1	
Aerated Lagoon No. 1 (1 each)	
Average Daily Flow Average Daily Maximum Month	 1.76 MGD 3.00 MGD
Loading Average Daily BOD Maximim Month BOD Average Daily TSS Maximum Month TSS	 18,560 lbs/day 49,920 lbs/day 4,320 lbs/day 10,520 lbs/day
Surface Area; Average Depth; Volume	6.0 Acres; 12.0 Feet; 17 Million Gallons
Detention Time Average Day Maximum Month	 13.6 Days 8.0 Days
Aerators, Type	8 each, Floating Surface
Aerator Power	75 HP each; 600 HP total

Effluent from Aerated Lagoon No. 1 can be routed to the mechanical treatment process, or can be routed to the lagoon treatment process.

Mechanical Treatment Process

Exiting from the Aerated Lagoon No. 1, wastewater enters the mechanical (activated sludge) treatment process and is pumped by the influent pump station to one of two sets of anoxic selector basins. Each set of anoxic selector basins consists of two tanks, where the conditioning of the biological organisms occurs resulting in improved nitrogen and phosphorus removal from the wastewater and improved settling qualities of the activated sludge. Following the anoxic selector basins, wastewater flows to one of two aeration basins where most of the biological treatment of wastewater occurs, and the wastewater is converted to activated sludge. Each aeration basin has a volume of 800,000 gallons. Mixing and aeration of the activated sludge is accomplished by two 100 hp aerators in each basin.

Activated sludge flows by gravity from the aeration basins to one of two center feed final clarifiers (activated sludge settling tanks), where the denser (sludge) portion of the activated sludge is separated from the lighter clarified portion. Each clarifier is 50 feet in diameter, 15 feet deep, with a volume of 220,000 gallons and a surface area of 1,962 square feet. Within each clarifier, settled solids are conveyed by circular sweepers to the clarifier center well. From there, sludge is either recirculated to the treatment process by pumping through one of three return activated sludge pumps to the anoxic selector basins, or is removed from the treatment process by pumping through one of two waste activated sludge pumps to the sludge treatment process. Effluent from the clarifiers gravity flows to the ultraviolet disinfection system.

The ultraviolet disinfection system consists of one channel containing 160 low pressure UV lamps, with a capacity of 1.5 MGD. Disinfected effluent from the ultraviolet disinfection system is discharged to the Yakima River via a 600-foot long 18-inch ductile iron and HDPE outfall pipe.

Information on mechanical treatment process is provided in Table 6-3.

TABLE 6-3 MECHANICAL TREATMENT PROCESS	
Influent Pump Station (1 each)	
Number of Pumps	3
Size; Type; Power	4-inch; Submersible; 10 HP
Capacity	525 GPM each at 39 Feet TDH
Drive	Variable Speed
Anoxic Selector Basins (4 each)	
Volume	230,000 Gallons Each
Mixers	Vertical Turbine
Power; Drive	15 HP; Variable Speed
Aeration Basins (2 each)	
Volume	800,000 Gallons Each; 1,600,000 Gallons Total
Detention Time (50% RAS at 1.5 MGD ave. flow)	17.1 Hours
Aerator Type; Number	Vertical Turbine; 2 Each Basin; 4 Total
Aerator Power	100 HP each
Recirculation Pumps; Power	1 per Basin (2 Total); 7.5 HP each
Clarifiers (2 each)	
Diameter; Side Water Depth	50 Feet; 15 Feet
Volume	220,000 Gallons each
Surface Area	1,962 Square Feet each
Mechanism Type	Center Feed

Operation	Parallel
Weir Type; Weir Length	Peripheral; 157 Feet Each (314 Feet Total)
Return Activated Sludge Pumps (3 each)	
Size; Type	8-Inch; Self-Priming Centrifugal
Capacity	1,050 GPM each at 36 Feet TDH
Power; Drive	20 HP each; Variable Speed
Waste Activated Sludge and Clarifier Scum Pumps (2 each)	
Size; Type	4-Inch; Self-Priming Centrifugal
Capacity	350 GPM each at 50 Feet TDH
Power; Drive	15 HP each; Variable Speed
Ultraviolet Disinfection System (1 each)	
Capacity; Number of Channels	1.5 MGD; 1
Lamp Number; Type	160; Low Pressure

Lagoon Treatment Process

Effluent from the primary clarifier flows to a diversion box where it can be routed to Aerated Lagoon No. 1 or can be routed to Aerated Lagoon A.

The lagoon treatment process consists of a series of five lagoons, also called cells. These cells, which are in fact natural depressions in basalt scab land, provide wastewater treatment and a portion of the needed winter storage volume when land application is not possible.

Mechanical aeration is provided in Lagoon A, and the remaining cells rely upon natural means to provide necessary aeration for biological treatment. Aeration in Lagoon A is provided by twenty, 20 horsepower floating horizontal aspirated aerators. Flow through the treatment cells is by gravity. From Lagoon A, wastewater passes to Lagoon B, then the flow divides into the C and D lagoons. Flow then recombines in the E/F Lagoon, from which effluent is discharged to the chlorine contact disinfection system and then pumped to the irrigation sprayfields or to other storage facilities. The treatment cells also provide a large surface area for disposal of wastewater by evaporation. Lagoons B through E/F can also provide a significant portion of the winter storage volume by varying the operating levels in the cells.

No means of solids removal is provided other than the removal of settled solids from the primary clarifier. As a result, all solids introduced into the flow stream or generated by the biological treatment process are either deposited on the lagoon bottoms or are passed through the process in the effluent.

A number of winter storage ponds surround the treatment lagoons. As with the treatment cells, these winter storage ponds consist of natural basalt depressions whose purpose in the treatment process is to provide storage of wastewater through the winter months when irrigation is not possible, although it is recognized that additional wastewater treatment does occur in these ponds. A side benefit of the winter storage ponds is the large surface area created for disposal of wastewater by evaporation. These winter storage ponds are filled in a number of ways depending on their relationship to the treatment cells, including gravity flow, discharge from the treatment process recirculation pipeline, pumping directly from the treatment cells or adjacent winter storage ponds, and discharge from the land application irrigation system. In the summer, stored water is returned to the treatment lagoons for disposal via land application. The return of water to the treatment lagoons is accomplished by gravity flow or by pumping back to the lagoons. Some winter storage ponds rely only on evaporation to remove their stored contents.

The portion of the effluent designed for land application, or for discharge to the East Game Ponds, the West Game Ponds, and to the diked valley can be disinfected in the chlorine contact tank disinfection system. The chlorine contact tank disinfection system consists of two compartments, each with a volume of 48,000 gallons. Both compartments of the chlorine contact tank combined have a detention time of 60 minutes at an average daily flow of 1,600 GPM.

The East Game Ponds are used for storage and disposal of wastewater. This series of man-made ponds, created by filling basalt depressions with treated effluent, is operated under an agreement with the Washington State Department of Fish and Wildlife to provide waterfowl habitat. Discharge to the East Game Ponds is accomplished by pumping treated effluent from the chlorine contact disinfection system.

The diked valley, an area of five man-made lagoons near the East Game Ponds, was constructed by the City of Grandview to create additional winter storage volume. The area has very sandy soils, and in the past demonstrated a significant ability to percolate wastewater. The diked valley has not been used for winter storage or disposal of wastewater since 2002.

The West Game Ponds are also used for storage and disposal of wastewater, and, like the East Game Ponds, are operated under an agreement with the Washington State Department of Fish and Wildlife to provide waterfowl habitat. Unlike the East Game Ponds, these ponds are natural and not man-made. Discharge to the West Game Ponds is accomplished by pumping treated effluent from the chlorine contact disinfection system. The West Game Ponds have not been used for winter storage or disposal of wastewater since 2004.

Land application of treatment and disinfected effluent is the method of disposal in the lagoon treatment process. Seven sprayfield areas are available for disposal of treated effluent, and are supplied treated wastewater from the chlorine contact chamber's irrigation pump.

Information on lagoon treatment process is provided in Table 6-4.

TABLE 6-4 LAGOON TREATMENT PROCESS

Lagoon Treatment Cells	
Average Surface Area	
Lagoon A	596,550 Square Feet
Lagoon B	762,650 Square Feet
Lagoon C	269,100 Square Feet
Lagoon D	192,500 Square Feet
Lagoon E/F	1,385,500 Square Feet
Total	3,206,300 Square Feet
Estimated Maximum Storage Volume	
Lagoon A	4.46 Million Gallons
Lagoon B	28.52 Million Gallons
Lagoon C	12.08 Million Gallons
Lagoon D	7.20 Million Gallons
Lagoon E/F	53.89 Million Gallons
Total	106.15 Million Gallons
Winter Storage Ponds	
Average Surface Area (Total)	3,198,250 Square Feet
Estimated Maximum Storage Volume (Total)	102.50 Million Gallons
East Game Ponds	
Average Surface Area	16,622,550 Square Feet
Diked Valley	
Average Surface Area	97,400 Square Feet
West Game Ponds	

Average Surface Area	774,000 Square Feet
Land Application (Sprayfield) Areas	
Area Available for Land Application	
"A" Cell Sprayfield	26.4 Acres
60-Acre Solid Set Sprayfield	45.0 Acres
Full Circle Center Pivot Sprayfield	28.5 Acres
Half Circle Center Pivot Sprayfield	57.6 Acres
Big Gun Solid Set Sprayfield	38.9 Acres
Extension 13 Solid Set Sprayfield	17.6 Acres
East Game Solid Set Sprayfield	22.1 Acres
Total	236.1 Acres

Information on lagoon treatment process disinfection system is provided in Table 6-5.

TABLE 6-5 LAGOON TREATMENT DISINFECTION SYSTEM	
Chlorine Contact Tank System	
Design Flow Average Daily Flow Maximum Daily Flow Peak Design Flow	 1,600 GPM 3,600 GPM 4,800 GPM
Detention Time At Average Daily Flow At Maximum Daily Flow At Peak Design Flow	 60 Minutes 27 Minutes 20 Minutes
Normal Operating Depth	12 Feet
Length to Width Ratio	40:1
Tank Volume North Half South Half Total	 48,000 Gallons 48,000 Gallons 96,000 Gallons
Maximum Chlorine Feed Rate	500 lbs/day
Chlorine Induction Unit Type Mixer Speed Power Vacuum Contact Time (max day)	 Submerged Propeller 3450 RPM 3.0 HP 14 Inches of Mercury 0.9 Minutes

6.2 BIOSOLIDS PROCESSING FACILITIES

Solids are removed from three locations within the waste stream: the primary clarifier and both mechanical treatment process secondary clarifiers. Solids that settle to the bottom of the primary clarifier are routed to the City's aerated sludge holding tank where they are combined with solids that are removed from the mechanical treatment process secondary clarifiers. After aeration in the sludge holding tank, sludge is dewatered in the belt filter press. Polymer is added prior to dewatering in the belt filter press to aid in the dewatering process. Following the belt filter press, biosolids are transported to the biosolids drying area, and are then stored at the biosolids storage area.

Information on the biosolids processing facilities is provided in Table 6-6.

TABLE 6-6 BIOSOLIDS PROCESSING FACILITIES	
Sludge Holding Tank (1 each)	
Capacity	250,000 Gallons
Sludge Rotary Positive Displacement Blower (1 each)	
Capacity	400 to 1,000 SCFM at 10 PSIG
Motor Speed	2,100 RPM
Sewage Grinder (1 each)	
Capacity	800 GPM at 5% Solids
Sludge Feed Pumps (3 each)	
Type	Centrifugal; 4-Inch; Non-Clog
Capacity	400 GPM at 60 TDH

Power; Drive	15 HP; Variable Speed
Belt Filter Press (2 each)	
Feed Solids Concentration	0.5% to 3.0%
Hydraulic Loading Rate	400 GPM each unit (maximum)
Capacity of Solids Throughput	500 to 3,800 lbs/hour each unit
Minimum Solids Concentration in Cake	18% at 200 GPM, 1,500 lbs Solids/hr feed
Minimum Solids Capture	94%
Polymer Feed System (1 each)	
Dry Polymer Availability	40 Pounds per Hour
Design Solution Concentration	0.5%
Mix Tank Usable Capacity	1,000 Gallons
Feed Tank Usable Capacity	1,500 Gallons
Transfer Pump Minimum Capacity; Power	100 GPM; 7.5 HP
Neat Polymer Metering Pump Type	Rigid Stator Progressive Cavity
Neat Polymer Metering Pump Capacity; Max Speed	50 GPH; 585 RPM
Solution Metering Pump Type	Rigid Stator Progressive Cavity
Solution Metering Pump Capacity; Speed	8 GPM; 400 RPM
Dewatered Biosolids Conveyor (1 each)	
Capacity	8 Tons per Hour at 12% to 18% Solids Content
Biosolids Drying Beds	
Total Drying Area	183,000 Square Feet

Following storage, the biosolids are, or may be utilized in one of five ways, these being:

1. Utilized as a component of final cover on the City of Grandview's Landfill Area No. 2, which is located within the wastewater treatment area boundary. A 12 acre area is available for biosolids utilization at this location;

2. Utilized as a component of intermediate landfill cover at Yakima County's Cheyne Landfill;

3. Utilized by Natural Selection Farms, an approved biosolids utilization facility, on agricultural lands in Yakima, Benton, and Klickitat counties;

4. Utilized by agricultural crops on approximately 331 acres of Washington Department of Fish and Wildlife land at the Byron, Biffen, and Rupley-Snipes sites near the cities of Sunnyside and Grandview in Yakima County; and

5. Utilized on yet to be identified agricultural lands within Yakima County.

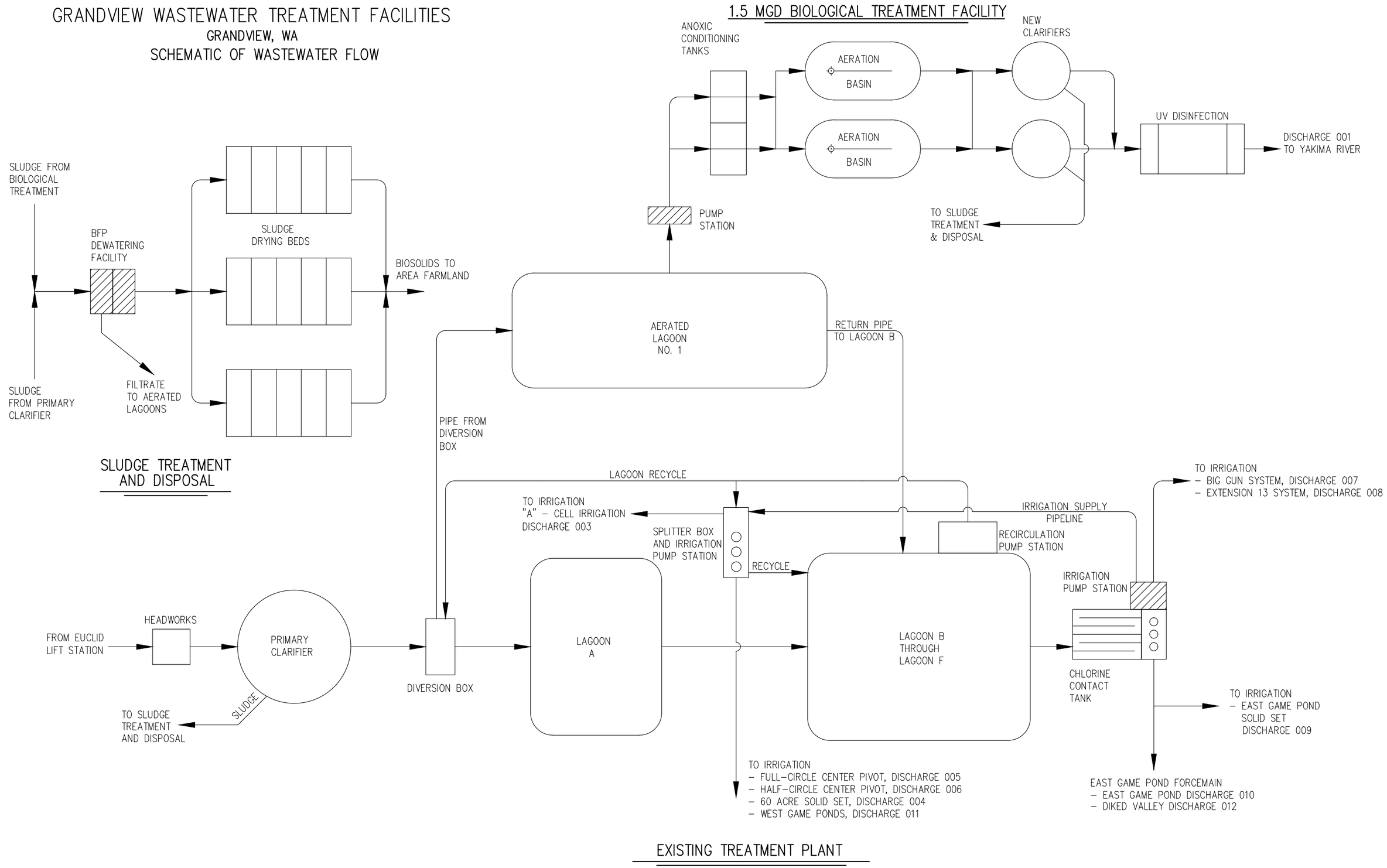
The location of the various components of the Grandview Wastewater Treatment Facilities is shown on Figure 6-1. A schematic of the treatment process is provided on Figure 6-2.

Insert Figure 6-1

GRANDVIEW WASTEWATER TREATMENT FACILITIES

GRANDVIEW, WA

SCHEMATIC OF WASTEWATER FLOW



P:\PROJECTS\2008\08032\Grandview WWTP Process Flow Diagram.dwg

FIGURE 6-2

6.3 PERMIT EFFLUENT LIMITS AND EFFLUENT QUALITY

Grandview's NPDES permit contains three sets of effluent limits, one for the discharge of treated effluent to the Yakima River, one for the discharge of treated effluent to the City's sprayfields, and one for the discharge of treated effluent to the non-overflow pond system. Table 6-7 presents the effluent limits applicable to the discharge of treated effluent to the Yakima River.

TABLE 6-7 YAKIMA RIVER EFFLUENT LIMITATIONS

Parameter	Average Monthly[a]	Average Weekly[a]
BOD[b] (5 day)	30 mg/l; 375 lbs/day	45 mg/l; 563 lbs/day
TSS[b]	30 mg/l; 375 lbs/day	45 mg/l; 563 lbs/day
Fecal Coliform Bacteria	100/100 ml	200/100 ml
pH	Daily minimum is equal to or greater than 6 and daily maximum is less than or equal to 9.[c]	
Parameter	**Average Monthly**	**Daily Maximum[d]**
Total Ammonia (NH_3-N)	7.1 mg/l	12.3 mg/l

[a] The average monthly and weekly effluent limitations are based on the arithmetic mean of the samples taken with the exception of fecal coliform, which is based on the geometric mean.
[b] The average monthly effluent concentration for BOD and for TSS shall not exceed 30 mg/l or 15 percent of the respective monthly average influent concentrations, whichever is more stringent.
[c] Indicates the range of permitted values.
[d] The maximum daily effluent limitation is defined as the highest allowable daily discharge. The daily discharge means the discharge of a pollutant measured during a calendar day.

Table 6-8 presents the effluent limits applicable to the discharge of treated effluent to the City's spray-fields.

TABLE 6-8 SPRAYFIELD EFFLUENT LIMITATIONS

Parameter	Average Monthly[a]	Average Weekly[a]
Soluble BOD (5 day) Loading	20 lbs/acre/day	N/A
TSS	135 mg/l	203 mg/l
pH	Daily minimum is equal to or greater than 6 and daily maximum is less than or equal to 10.[b]	
Parameter	**Average Monthly**	**Daily Maximum[c]**
Fecal Coliform Bacteria	N/A	200/100 ml

[a] The average monthly and weekly effluent limitations are based on the arithmetic mean of the samples taken with the exception of fecal coliform, which is based on the geometric mean.
[b] Indicates the range of permitted values.
[c] The maximum daily effluent limitation is defined as the highest allowable daily discharge. The daily discharge means the discharge of a pollutant measured during a calendar day.

Table 6-9 presents the effluent limits applicable to the discharge of treated effluent to the non-overflow pond system.

TABLE 6-9 NON-OVERFLOW POND SYSTEM EFFLUENT LIMITATIONS		
Parameter	Average Monthly[a]	Average Weekly[a]
BOD (5 day)	45 mg/l	65 mg/l
TSS	75 mg/l	112 mg/l
pH	Daily minimum is equal to or greater than 6 and daily maximum is less than or equal to 10.[b]	
Parameter	Average Monthly	Daily Maximum[c]
Fecal Coliform Bacteria	N/A	200/100 ml

[a] The average monthly and weekly effluent limitations are based on the arithmetic mean of the samples taken with the exception of fecal coliform, which is based on the geometric mean.
[b] Indicates the range of permitted values.
[c] The maximum daily effluent limitation is defined as the highest allowable daily discharge. The daily discharge means the discharge of a pollutant measured during a calendar day.

A copy of the City's NPDES Permit is included in the Appendix of this Plan.

Effluent Quality - Yakima River Discharge

The average monthly effluent quality for BOD discharged to the Yakima River during the period 2003 through 2007 is presented in Table 6-10.

TABLE 6-10 AVERAGE MONTHLY BOD EFFLUENT QUALITY 2003 - 2007

	2003		2004		2005		2006		2007	
	mg/l	lbs/day	mg/l	lbs/day	mg/l	lbs/day	mg/l	lbs/day	mg/l	lbs/day
January	5	32	5	45	2	19	3	29	4	35
February	5	37	8	78	2	18	5	50	4	35
March	3	20	4	37	3	25	5	45	2	21
April	5	35	3	27	3	19	4	33	3	33
May	5	30	4	35	2	13	2	16	4	43
June	4	24	4	44	4	26	3	23	2	18
July	3	18	3	29	2	13	3	26	4	38
August	2	15	3	35	2	13	2	17	2	11
September	5	50	4	45	2	14	2	18	4	40
October	6	43	4	34	3	33	4	44	4	43
November	4	31	2	22	5	42	3	32	6	71
December	4	35	3	25	3	24	5	48	5	51
Annual Ave.	4	31	4	38	3	22	3	32	4	37
Permit Limit	30	375	30	375	30	375	30	375	30	375

The average monthly effluent quality for TSS discharged to the Yakima River during the period 2003 through 2007 is presented in Table 6-11.

TABLE 6-11 AVERAGE MONTHLY TSS EFFLUENT QUALITY 2003 - 2007										
	2003		2004		2005		2006		2007	
	mg/l	lbs/day	mg/l	lbs/day	mg/l	lbs/day	mg/l	lbs/day	mg/l	lbs/day
January	9	58	13	116	4	39	5	49	10	87
February	18	132	15	146	5	45	11	110	7	62
March	12	79	12	111	8	66	11	99	4	41
April	18	126	6	53	5	32	7	57	6	65
May	10	59	10	88	6	38	5	40	9	97
June	6	36	11	121	4	26	10	78	6	53
July	6	36	10	98	5	32	9	77	7	67
August	5	37	4	46	4	26	6	50	4	23
September	6	61	7	79	3	21	3	27	6	61
October	12	86	9	76	4	44	11	121	10	108
November	12	94	3	33	9	75	9	95	16	188
December	20	173	10	83	7	57	13	125	15	154
Annual Ave.	11	81	9	88	5	42	8	77	8	84
Permit Limit	30	375	30	375	30	375	30	375	30	375

The average monthly effluent quality for fecal coliform bacteria discharged to the Yakima River during the period 2003 through 2007 is presented in Table 6-12.

TABLE 6-12 MONTHLY FECAL COLIFORM BACTERIA EFFLUENT QUALITY 2003 - 2007					
	2003	2004	2005	2006	2007
January	6	6	1	2	1
February	16	3	2	1	1
March	4	6	0	4	1
April	6	3	5	2	2
May	15	4	10	8	7
June	25	3	21	4	21
July	29	7	14	7	6
August	59	7	7	19	17
September	35	2	3	68	7
October	14	4	5	4	8
November	3	1	1	2	2
December	3	4	3	2	6
Annual Average	18	4	6	10	7

Permit Limit	100	100	100	100	100

The minimum and maximum effluent quality for pH discharged to the Yakima River during the period 2003 through 2007 is presented in Table 6-13.

TABLE 6-13 MONTHLY MINIMUM AND MAXIMUM pH EFFLUENT QUALITY 2003 - 2007

	2003		2004		2005		2006		2007	
	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max
January	6.94	8.05	7.01	8.13	7.46	7.99	7.32	8.06	7.53	8.08
February	7.73	8.11	7.37	7.90	7.19	8.05	7.58	8.03	7.41	8.26
March	7.54	8.89	7.23	7.98	7.35	8.02	7.60	8.38	7.36	7.91
April	7.34	8.01	7.33	7.88	7.67	8.00	7.59	8.69	7.61	8.00
May	6.42	8.12	7.27	8.01	7.27	7.98	7.45	8.28	7.08	7.94
June	7.20	7.98	7.42	7.97	7.71	8.17	7.72	8.25	7.65	8.00
July	7.45	8.09	7.30	7.97	7.54	8.11	7.77	8.23	7.36	8.03
August	7.60	8.10	7.34	7.85	7.76	8.10	7.67	8.24	7.60	8.02
September	7.47	8.01	7.61	8.00	7.82	8.10	7.55	8.29	7.58	8.09
October	7.59	8.00	7.49	7.85	7.77	8.02	7.91	8.17	7.75	8.05
November	7.58	8.07	7.18	7.93	7.50	8.02	7.44	8.10	7.54	8.00
December	6.98	8.15	7.51	8.05	7.61	7.85	7.32	7.93	7.30	7.97
Permit Limit	6.0	9.0	6.0	9.0	6.0	9.0	6.0	9.0	6.0	9.0

The minimum and maximum effluent quality for ammonia discharged to the Yakima River during the period 2003 through 2007 is presented in Table 6-14.

TABLE 6-14 MONTHLY AVERAGE AND DAILY MAXIMUM AMMONIA EFFLUENT CONCENTRATIONS 2003 – 2007
(values are in mg/l)

	2003		2004		2005		2006		2007	
	Ave	Max	Ave	Max	Ave	Max	Ave	Max	Ave	Max
January	1.00	1.00	0.13	0.19	11.20	22.30	0.07	0.07	0.18	0.28
February	1.00	1.00	0.09	0.11	1.08	2.09	0.08	0.08	1.12	2.17
March	8.56	11.60	0.07	0.07	2.54	4.99	0.26	0.45	0.16	0.25
April	0.12	0.17	3.69	7.31	0.07	0.07	0.83	1.59	0.07	0.07
May	0.16	0.23	0.12	0.16	0.07	0.07	0.07	0.07	0.09	0.09
June	0.25	0.36	0.10	0.12	0.07	0.07	0.32	0.32	0.07	0.07
July	0.07	0.07	0.07	0.07	0.10	0.12	0.16	0.18	0.20	0.27
August	0.07	0.07	0.07	0.07	0.07	0.07	0.15	0.23	0.10	0.14
September	0.08	0.08	0.07	0.07	0.07	0.07	0.07	0.07	0.24	0.41

October	0.08	0.09	0.14	0.22	0.34	0.62	0.08	0.09	0.26	0.27
November	0.07	0.07	0.12	0.15	0.08	0.09	0.07	1.02	1.54	1.96
December	1.00	2.00	8.67	16.90	0.08	0.09	0.10	0.14	0.14	0.14
Permit Limit	7.1	12.3	7.1	12.3	7.1	12.3	7.1	12.3	7.1	12.3

Effluent Quality - City Sprayfield Discharge

The City of Grandview had no discharge of treated effluent to its effluent sprayfields during the period of 2003 through 2007.

Effluent Quality - Non-Overflow Pond System

The City of Grandview discharged treated effluent to the non-overflow pond system during portions of two months (February and March) during the period of 2003 through 2007. The effluent quality discharged during this period was within permitted limits.

6.4 FUTURE WASTEWATER LOADING PROJECTIONS

Forecasts for future loadings for flow, BOD and TSS to the Grandview Wastewater Treatment Facility for the years 2013, 2018, 2023, and 2028 were previously presented in Chapter 2 of this Plan, and are again presented in Table 6-15.

TABLE 6-15 FUTURE WASTEWATER LOADING PROJECTIONS

	Year 2013	Year 2018	Year 2023	Year 2028
Service Population	10,092	10,952	11,884	12,895
Annual Average Flow (MGD)	1.96	2.13	2.31	2.51
Maximum Monthly Flow (MGD)	3.18	3.45	3.74	4.06
Annual Average BOD_5 Loading (lbs/day)	16,471	17,873	19,395	21,046
Maximum Month BOD_5 Loading (lbs/day)	27,209	29,525	32,038	34,765
Annual Average TSS Loading (lbs/day)	12,955	14,057	15,254	16,553
Maximum Month TSS Loading (lbs/day)*	23,328	25,314	27,469	29,807

* 2007 Maximum Month TSS value of 26,153 lbs/day has been reduced by 5,000 lbs/day for the purpose of future total suspended solids loading projections as discussed in Chapter 2.

6.5 FACILITY DESIGN LIFE

For projecting the design life of Grandview's treatment system, only the entire facility will be evaluated because the City can route loading to either the aerated lagoon / facultative lagoon process or to the mechanical plant depending on the situation. Thus, while loading for a particular month may indicate that either the aerated lagoon / facultative lagoon process, or the mechanical plant may be approaching design capacity, simply re-routing influent loading can alter that situation significantly.

The design capacity of the entire facility, previously presented in Chapter 2 of this Plan, and used as the basis for determining when capacity of the facility will be reached is as follows:

Average Flow for the Maximum Month	4.95 MGD
Maximum Monthly BOD Loading	86,000 lbs/day

Maximum Monthly TSS Loading	30,000 lbs/day

Based on these values, and an annual growth rate of 1.6473%, the design capacity of the treatment plant will be reached as follows:

Hydraulic Capacity

2007 Maximum Month Loading	=	2.88 MGD
WWTP Maximum Month Design Capacity	=	4.95 MGD
* Year Design Capacity is Reached	=	2040

BOD Capacity

2007 Maximum Month Loading	=	24,668 lb/day
WWTP Maximum Month Design Capacity	=	86,000 lb/day
* Year Design Capacity is Reached	=	2084

TSS Capacity

2007 Maximum Month Loading (adjusted)**	=	21,150 lb/day
WWTP Maximum Month Design Capacity	=	30,000 lb/day
* Year Design Capacity is Reached	=	2029

* 2006 Maximum Month Loadings are used in the final calculation to determine the year design capacity is reached.

** 2007 Maximum Month TSS loading value of 26,153 lbs/day has been reduced by 5,000 lbs/day for the purpose of future total suspended solids loading projections.

CHAPTER 7
CAPITAL IMPROVEMENT PLAN

7.1 GENERAL

In the previous sections of this General Sewer Plan, deficiencies in the existing City of Grandview wastewater collection system have been identified and the collection system necessary to serve future development within the City and its UGA presented. However, specific improvements to the system have been deferred to this chapter of the Plan and are presented below. Recommendations address both current and future capacity related items, as well as maintenance related items.

7.2 EXISTING SYSTEM IMPROVEMENTS

Existing Capacity Improvements

The hydraulic analysis model of the existing collection system identified no areas where current capacity at existing peak wastewater flows is insufficient.

Maintenance Related Improvements

The City has identified 18 sections of sewer pipe that have root, grease and debris problems, which require regular cleaning and maintenance.

The City should further investigate these high maintenance areas using TV inspection of each problem area. Confirmed root problem areas due to broken pipes or offset joints should be scheduled for replacement as City sewer funds become available. The source or sources of grease problem areas should be identified, and the City should work with those system users to eliminate or reduce their discharge of grease. Pipes that are known to have periodic debris or gravel issues should identify the source and eliminate or reduce the problem.

The City has implemented a 3 month, 6 month and 12 month rodding program to eliminate collection system blockage. The rodding program has significantly reduced collection system issues and has eliminated the need for maintenance related sewer line replacement at this time.

7.3 UGA BUILDOUT IMPROVEMENTS

It is impractical to initially construct all facilities needed to serve the full UGA buildout, particularly when it is unknown when such full buildout will occur. However, full UGA needs should be considered when evaluating improvements to the existing system and when service is extended into new areas. That is, the upgrade of existing facilities and the extension of sewers into the UGA should consider what full development of those areas will require. In that manner, the City will avoid having to prematurely replace new or upgraded facilities.

Capacities of the lift stations to accommodate projected wastewater from year 2028 and from ultimate buildout are shown on Table 7-1.

TABLE 7-1 SEWAGE LIFT STATION CAPACITIES

Station No.	Station Name	Current Station Capacity*	Current Modeled Peak Flow	Year 2028 Peak Flow*	Ultimate Buildout Peak Flow*
1	Butternut	300 gpm	196 gpm	240 gpm	343 gpm
2	Cherry Lane	200 gpm	21 gpm	21 gpm	21 gpm
3	Ballpark	40 gpm	3 gpm	3 gpm	3 gpm
4	West Wine Country Road	600 gpm	53 gpm	53 gpm	650 gpm
5	Stover Road	350 gpm	3 gpm	368 gpm	3 gpm
6	Forrest Road	2,000 gpm	471 gpm	941 gpm	2,599 gpm
7	Euclid	8,400 gpm	2,259 gpm	2,862 gpm	7,885 gpm
* Capacity with largest pump out of service.					

As the above table shows, the analysis determined Lift Station Numbers 1, 4 and 6 would need increased capacity to accommodate for the projected flows at ultimate buildout. The current lift stations, with the exception of Lift Station Number 5 (Stover Road), will have sufficient capacity to accommodate for year 2028 projected flows. Due to the small difference between the existing lift station capacity and the capacity required for year 2028 projected flows, it is recommended that Stover Road Lift Station performance be monitored closely over the next 20 years. No modifications to the Stover Road Lift Station are being proposed at this time.

7.4 FUNDING SOURCES

Funds may be available for financing the proposed improvements from several sources. Those considered in this section are listed below:

1. Local Public Enterprise Funds.
2. Use of Local Public Powers.
3. State Assisted or Guaranteed Resources.
4. Federally Assisted or Guaranteed Resources.
5. Private Development.

Available funding is limited in a number of these five sources. Many also restrict the use of funds to certain projects, while other sources limit their participation to a percentage of the total cost. Each of these categories are described briefly below.

1. Local Public Enterprise Funds

Reserves in the Enterprise Fund are accumulated from revenues from sewer user fees. The amount of the reserves will depend on the balance of operation and maintenance costs of the system versus total revenue generated by the fees. These reserves may be used to finance any sewer system related project approved by the City Council.

Funds for a future project may be generated by increases in user fees, thus building the reserves in the Enterprise Fund. With this method of financing, often called the "pay-as-you-go" approach, the City is collecting interest on the reserves as opposed to paying interest on a loan balance. One method used by some communities to accumulate reserves is through the development of a capital recovery charge system. This approach is similar to assessing connection fees, except the amount is based on the capital costs of constructing collection system trunk lines and treatment facilities, and the collected funds are usually set aside as capital reserves for future projects.

2. Use of Local Public Powers

The use of local public powers consists of three primary bonding techniques including general obligation bonds, special assessment bonds, and revenue bonds. There are advantages and disadvantages to each. The type of bond issued to finance a community improvement depends in part on custom and in part on the circumstances of a particular offering. General information about the three principal types of municipal bonds follows:

GENERAL OBLIGATION BONDS pledge the unlimited taxing power and the full faith and credit of the issuing government to meet the required principal and interest payments.

SPECIAL ASSESSMENT BONDS (LID Bonds) are used to finance improvements where the property specially benefitted can be identified. Special assessment bonds are frequently used to make capital improvements in a particular neighborhood. Principal and interest payments for these bonds are made by the special assessment on the property benefitting from the improvement. Before special assessment bonds are issued, estimated costs are mailed to property owners, and a public hearing is held to allow the affected property owners to say whether or not they want the improvements. During a subsequent 30-day protest period, property owners may protest the improvements prior to City Council action formally establishing the project. Debt financed by special assessment bonds is not subject to debt limitations. This type of financing is typically not suited to treatment plant improvement projects or for construction of trunk sewers within a collection system. However, it is often used as a means to finance extension of sewers into a new service area.

REVENUE BONDS are frequently used to finance City-owned utilities, industrial parks, and other municipal public facilities. The bonds pledge the revenue from a particular revenue source to meet the principal and interest payments. Revenue bonds are appropriate debt instruments when the enterprise fund can be expected to generate sufficient revenue to meet both operating and debt service cost. Revenue bonds generally do not become a general obligation of the government issuing them. Communities may have to pay higher rates of interest on these bonds than on general obligation bonds, because revenue bonds are considered less secure. However, revenue bonds also have an important advantage over general obligation bonds: the amount of the revenue bonds is not included in the amount of indebtedness subject to state debt limitations. The legal requirements for issuing revenue bonds are more complex than those for issuing general obligation bonds. When revenue bonds are issued, a special authority (e.g., Sewer Fund) operates the facility and a special revenue fund receives and disburses all funds. A trust agreement to provide for the monthly reimbursement of revenues and containing provisions to protect the bond holders must be formulated.

3. State Assisted or Guaranteed Resources

Three types of state administered funding sources are available for domestic wastewater system projects: the Centennial Clean Water Fund Program (administered by the Washington Department of Ecology), the State Revolving Fund Loan Program (administered by the Washington Department of Ecology), and the Public Works Trust Fund (administered by the Department of Community, Trade, and Economic Development).

The CENTENNIAL CLEAN WATER FUND was established in 1986, obtaining its money from a tax on tobacco products. Funds from this program are used for grants and loans to local governments for measures to prevent and control water pollution. Up to two-thirds of the funds in this program can be used for activities and facilities related to point source discharges. The Centennial Program will fund up to 50% of the total eligible project costs. Applications are accepted once a year. However, rules for these funds prohibit their use on projects where state or federal grants were previously awarded and the same objective achieved.

The STATE REVOLVING FUND provides low-interest loans to local governments for projects which improve and protect the state's water quality. Up to 100% of eligible project costs are fundable through this program. Applications are accepted once a year, concurrent with the Centennial Clean Water Fund applications.

The PUBLIC WORKS TRUST FUND was created in 1985 to provide loans for replacement of public works facilities. Applications for construction funds may be submitted once each year, and applications

for pre-construction funds (for such items as engineering design, bid document preparation, right of way acquisition, environmental studies, and infiltration/inflow studies) may be submitted anytime during the year. Current allocations of funds have been for a wide variety of projects including domestic wastewater projects. The interest rate on PWTF loans ranges from 0.5% to 2% depending on the amount of matching money provided by the City.

4. Federally Assisted or Guaranteed Resources

Three federally financed funding sources are available for domestic wastewater system construction: the USDA's Rural Development Program, the Economic Development Administration's Public Works Grants and Loans Program, and the Department of Housing and Urban Development's Community Development Block Grants administered by the State Department of Community, Trade, and Economic Development.

The USDA RURAL DEVELOPMENT PROGRAM is one of several programs established by RECD to provide public works assistance to small communities in rural areas. Public entities such as municipalities, counties, special purpose districts or authorities, Indian tribes, and nonprofit corporations or cooperatives are eligible in areas under 10,000 population. Priority will be given to public entities in areas smaller than 5,500 people to improve, enlarge, or modify a wastewater facility. Preference will also be given to requests which involve the merging of small facilities and those serving low-income communities. Loans and grant funds may be used to construct, repair, improve, expand, or otherwise modify rural wastewater collection and treatment systems. Targeted at the most needy communities, grants are designed to keep costs economical. Grants are limited to reducing the facility's per user annual costs for debt service to a minimum of 1% of the area's median family income. Loans in the past have also been available at a 5% to 10% interest rate for the useful life of the facility, or the statutory limit on the applicant's borrowing authority, or for a maximum of 40 years.

The PUBLIC WORKS GRANTS AND LOANS PROGRAM funded by the Economic Development Administration (EDA) is used to encourage long-range development gains in jurisdictions where economic growth is lagging or where the economic base is shifting. The program provides public works and development facilities needed to attract new industry and provide business expansion. Financial aid may be used to acquire and develop land and improvements for public works and to acquire, construct, rehabilitate, alter, expand, or improve such facilities, including related machinery and equipment. When completed, such projects are expected to bring additional private investment to the area. Grandview has successfully used these funds for past water and wastewater system upgrades by showing demonstrable benefits to the local industries.

Under the U.S. Department of Housing and Urban Development (HUD), COMMUNITY DEVELOPMENT BLOCK GRANT PROGRAM administered by the State Department of Community, Trade, and Economic Development (CTED), communities under 50,000 can apply for grants to undertake activities in providing adequate housing, expanded economic opportunities, and correcting deficiencies in public facilities which affect the public safety and health of area or community residents. The program is designed to aid low- and moderate-income people, and is also directed to have maximum impact on stated community problems. Its primary focus is to assist blighted communities, or communities suffering a particular community or economic development problem. Sanitary sewer system projects in low-income areas of the City could be eligible for funding under this program.

5. Private Development

Expansion of domestic wastewater facilities to newly developing areas outside the existing service area is a common requirement of private developments. Installation of public utilities within housing subdivisions is normally financed entirely by the developer.

Although funding has been curtailed in a number of programs within the last few years, some projects statewide are still receiving financing. Competition for available funds, however, has increased significantly. Projects which show the greatest need and have the largest local funding participation, or benefit to low-income families, are receiving the majority of financing from these programs. Careful planning and packaging of the project is necessary so that through effective dollar use, including local participation, a funding agency may obtain the maximum benefit for the greatest number of people.

Table 7-2 provides a summary of funding sources and projects which are eligible under each program.

TABLE 7-2 FUNDING SOURCE SUMMARY	
Funding Source	Eligible Projects
Sewer Enterprise Fund	All wastewater system projects
General Obligation Bond	All wastewater system projects
Revenue Bond	All wastewater system projects
Special Assessment Bond	Local Improvement District projects
Centennial Clean Water Fund	All wastewater system projects not previously funded with state or federal funds; limited eligibility for growth- and industrial-related projects
State Revolving Fund	All wastewater system projects; limited eligibility for industrial-related projects
Public Works Trust Fund	Replacement of existing wastewater system facilities; service to previously unsewered areas
USDA Rural Development Grant	All wastewater system projects once maximum level of indebtedness is reached
USDA Rural Development Loan	All wastewater system projects
EDA Public Works Grant	Wastewater system projects to attract new industries and provide for business expansion
EDA Public Works Loan	Wastewater system projects to attract new industries and provide for business expansion
HUD Community Development Block Grant	Wastewater system projects which directly benefit low- and moderate-income families
Private Development	All wastewater system projects necessary for new housing and/or commercial developments

7.5 RECOMMENDED PROJECT FINANCING

The City of Grandview's current sewer fund financial program is shown below in Table 7-3.

The financial program was updated as part of the 2009 budget process. As indicated earlier, Wild River Foods, the largest discharger and largest single source of sewer revenue, ceased operation in July 2008 due to a fire. The update considered the loss of revenue caused by the Wild River Foods fire and assumes they will not be back in operation in 2009. Had Wild River Foods remained in operation for a full year, they would have generated about $130,000 in water charge revenues and about $750,000 in sewer charge revenue. With this significant loss of revenue, a 5-year plan was developed to bring water and sewer revenues back to the level where each department is self-sufficient. The water and sewer departments are combined into a single fund, but revenues and expenditures are tracked separately for each department. This combined fund approach allowed flexibility in addressing revenue needs.

The water department has a significant fund balance of about $2 million, which provides the financial base for the water and sewer departments. The City's Water System Plan is also being updated, and a separate cash flow analysis was completed. Based on that analysis, water rates will be increased 6% per year from 2009 through 2013.

A goal in generating sewer revenue is to make the fund self-sufficient (revenue exceeds expenditures) by the end of 2013. Therefore, deficit spending will continue in the sewer department and the fund balance will continue to decline until then, when it will begin to build to a positive balance. However, the water department balance is large enough to meet this deficit. Three options were examined to generate the needed sewer revenue:

- Option 1: Return industrial charges to 2007 rates, increase domestic rates 33%, and follow with 4 successive years of 4% increases to all users. The net effect would be a 56% increase to all users over a 5-year period. The 2007 industrial rates were selected as the starting point, because industrial rate adjustments were made when Wild River Foods began operations and generated new sewer revenue. It was felt that industrial rates should return to the pre-Wild River Foods level.

- Option 2: Return industrial charges to 2007 rates, increase domestic rates 20%, and follow with 4 successive years of 6% increases to all users. The net effect would be a 68% increase to industrial users and a 52% increase to domestic users over a 5-year period.

- Option 3: Return industrial charges to 2007 rates, increase domestic rates 10%, and follow with 4 successive years of 7.5% increases to all users. The net effect would be a 78% increase to industrial users and a 47% increase to domestic users over a 5-year period.

The City selected Option 2 as the preferred method of meeting sewer revenue needs. While Option 1 would raise revenues faster, it does not allow for a “wait and see” approach in the event another industry returns to Grandview. Option 3 places more of the burden on industrial users and increases the City’s dependency on industrial revenues. Option 2 strikes a balance in these areas and the proposed future 6% sewer rate increases match the proposed water rate increases. Revenues listed in Table 7-3 reflect the rate increases presented in Option 2.

TABLE 7-3 SEWER FUND FINANCIAL PROGRAM							
Year	2008*	2009	2010	2011	2012	2013	2014
BEGINNING FUND BALANCE	$333,005	($71,719)	($227,689)	($349,532)	($378,088)	($386,328)	($296,659)
REVENUE							
Sewer Service Fees	$2,133,106	$2,058,800	$2,182,328	$2,313,268	$2,452,064	$2,599,188	$2,651,171
Connection Fees	$11,550	$10,000	$10,300	$10,609	$10,927	$11,255	$11,593
Interest Earnings	$14,328	$7,500	$0	$0	$0	$0	$0
Interest - Bond Proceeds							
Rent & Leases	$11,745	$11,400	$11,742	$12,094	$12,457	$12,831	$13,216
Insurance Claim Receipts	$0	$0	$0	$0	$0	$0	$0
Other Sewer Revenue	$0	$0	$0	$0	$0	$0	$0
Grant /LID Proceeds	$0	$0	$0	$0	$0	$0	$0
Loan/Bond Proceeds	$0	$0	$0	$0	$0	$0	$0
Utility Tax	$127,986	$123,528	$130,940	$138,796	$147,124	$155,951	$159,070
TOTAL WATER FUND REVENUE	$2,298,715	$2,211,228	$2,335,310	$2,474,767	$2,622,572	$2,779,225	$2,835,050
EXPENDITURES							
GENERAL EXPENSES							
Salary & Wages	$482,924	$534,280	$550,308	$566,818	$583,822	$601,337	$619,377
Benefits	$207,487	$265,080	$273,032	$281,223	$289,660	$298,350	$307,300
Supplies	$171,326	$125,000	$128,750	$132,613	$136,591	$140,689	$144,909
Other Services & Charges	$716,227	$602,300	$620,369	$638,980	$658,149	$677,894	$698,231
Utility Tax	$0	$123,528	$130,940	$138,796	$147,124	$155,951	$159,070
Operating Transfers Out	$48,045	$33,700	$34,711	$35,752	$36,825	$37,930	$39,068
Subtotal - Expenditures	$1,626,009	$1,683,888	$1,738,110	$1,794,182	$1,852,171	$1,912,150	$1,967,955
CAPITAL OUTLAYS							
Major Capital Improvements	$185,000	$0	$0	$0	$75,000	$75,000	$75,000
Machinery and Equipment	$171,584	$20,000	$20,000	$20,000	$20,000	$20,000	$20,000
Subtotal – Capital Outlays	$356,584	$20,000	$20,000	$20,000	$95,000	$95,000	$95,000
DEBT SERVICE							
PWTF Loan (1%, 20 years)	$258,881	$256,596	$254,131	$251,756	$249,381	$247,005	$244,630
Bond Loan (7%, 20 years)	$558,625	$431,075	$434,445	$437,385	$434,260	$435,400	$430,600
Transfers to Bond Redemption	($164,063)	($54,161)	$0	$0	$0	$0	$0
Existing Debt Service	$67,403	$29,800	$10,466	$0	$0	$0	$0
Subtotal – Debt Service	$720,846	$663,310	$699,042	$689,141	$683,641	$682,405	$675,230
TOTAL EXPENSES	$2,703,439	$2,367,198	$2,457,152	$2,503,323	$2,630,812	$2,689,555	$2,738,185
ENDING FUND BALANCE	($71,719)	($227,689)	($349,532)	($378,088)	($386,328)	($296,659)	($199,794)
Net Increase (Decrease)	($404,724)	($155,970)	($121,843)	($28,556)	($8,240)	$89,670	$96,865
Projected Rate Increase at Start of Year	0%	0%	6%	6%	6%	6%	2%

* Year 2008 revenues and expenditures are projected to year end based on data collected through August 2008.
** Year 2009 values are based on the adopted 2009 budget.
** O&M Costs are assumed to increase at 3 percent per year.

APPENDIX

APPENDIX DOCUMENTS

State Environmental Policy Act Checklist
SEPA Determination of Non-Significance (DNS)
NPDES Permit No. WA-005220-5
City of Grandview Sewer Code

Chapter 13.04	General Provisions
Chapter 13.08	Use of Public Sewers - Connections
Chapter 13.12	Use of Public Sewers - Discharges
Chapter 13.16	Building Sewers and Connections
Chapter 13.20	Private Sewage Disposal Systems
Chapter 13.22	Sewage Works Design Criteria
Chapter 13.28	Rates and Charges
Chapter 13.30	Low-Income Senior Citizens and Low-Income Disabled Persons Utility Rates
Chapter 13.40	Capital Facilities Plan for Public Works Facilities

Lift Station Information
Bleyhl Sanitary Sewer Latecomers Agreement
City of Grandview Construction Standards for the Private Construction of Public Facilities
Map A – Existing Water System
Map B – Existing Sewer Collection System Hydraulic Analysis Node and Pipe Map
Map C – Future Sewer Collection System At Ultimate Buildout
Map D – Future Sewer Collection System Improvements At Year 2028