Facility Plan

Duvall Wastewater Facility Plan

City of Duvall, Washington

Parametrix October 2001

Wastewater Facility Plan

Prepared for

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CERTIFICATE OF ENGINEER

The technical material and data contained in this document were prepared under the supervision and direction of the undersigned, whose seal, as a professional engineer licensed to practice as such, is affixed below. The Financial Analysis and Funding Strategy prepared by the FCS Group is located in Chapter 9.

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1. INTRODUCTION

1.1 BACKGROUND

The City of Duvall authorized Parametrix to prepare a *Wastewater Facility Plan* in accordance with the Department of Ecology regulatory requirements. This plan modifies and updates the Gray & Osborne, Inc. revision to the City's *General Sewer Plan* dated February 1996.

1.2 PLANNING GOALS

It is the City's goal to ensure that the *Wastewater Facility Plan* (Plan) includes the following:

- Demographic changes that affect the City's wastewater collection and treatment system.
- Evaluation of the condition and capacity of the existing wastewater system.
- Establishment of wastewater system improvements necessary to upgrade the existing system.
- Establishment of improvements to the City's existing wastewater system to provide adequate capacity to serve future City wastewater users.
- Recommendations of the wastewater collection and treatment system improvements necessary to extend the wastewater collection system into portions of the UGA that are not currently being served.
- Estimates of the probable capital costs for improvements to the City's existing wastewater system to meet existing and future needs.
- Estimates of the impact to the City's sanitary sewer rates necessary to fund recommended improvements.

1.3 PLAN REQUIREMENTS

The Plan has been prepared in accordance with the requirements of the Department of Ecology and the Washington Administrative Code. Chapters 2 and 3 of this document fulfill the information requirements of WAC 173-240-050. This Plan also integrates previous wastewater plans, including:

- *Wastewater Treatment Plant Outfall Improvements*, City of Duvall, Parametrix, Inc., April 2000; *Addendum*, January 2001.
- *Wastewater Treatment Plant Capacity Analysis*, City of Duvall, Gray & Osborne, Inc., September 1999;
- *Infiltration and Inflow Preliminary Engineering Study*, City of Duvall, Earth Tech, Inc., April 1999;
- *General Sewer Plan Update*, City of Duvall, Gray & Osborne, Inc., February 1996;
- *Comprehensive Plan*, City of Duvall, April 1994; and
- *Volume I Wastewater Treatment Plant Expansion*, City of Duvall, Hammond, Collier & Wade-Livingstone Associates, Inc., November 1990.

2. EXISTING CONDITIONS AND SERVICE AREA DEMOGRAPHICS

2.1 INTRODUCTION

Existing conditions and service area demographics affect the wastewater system, including physical features such as the size of the service area, land use and zoning population variations, soils, groundwater conditions, and topography. Climate and economic factors also play an important role in planning community utility systems. Collectively, the factors discussed in this chapter and Chapters 3 (Population Projections and Land Use Designations) and 4 (Wastewater Flow Projections) have a considerable impact on the processes involved in determining the location, size, and extent of the wastewater facilities, and the ability of the community to accept the financial burden of improvements. These factors are briefly described in this chapter.

2.2 BOUNDARY AND SERVICE AREA

The City of Duvall is located along SR-203, approximately 25 miles northeast of the City of Seattle. The City of Duvall corporate limits is generally found east of the Snoqualmie River (see Figure 2-1). Land within this area is subject to the City's municipal code, ordinances, resolutions, and policies. Other agencies with limited jurisdiction include the Riverview School District, King County Fire District No. 45, the Seattle King County Health Department, and all State and Federal agencies.

The City of Duvall's current sanitary sewer service area is the city limits. In the future, the service area will include the City's UGA and UGAR (see Figure 2-1). The 2.14-square-mile (1,372-acre) area designated as the UGA contains over 98,700 lineal feet (18.7 miles) of gravity sewer and force mains. The City and King County coordinated activities in developing an annexation policy and in identifying the Urban Growth Boundary in accordance with countywide planning policies.

In accordance with the State Growth Management Act (GMA), the boundary of the UGA established in 1994 was based upon the following:

- 20-year population forecast.
- Environmental constraints.
- Concentration of existing development.
- Existing infrastructure and services.
- Location of existing and proposed transportation corridors.
- Areas the City could extend and provide urban services to logically and economically.

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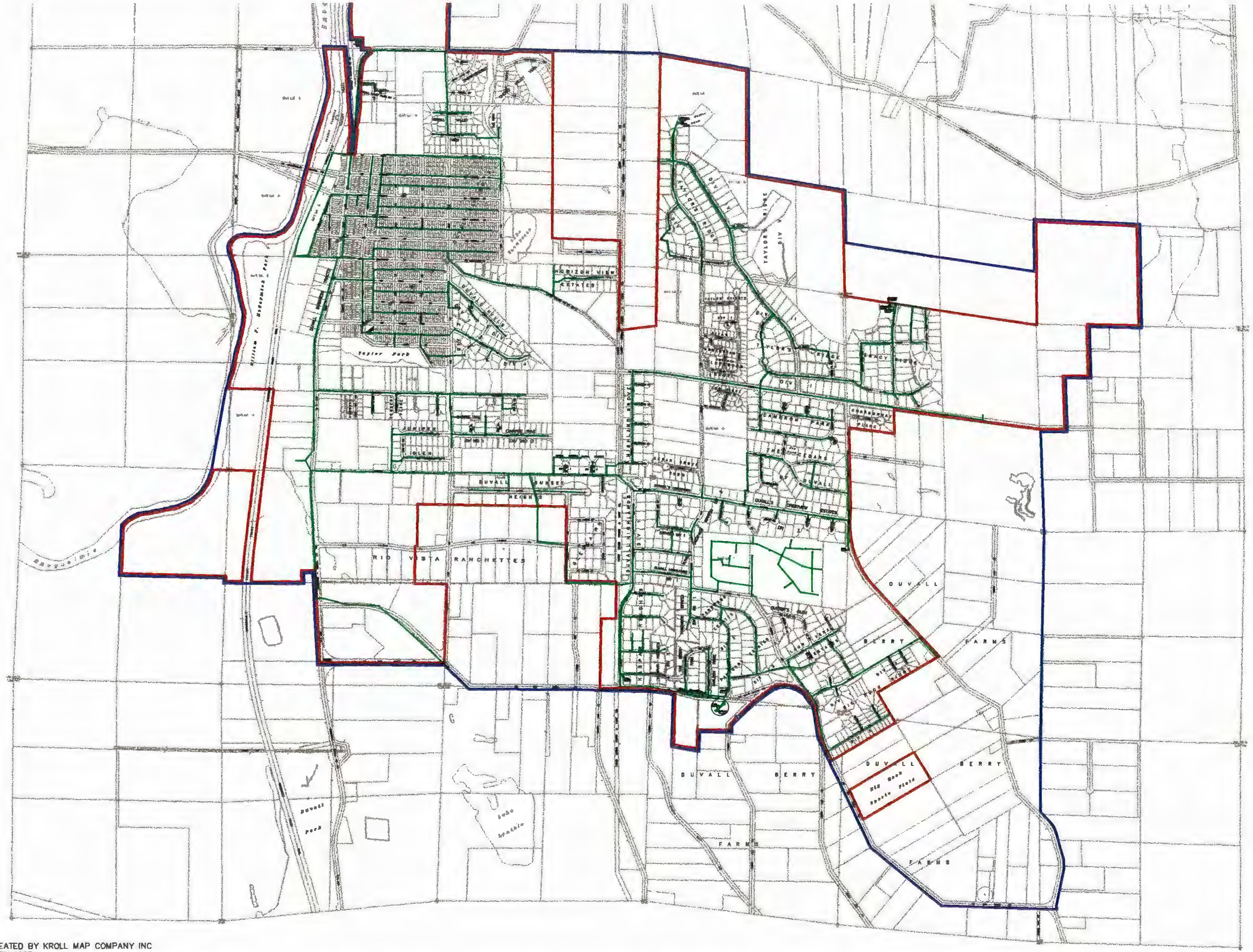

LEGEND

EXISTING CITY LIMITS

UGA

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Figure 2-1
Existing City & UGA Limits
Wastewater Facility Plan
City of Duvall

It is expected that within the 20-year timeframe, 1992–2012, of the *Comprehensive Land Use Plan* that sewer, water, stormwater, utilities, telecommunications, and transportation may be extended to developments in all or most of the areas outlined in the UGA. It is important to note that the City is almost halfway through the 20-year timeframe of the *Comprehensive Land Use Plan.*

2.3 HISTORY

The City of Duvall was first incorporated in 1913. Initially, all residential and commercial buildings used on-site septic systems and unauthorized sewage outfalls. In the mid 1960s, drainfield failures resulted in a declaration of health hazards by the Washington State Department of Health and Water Pollution Control Commission. In October 1967, the City had an engineering study and comprehensive plan prepared that proposed a sewer collection system and four alternative treatment systems. A supplemental report was released in March of 1971 to update the 1967 report, and a ULID was formed for the installation of the collection system and the WWTP. The City of Duvall's collection system and treatment plant came on-line in 1976.

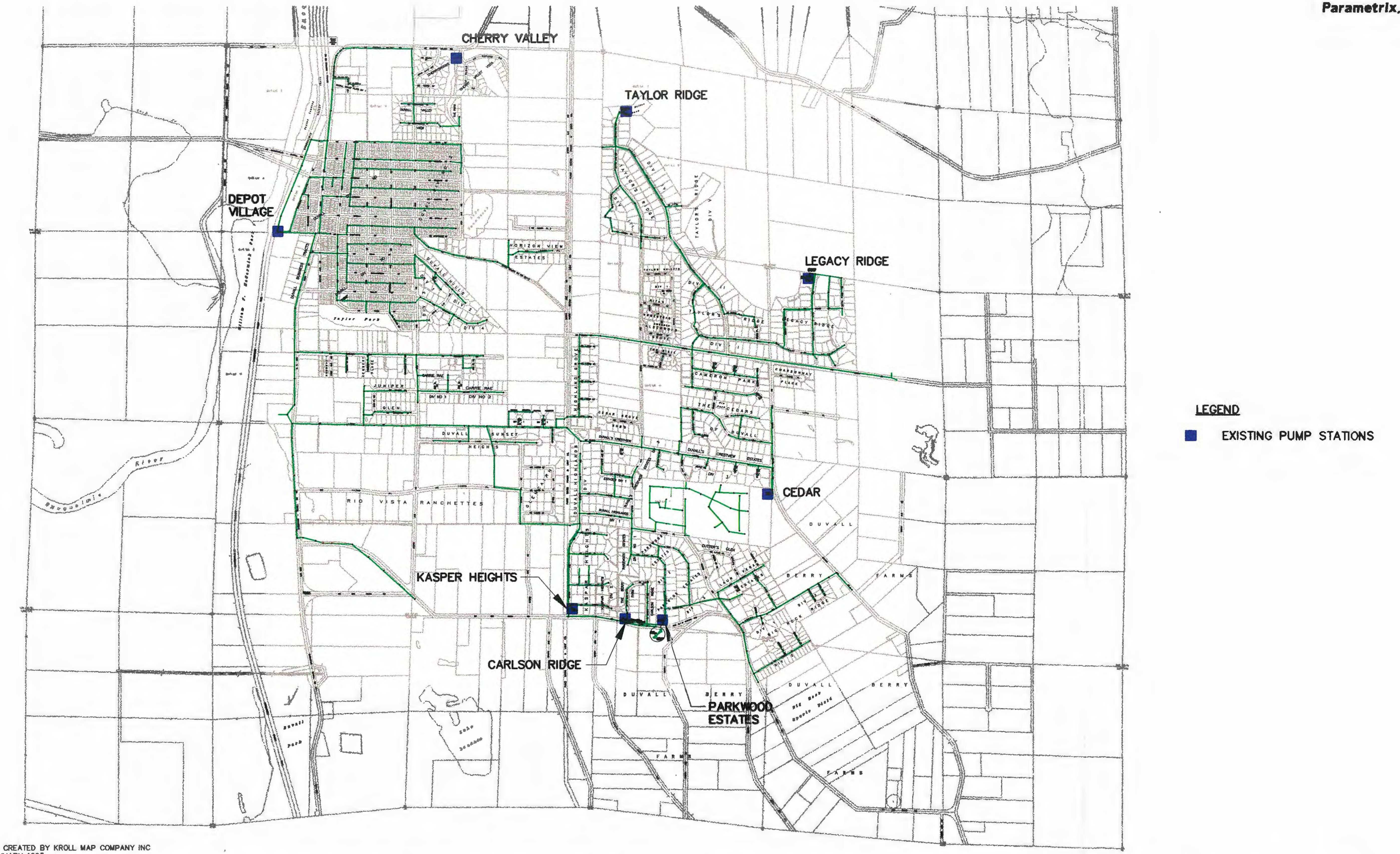
Construction of the first WWTP, pump stations, and sanitary sewer force main system were completed in 1976. Additional pump stations have been installed at various times during the expansion of the system. The Depot Village Station remains the oldest station in the system. It was initially installed in 1976 and it was upgraded in 1993. Table 2-1 lists the City's pump stations, year of construction, last year rebuilt or refurbished (if known), and station design capacity.

Table 2-1. Pump Station Characteristics

	Year Constructed	Last Year Rebuilt	Type	Station Design Capacity (gpm)
Depot Village	1976	1993	Submersible	253
Cherry Brooke	1993		Submersible	154
Cedars	1990		Submersible	200
Taylor Ridge	1994		Submersible	220
Parkwood Estates	1994		Submersible	250
Legacy Ridge	1995		Submersible	100
Carlson Ridge	1995		Submersible	160
Kasper Heights	1995		Submersible	150

In addition to the public pump stations, the Riverview School District owns and operates a pump station at Cedar Crest High School that discharges to the City's collection system.

Figure 2-2 shows the locations of the City of Duvall's existing pump stations.



CITY OF DUVALL MAP CREATED BY KROLL MAP COMPANY INC
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Figure 2-2
Existing Pump Station Locations
Wastewater Facility Plan
City of Duvall

2.4 LOCATION, TOPOGRAPHY, AND SOILS

The City is located directly east of the Snoqualmie River. The main business district is located upon a region generally described as the lower plateau. The area west of the business district slopes downward towards the Snoqualmie River. The higher ground within this area is devoted to industrial and commercial uses. The area east of the business district is located on a fairly steep ridge rising to the east on a north-south axis. The steep ridge ends in the higher plateau region. The higher plateau region is zoned and partially developed for lower-density residential uses.

Elevations in the service area valley range from 50 feet above mean sea level to 490 feet, based upon the 1929 National Geodetic Vertical Datum (NGVD) for the City of Duvall. The highest point within the city's service area is approximately 491 feet above mean sea level near the southeastern end of Big Rock Road. The slopes in the region range from 0 to 70 percent. Figure 2-3 shows the planning area topography.

Soils in the area are classified in the Alderwood Association. Within the service area, approximately 85 percent are described as Alderwood soils, 8 percent Everett soils, and 7 percent as less extensive soils, including Kitsap soils. These soils are described as moderately well drained, 20 to 40 inches deep over consolidated glacial till.

The soils of this association are well suited to pasture and timber production but are poorly suited to cultivated crops. Limitations for home sites due to this classification of soils relate to on-site waste disposal that is described as moderately poor, except on Kitsap soils that is described as severely poor.

2.5 CLIMATE

Climate and weather are critical factors in wastewater system planning, design, and engineering. The amount of precipitation impacts the amount of infiltration and inflow (I/I) that can potentially enter the wastewater collection system. I/I is defined as surface and/or groundwater that enters the sanitary sewer collection system and contributes to the total wastewater volume.

Summers in Duvall are mild and warm (average daytime temperature in the low 60s) and winters are comparatively mild (average daytime temperature in the 40s). Precipitation is usually in the form of rain, with occasional snow in the winter. Over the last three complete years, the City of Duvall averaged 64 inches of precipitation annually with monthly variations from a low of 1.17 inches in August to a high of 9.59 inches in December. Table 2-2 (see page 2-7) indicates average precipitation and temperature for each month for the years 1997–1999.

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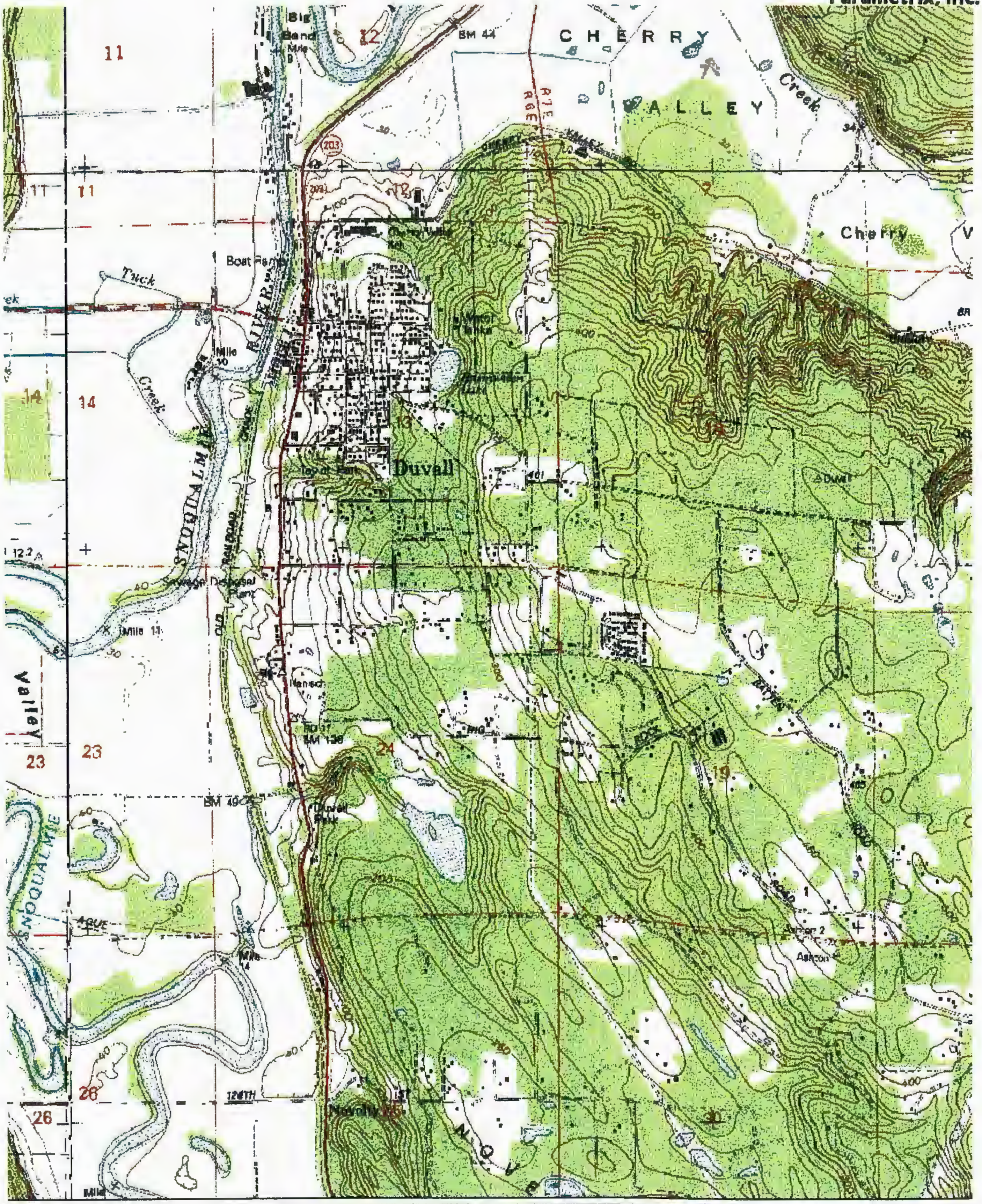

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Figure 2-3
Topography
Wastewater Facility Plan
City of Duvall

Table 2-2. City of Duvall Average Temperature and Precipitation

Month	Average Temperature (°F)	Average Precipitation (inches)
January	40.3	9.28
February	41.0	5.83
March	43.0	8.02
April	44.7	4.04
May	40.3	4.39
June	57.7	3.31
July	60.0	1.84
August	59.3	1.17
September	53.3	2.42
October	46.7	5.69
November	43.7	9.20
December	38.7	9.59

2.6 INDUSTRY

The City of Duvall has limited industries located within its service area. Duvall currently serves as a bedroom community for the cities of Redmond and Bellevue. The City has recently seen an increase in the construction of small office/retail type facilities in the commercial zoned area along the SR-203 corridor. A copy of the current industrial user survey for the City of Duvall's collection system is included in Appendix A of this report.

2.7 WATER SUPPLY

The City of Duvall is a wholesale customer of the Seattle Water Department. Water supply is provided from the Tolt River Supply line. The City has two transmission mains connected to the supply line. A 10-inch asbestos cement (AC) pipe extending from the supply line to the intersection of Third Avenue and Stephens Street and a 12-inch ductile iron (DI) pipe that crosses Big Rock Road. The City's 0.5-MG storage reservoir is located at NE 144th Street and 283rd Street.

The City holds water rights to the artesian well located at Taylors Landing but has not exercised that right since 1962.

3. POPULATION PROJECTION AND LAND USE DESIGNATIONS

3.1 INTRODUCTION

Population and land-use information contained within this chapter is the basis for projecting wastewater volumes and sizing the collection system facilities discussed in Chapter 4. Wastewater volumes were projected using two independent methods:

- Service Area Population Method: Calculating the total service area wastewater flow based upon the number of potential residents within the Duvall UGA and UGAR.

- Land-Use Method: Calculating the total service-area wastewater flow based upon the potential type of land use and the potential percent build-out of land within the Duvall UGA and UGAR.

The Service Area Population Method is a common tool for determining wastewater flow from a city or service area.

The Land-Use Method is also a common method for determining the volume of wastewater generated within a portion of the service area or basin. By adding all individual basin flows together, the total flow from the city can be determined.

The Land-Use Method was used to estimate wastewater flow and size the collection system facilities. The Service Population Method was used to verify the results of the hydraulic modeling program.

3.2 POPULATION

Since 1920, the residential population of Duvall increased from 258 residents to 4,435 residents in January 1999, as shown in Table 3-1. The average annual growth rate has been approximately 4.8 percent since 1990. The City's Planning Department estimates a continued average annual growth rate of 5.0 percent over the next 20 years.

Table 3-1. City Population

Year	City Population	Population Change per Decade	Average Annual Population Change (%)
1920	258	–	–
1930	200	-58	-2.0
1940	234	34	1.6
1950	236	2	0
1960	345	109	3.9
1970	607	262	5.8
1980	729	122	1.8
1990	2,770	2,041	14.3
1999	4,435	1,665	4.8

Table 3-2 is the population estimates for the City of Duvall through the year 2020 based upon data provided by the City of Duvall Planning Department.

Table 3-2. City Population Projection

Year	City Population	Population Change	Average Annual Population Change (%)
2000	4,616[a]	181	4.1
2005	5,942	1,286	5.0
2010	7,583	1,641	5.0
2015	9,817	2,234	5.0
2020	12,516	2,699	5.0

a Washington State Office of Financial Management estimated the existing population of 4,860 as of April 1, 2001. The City of Duvall has already committed sewer service to a projected population of 6,600.

3.3 LAND USE, ZONING, AND SERVICE AREA

The City of Duvall established the Duvall UGA in 1994 in cooperation with King County and surrounding communities.

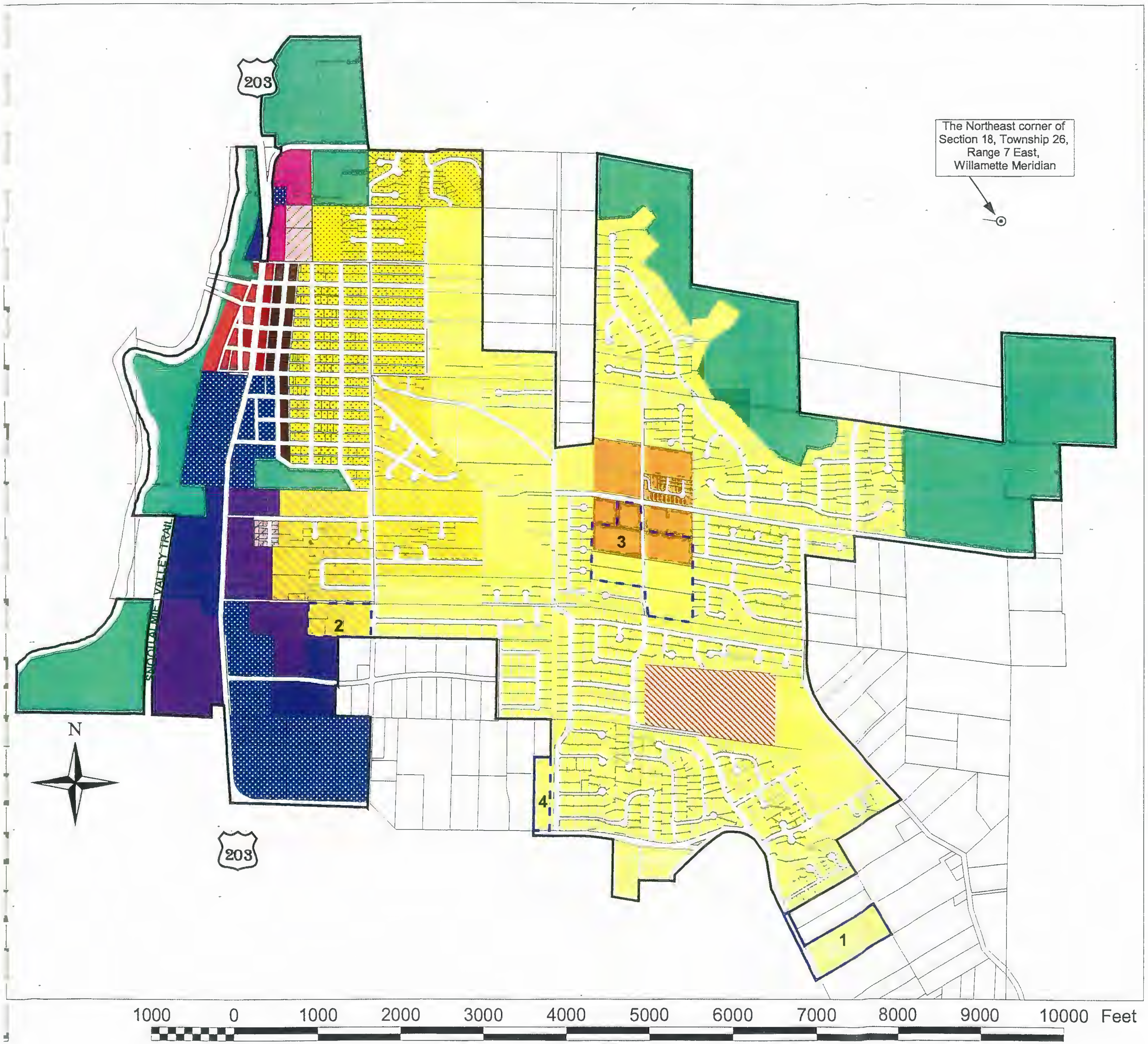
Existing land use includes residential, commercial, and industrial development, as shown in zoning (Figure 3-1) and land-use figures (Appendix B) provided by the City of Duvall. Table 3-3 summarizes the current zoning classifications.

Table 3-3. Current Zoning Designations

Abbreviation	Description
Pf	Public Facilities
Rmh	Residential Mobile Home Park – 5 ERU[a] per gross acre
R3	Low-Density Residential – 3 ERU per gross acre
R4.5	Low-Density Residential – 4.5 ERU per gross acre
R6	Medium-Density Residential – 6 ERU per gross acre
R8	Medium-Density Residential – 8 ERU per gross acre
R12	High-Density Residential – 12 ERU per gross acre
MR12	Mixed-Use Residential – 12 ERU per gross acre
Mxd12	Mixed-Use Residential and Commercial – 12 ERU per gross acre
Mxd16	High-Density Residential and Commercial – 16 ERU per gross acre
MU16	Multi-Use Commercial and Residential – 16 ERU per gross acre
Co	Commercial
Eo	Employment – Industrial and Office

a Equivalent residential unit.

CITY OF DUVALL OFFICIAL ZONING MAP



LEGEND

City Limits

Zoning

R3	Residential 3 units per gross usable acre
R4.5	Residential 4.5 units per gross usable acre
R6	Residential 6 units per gross usable acre
R8	Residential 8 units per gross usable acre
R12	Residential 12 units per gross usable acre
Rmh	Residential-mobile home park
Mxd12	Mixed Use District commercial and residential 12 units per gross usable acre
MR12	Multifamily Residential 12 units per gross usable acre
Mxd16	Mixed Use District commercial and residential 16 units per gross usable acre
MU16	Multi-Use Commercial and Residential 16 units per gross usable acre
Co	Commercial- retail and office
Eo	Employment- industrial and office
Pf	Public Facilities

Scale 1" = 1,250'

Amendments to 1995 Zoning Map

1: 10/22/98, Ord 875; 1/28/99, Ord 880; 6/22/00, Ord 910; 8/10/00, Ord 911
2: 6/10/99, Ord 882
3: 7/08/99, Ord 883
4: 9/18/99, Ord 884

CITY OF DUVALL

Created by: City of Duvall, October 23, 2000 based on information provided by King County. This map is for illustrative purposes only. For information regarding a specific parcel, contact City of Duvall Planning Department at (425) 788-2779.

The approved planning documents for the City of Duvall do not include land use classifications for the densities for the UGA and UGAR. After discussion with the Planning Department, Parametrix has assumed 66 percent of the UGAR will be designated Suburban Housing (SUBSHG) and 33 percent will be designated Urban Housing (URBHSG). It is further assumed that the development will occur at the low end of those designations, or 3 units per acre in the SUBSHG classification and 8 units per acre in the URBHSG classification (see Table 3-4).

Table 3-4. Land Use Classifications

Abbreviation	Description
SUBSHG	Single family residential at densities of 2.4–5.8 units per acre; 3 units per acre assumed for $^2/_3$ of the UGAR.
URBHSG	Multi-family or small lot single family residential at densities of 8–18 units per acre; 8 units per acre assumed for $^1/_3$ of UGAR.

The 1994 *Comprehensive Plan* did not take into account the majority of the UGAR when the estimated population capacity of approximately 9,000 people was determined. That population capacity was for the 20-year period from 1992–2012. The UGAR was likely not considered due to the estimated capacity of the wastewater treatment plant of approximately 9,000 people. The UGAR is within Duvall's UGA and it is likely that the UGAR will be annexed into Duvall's city limits at some point in the future. In 2002, King County will allocate additional population capacity for the next 10 years to cities within the county, that is, additional population for the period 2012–2022. In 2002 or 2003, Duvall will be considering that additional allocation and will likely designate the UGAR with land use designations at that time.

Due to the need for a sanitary sewer facility plan that addresses growth for the next 20-year planning horizon, some assumptions about land use designations in the UGAR were necessary. Those assumptions result in a population projection that is higher than the approximate 9,000 people planned for in Duvall's *Comprehensive Plan*. The City of Duvall will schedule the update of the *Comprehensive Plan* for 2002-2003 and will likely officially designate the UGAR at that time. See Figure 3-2 for location of the UGA.

The estimated population of the City of Duvall was calculated using the land-use data for the UGA and UGAR region. The Land-Use Method estimates a build-out population of 12,444. Table 3-5 compares the population projections for the Population and Land-Use Methods:

Table 3-5. Projection Comparison

Projection Method	Growth Rate	Projected Population
Population	5%	12,516
Land Use	Land Use	12,444

Table 3-5 indicates that the two projection methods have less than a 1 percent difference in the projected population for the City of Duvall and that the build-out of the existing UGA and UGAR should be approximately 20 years, or until the year 2022.

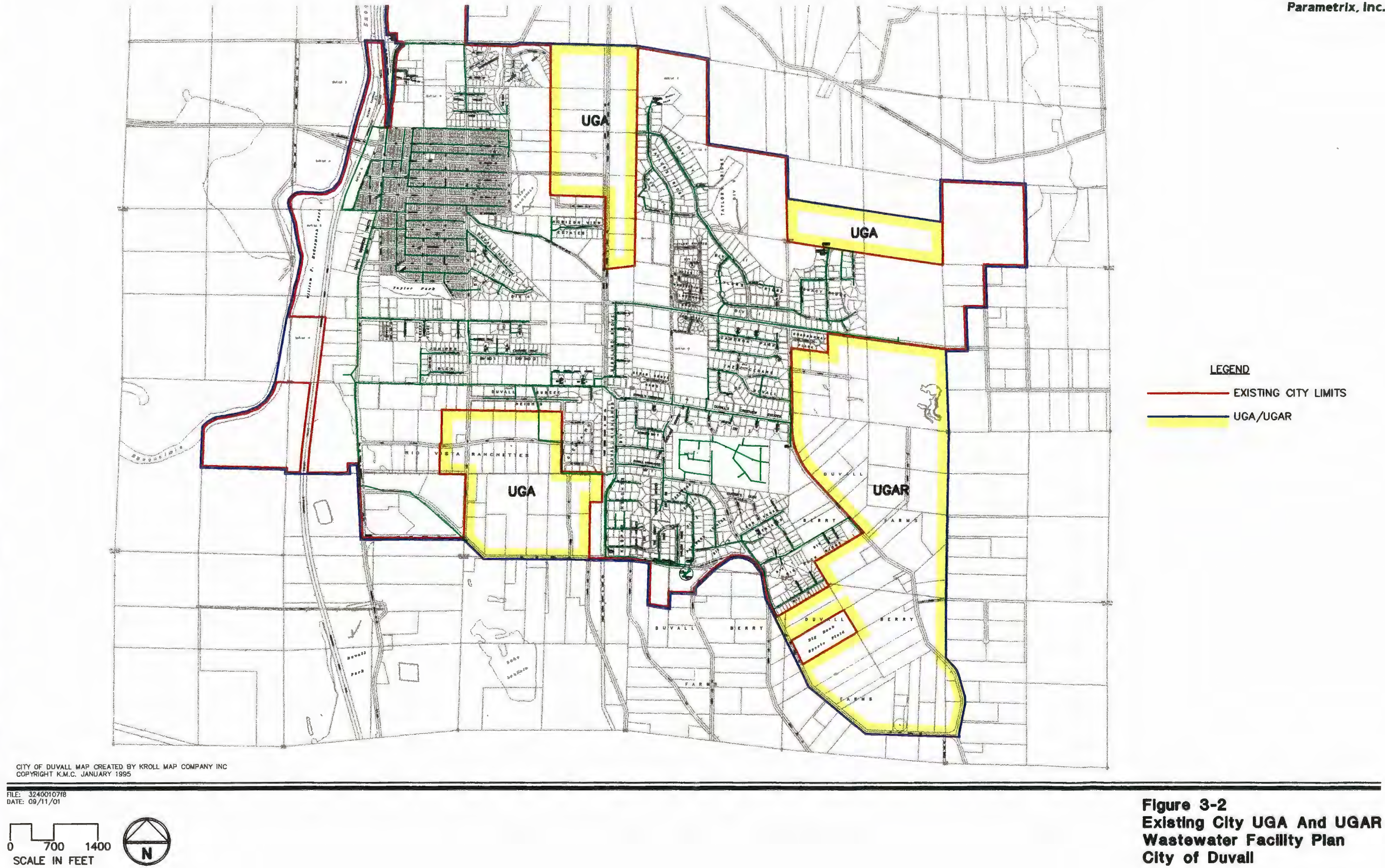


Figure 3-2
Existing City UGA And UGAR
Wastewater Facility Plan
City of Duvall

4. WASTEWATER FLOW PROJECTIONS

4.1 INTRODUCTION

Chapter 4 develops flow projections that are used to size individual capital facilities within the wastewater system. To project wastewater flow volumes, it was necessary to establish the following:

- Identify the existing peak-day flow generated in the City of Duvall's service area.
- Estimate the components of the existing peak-day flow, including residential/commercial wastewater flow, and system I/I.
- Simulate the existing peak-day wastewater flow conditions using the Land Use Method, and compare these wastewater flow projections to existing flow data at the WWTP.
    - Land Use Method – Wastewater flow projections were prepared by multiplying a given wastewater flow per acre (based upon land use) by the size of a basin. Wastewater flows using the Land Use Method are generated as a product of the system hydraulic analysis conducted in Chapter 5. The hydraulic analysis computes wastewater flow projections for the entire service area and for individual basins contained within the service area. The Land Use Method of wastewater flow projection was used to size the City of Duvall's collection system facilities.
- Determine the existing per capita peak-day wastewater flow originating from residential/ commercial users. The per capita peak-day wastewater flow is used to validate projected future wastewater flows simulated by the Service Area Population Method.
    - Service Area Population Method – Wastewater flow projections for the entire service area were established by multiplying the number of people in the service area by an estimated peak-day wastewater volume per capita. The number of people within a service area is directly proportional to the volume of wastewater discharged into the wastewater collection system and ultimately to the WWTP.

      Systems that have a large percentage of commercial and industrial land use must also be considered independently from the service area population since employed personnel most likely live outside of the community but contribute to the community's wastewater flow during the business day. The City of Duvall does not have a large percentage of commercial or industrial land use components within the city.

Future wastewater flow projections calculated using the Population Method were compared to projections using the Land Use Method to validate the system hydraulic analysis.

4.2 EXISTING PEAK-DAY WASTEWATER FLOW

The City of Duvall's WWTP operational reports were investigated to determine the existing peak-day flow. The peak-day wastewater flow was then used to verify the land use flow projection calculated by the hydraulic modeling program.

On November 26, 1998, the Duvall wastewater collection system experienced a peak-day flow of 1.209 mgd (see Daily Monitoring Record [DMR] reports, Appendix C).

4.2.1 Peak-Day Wastewater Components

The components of the existing peak-day flow were estimated using the City of Duvall's WWTP DMR reports, water usage records, and industrial survey information. The components were estimated in order to calculate an existing service area wastewater flow for the City of Duvall's collection system (Section 4.5). The existing peak-day flow is comprised of 1) residential/ commercial and industrial wastewater flows, and 2) system I/I as outlined:

- The City of Duvall's estimated peak storm I/I is 0.749 mgd (see Appendix B). Peak-day I/I was calculated by subtracting average day, dry weather flow from peak-day wet weather flow.

- Peak-day residential/commercial wastewater flow was calculated to be 0.46 mgd

  $$(Peak-Day\ Residential/Commerical\ Wastewater\ Flow = 1.209mgd - 0.749mgd)$$

4.3 LAND USE METHOD

Chapter 3 established the land use components used to project wastewater flow in the City of Duvall wastewater collection system. The following steps were used to project total collection system flow:

- Separate the City of Duvall's wastewater collection system into smaller service areas defined by the City's I/I Preliminary Engineering Study.

- Estimate the volume of wastewater flow from each of the land use components.

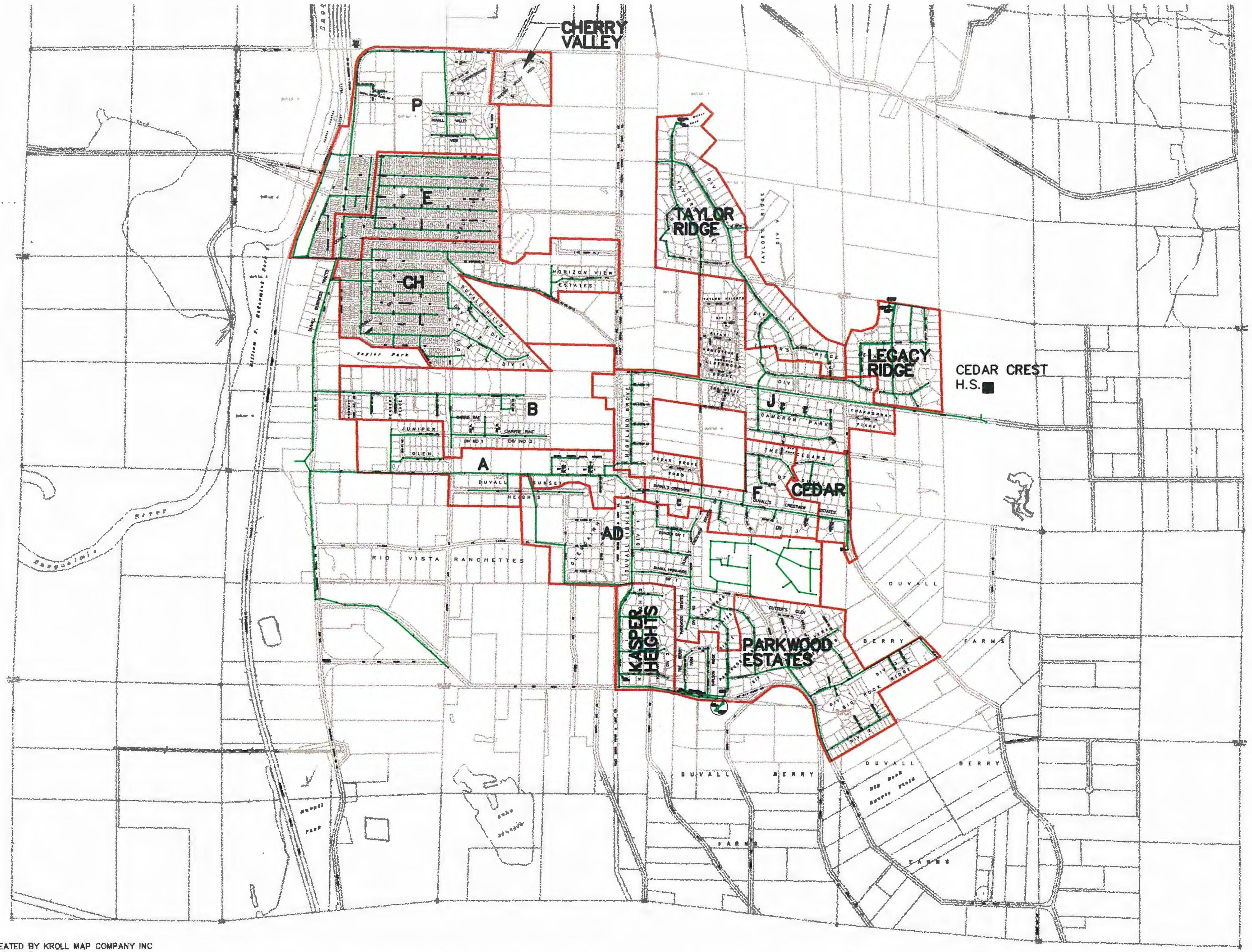
- Estimate the total volume of I/I gallons per day (gpd) flowing in the collection system, divide by the total collection system acreage, and then apply the system-wide I/I flow gallons per acre per day (gpad) to each of the basins.

- Analyze the City's collection system using a computer program specifically written to produce a hydraulic model for a wastewater collection system based on land use. Parametrix selected "HYDRA" for the modeling program. Details of the computer model are contained in Chapter 5.

4.3.1 Collection System Basin

The total collection system was subdivided into basins in order to assess existing and future capacities of the collection system facilities within the individual basins. Parametrix selected the land areas identified in the 1999 *City of Duvall Infiltration and Inflow Preliminary Engineering Study* prepared by Earth Tech Incorporated.

The basin boundaries were identified using the City of Duvall's base map created by Kroll Map Company Inc., shown in Figure 4-1. Using AutoCAD, the total area contained within each of these basin boundaries was determined. Table 4-1 (see page 4-4) summarizes each of the City's basin station boundary areas.



CITY OF DUVALL MAP CREATED BY KROLL MAP COMPANY INC

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Figure 4-1
Existing Basin Boundaries
Wastewater Facility Plan
City of Duvall

Table 4-1. Boundary Areas

Basin	Area (ac)
WWTP	91.88
P	82.05
Cherry Valley	11.72
E	47.27
CH	95.95
B	80.42
A	55.69
AB	101.12
Kasper Heights	22.57
Parkwood Estates	81.40
F	34.86
Cedar	16.56
J	116.59
Taylor Ridge	67.41
Legacy Ridge	31.48

4.3.2 Land Use Wastewater Flow Estimates

While Chapter 3 provided the method to establish the flow volume projection, this chapter will estimate the actual volume of peak-day wastewater produced for each of the land uses on a per acre basis.

Table 4-2 summarizes the flow per acre from each of the land use designations.

Table 4-2. Wastewater Flow Estimates Based Upon Land Use

Land-Use[a]	Flow (gpad)
Pf	
Rmh	700
R3	680
R4.5	945
R6	1,300
R8	1,735
R12	2,100
MR12	1,765
Mxd12	1,680
Mxd16	2,240
MU16	2,240
Co[b]	900
Eo[b]	900

[a] For land-use abbreviations, see Tables 3-3 and 3-4.

[b] Wastewater flow estimates for commercial and employment were estimated to be 900 gpad based upon projections made by Gray & Osbome, Inc. in the 1996 *General Sewer Plan.*

Peak-day wastewater produced from residential land use classifications were calculated using the following assumptions and equation:

- 85 gpcd = daily wastewater production for residential and commercial.
- Number of people per single-family housing varied between 2.0 and 3.5 depending on zoning.
- $(Units\ per\ Acre) \times (Wastewater\ Gallons\ per\ Capita\ per\ Day) \times (Capita\ per\ Unit)$

The contribution of I/I was assumed to be a separate component of the wastewater flow and has been calculated in Section 4.4 of this report.

For comparison purposes, the Department of Ecology's *Criteria for Sewage Design* standards are 100 gpcd with a minimum of 3 people per unit. These design standards include normal infiltration and inflow. The 1996 *General Sewer Plan* Update established design standards of 70 gpcd residential flow, a commercial flow of either 605 gpad or 900 gpad, and 2.5-3.2 people per unit, depending on land use.

In the late 1980s and early 1990s, the City of Duvall was primarily a bedroom community for the Seattle, Kirkland, and Redmond areas and therefore produced wastewater flows below established design standards. As the City continues to develop, the demographics have the potential of evolving in such a way that the per capita wastewater flows will increase to the design standards chosen for this report.

For the complete calculation of land-use flows, please refer to the spreadsheet in Appendix D of this report.

4.4 STORMWATER INFILTRATION AND INFLOW ESTIMATES

The I/I estimates are based upon the City of Duvall's WWTP DMR. The City of Duvall assumes the difference between wet- and dry-weather DMR constitutes the total storm-induced I/I for the collection system. Collection system I/I estimates were used, along with basin areas, to determine a per acre I/I distribution for the entire existing collection system.

The City of Duvall's wastewater collection system conveys stormwater in the form of I/I to the WWTP during wet-weather conditions.

Stormwater infiltration is groundwater that seeps into the wastewater collection system through pipe cracks, faulty joints, and faulty manholes. The quantity of water that may infiltrate into a sewer system is rather indeterminate and will generally increase with the age of the sewer system.

Stormwater inflow consists of water that may enter the wastewater collection system through illegal connections such as roof gutters, area drains, catch basins, and unplugged clean-out openings.

4.4.1 Total Infiltration and Inflow

The total I/I for the City of Duvall's collection system was estimated by comparing the wet- and dry-weather WWTP DMR.

The wet- and dry-weather DMR for the years 1997, 1998, 1999, and 2000 were compiled into spreadsheets (see Appendix C). The difference between the average day wastewater dry flow and maximum day wastewater flow was assumed to be the total peak-day I/I.

This analysis assumes that the total peak-day I/I is the difference between peak-day wet weather and average-day dry weather, but infiltration may exist during the summer due to the high-localized groundwater table and the age of the existing system. Summertime infiltration would have to be identified in a detailed I/I study outside the scope of this report.

As outlined in Appendix D, the peak-day I/I for the City of Duvall's collection system was calculated at approximately 0.749 mgd.

Maximum month wet weather I/I was assumed to be the difference between average wet-weather flow and average dry-weather flow. As outlined in Appendix D the maximum month wet-weather flow is 0.387 mgd.

4.4.2 Infiltration and Inflow Distribution

A spreadsheet was prepared (see Appendix D) comparing the treatment plant's DMR influent flows for wet and dry weather to determine the I/I throughout the City of Duvall's collection system as summarized below:

- The existing service area and the percent of build-out were determined using a Washington Department of Transportation aerial photograph of the City of Duvall.
- The existing portions of the individual basins were then assumed to contribute the per acre I/I distribution determined for the entire collection system I/I.

Using the information from Table 4-1 (see page 4-4) and the WSDOT aerial photo, a distribution of I/I on a per-acre-per-day basis was determined for the entire collection system. Table 4-3 summarizes the existing build-out identified for each of the collection system basins.

Table 4-3. Existing Collection System Basin Area

Basin	Total Basin Area (ac)	Percent Build-out	Existing Basin Area (ac)
WWTP	91.88	90	82.69
P	82.05	65	53.33
Cherry Valley	11.72	70	8.19
E	47.27	90	42.54
CH	95.95	75	71.96
B	80.42	65	52.27
A	55.69	82	45.90
AD	101.12	86	86.96
Kasper Heights	22.57	90	20.31
Parkwood Estates	81.40	88	71.63
F	34.86	97	33.81
Cedar	16.56	92	15.23
J	116.59	60	69.40
Taylor Ridge	67.41	100	67.41
Legacy Ridge	31.48	90	28.33
UGA and UGAR	435	0	0
Total	1,372		750

The peak-day collection system per acre I/I was calculated using the estimated peak-day I/I of 0.749 mgd (see Section 4.2.1) and the existing service area of 750 acres. The peak-day collection system I/I is approximately 1,000 gpad.

The maximum month I/I flow was calculated using an estimated maximum month I/I of 0.387 mgd (Appendix D) and the existing service area of 750 acres. The maximum month collection system I/I is approximately 515 gpad.

4.5 SERVICE AREA POPULATION METHOD

The service area population wastewater flow was calculated to verify the future wastewater flow projected through the Land Use Method by the hydraulic modeling program. To project total population flows for the City of Duvall, a current population flow was established according to the following assumptions and formula:

- November 26, 1998, peak-day flow of 1.209 mgd.
- Estimated peak-day I/I of 0.749 mgd.
- 1999 City of Duvall Population of 4,435.

$$\frac{(\textit{Total Peak Average Wastewater Flow}) - (\textit{Total Stormwater I / I Flow})}{(\textit{Population})} = \frac{(1.209\ mgd) - (0.749 mgd)}{4{,}435}$$

The current peak-day wastewater flow based on population is 104 gpcd, representing residential and commercial projected flow.

4.6 TOTAL PROJECTED WASTEWATER FLOW

The existing peak-day estimated wastewater flow in the service area was calculated using a computer program that features hydraulic modeling capabilities. The computer program used by Parametrix, Inc. to perform the hydraulic modeling is "HYDRA," which uses the Land Use Method to determine total peak-day wastewater flow generated throughout the service area. Specific details of the HYDRA program are contained within Chapter 5.

The HYDRA model calculates the theoretical peak-day flow and the peak-instantaneous flow expressed in cubic feet per second. The result of the HYDRA model is then compared to actual historical wet-weather wastewater flow at the Duvall treatment plant to verify that the engineering assumptions included within the model are reasonable. If the results of the HYDRA model are substantially different than actual wastewater flows at the treatment plant, the land-use-wastewater flow assumptions entered into the model must be modified.

The results of the HYDRA model were also compared to the wastewater flow projections calculated using the Population Method as discussed earlier. Comparison of the wastewater flows also assumed that build-out of the service area would be equal to the population increase experienced by the City over the next 20-year planning period. The results of the flow projections are included in Table 4-4.

Table 4-4. Wastewater Flow Comparisons

Source	Maximum Month Wet Weather (mgd)	Peak Day (mgd)	Peak Hour (mgd)
Existing			
HYDRA (Land Use)[a]	1.02	1.60	3.38
WWTP Flow	0.642	1.209	1.83
Projected			
HYDRA[b]	1.93	2.91	5.51
WWTP Flow (5% Growth)[c]	1.79	3.37	5.10
Population[d]	1.75	3.59	5.44

[a] HYDRA uses existing Land Use Method and percent of build-out of each basin to project flows.

[b] Uses existing peak-day flow and projecting flow increases to match the assigned land use within the existing service area and light residential development within the UGAR. Assumes existing system I/I remains at 1,000 gpad and any additional development within the collection system will contribute approximately 500 gpad.

[c] Assumes existing WWTP maximum month flow projected forward by growth rate listed. Assumes that the rate of I/I is corrected to 500-gpad system throughout the system.

[d] Population projected flow was determined using a projected population of 12,516 (year 2020), and a total service area of 1,660 acres. I/I was assumed to be 500 gpad throughout the service area.

Upon review of the differing flow projections, it appears that the wastewater flow assumptions based on land use are reasonable if somewhat conservative. The flows generated for the Land Use Method assumes that the flow per person should be approximately 70 gpd. Currently the per capita flow in the City of Duvall is approximately 56 gpd. The City's demographics should continue to change to bring the per capita wastewater flow closer to normal design standards.

5. WASTEWATER COLLECTION SYSTEM EVALUATION

5.1 INTRODUCTION

The condition and capacity of the City's existing collection system facilities is evaluated in this chapter. This evaluation has been separated into the following sections:

- Identified System Deficiencies: Identify deficiencies in the existing collection system not attributed to a capacity deficiency.
- Hydraulic Capacity: Calculate the hydraulic capacity of the existing collection system and compare the conveyance capacity to existing and future wastewater flow conditions.
- Collection System Extension: Address extension of the City's wastewater collection system into portions of the UGA that are not currently being served.
- Recommended System Improvements: Recommend improvements to the existing collection system that will correct existing deficiencies and provide sufficient capacity for service to existing and future wastewater customers.

5.2 IDENTIFIED SYSTEM DEFICIENCIES

Existing collection system deficiencies are indicators of inadequate capacity, overloaded pipe segments, or needed system repairs. During an interview with City personnel, known system deficiencies were identified in the existing collection system facilities, including:

- Areas of periodic/repetitive maintenance
- Pump station problems

5.2.1 Collection Pipeline Deficiencies

Interviews were conducted with City personnel to identify deficiencies within the collection system pipeline. A map was prepared showing deficiency locations and severity. Also included were areas that required ongoing periodic maintenance, such as jetting. Figure 5-1 shows these identified areas and a summary is included in Table 5-1.

Table 5-1. System Collection Pipeline Deficiencies

Street	Cross Street Locations	Deficiency
Riverside Avenue	Stephens and Stella	Flat pipe segment – periodic cleaning required
First Avenue NE	Richardson and Ring	Segment requires cleaning due to grease

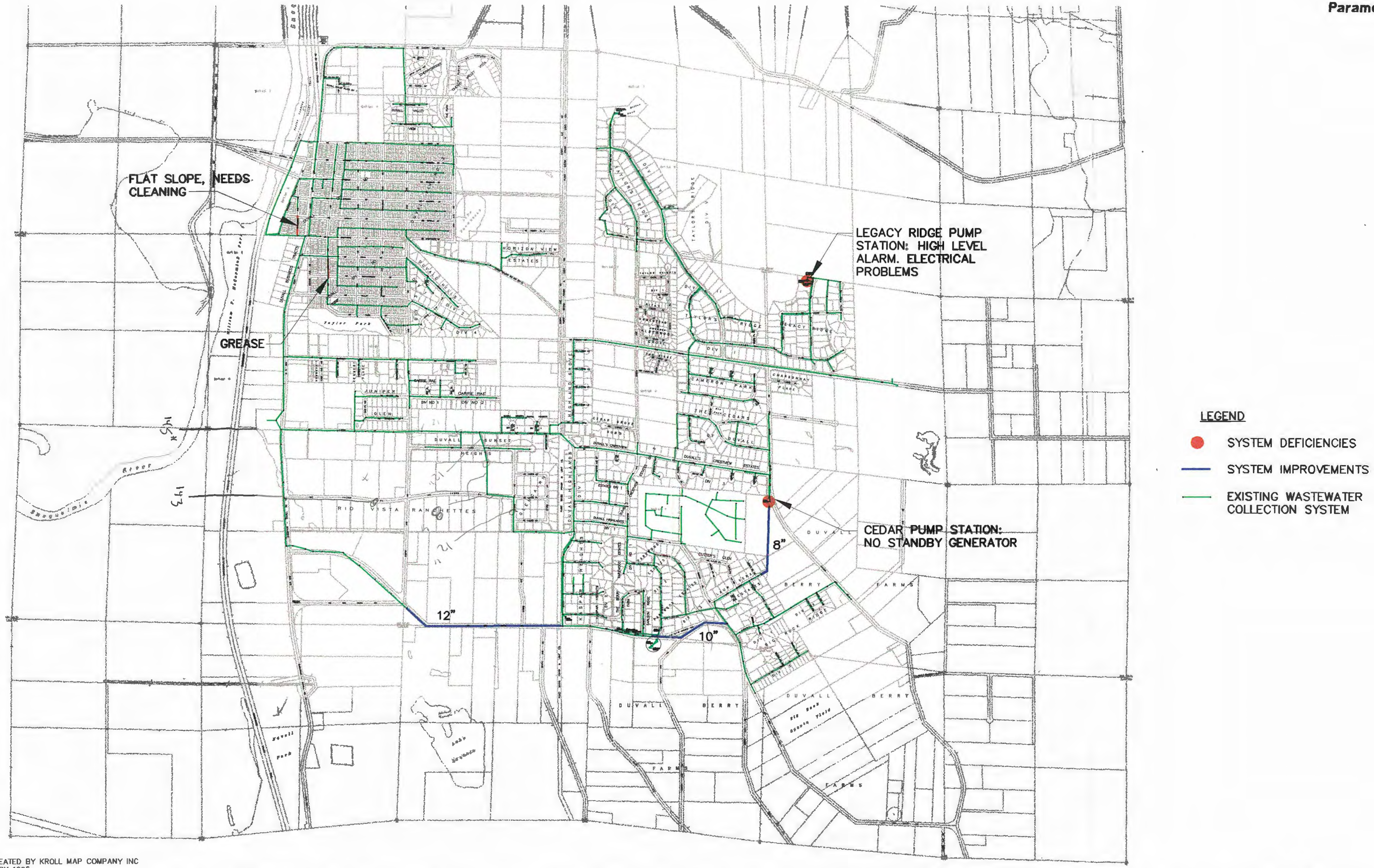

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Figure 5-1
Identified System Deficiencies or Improvements
Wastewater Facility Plan
City of Duvall

5.2.2 Identified Pump Station Problems

It is the City personnel's opinion that the only pump station currently experiencing problems is Legacy Ridge. This pump station has been experiencing electrical problems. City personnel have reported high-level alarm electrical problems.

5.2.3 Identified System Improvements

City personnel also identified the following additional improvements for the wastewater collection system to improve system reliability:

- Install on-site generator at Cedar Pump Station.
- Install flow meters in the existing pump stations to increase the City's ability to monitor the system better.
- Install gravity mains along Big Rock Road from 268th Avenue NE to the existing 12-inch dry lines at 275th Avenue NE.
- Install gravity mains along Big Rock Road from approximately 278th Avenue NE to the existing 8-inch gravity mains located at 282nd Place NE.
- Extend gravity mains from the Cedar pump station south approximately 1,100 lineal feet to the existing sewer main along NE 140th Place.

5.3 HYDRAULIC CAPACITY

The hydraulic capacity of the existing wastewater collection system was analyzed using the computer software program "HYDRA." HYDRA simulated existing and future wastewater flows based upon engineering assumptions entered into the computer program. By comparing the existing collection system capacity with simulated existing and future flows, capacity deficiencies in the collection system can be identified.

HYDRA was developed by Pizer, Incorporated. It is a flexible program developed for analysis of storm and wastewater systems. Its menu-driven format allows AutoCAD and GIS integration, and the command files are user friendly. Flow criteria and development scenarios can be developed in several ways, and each pipe segment can be analyzed for gravity or pressure flow conditions. Pump stations may be modeled for one-, two-, or three-pump scenarios. For this analysis, firm pumping capacity was assumed at each station. Firm pumping capacity assumes the largest pump at each station is out of service. For example, on a duplex system it was assumed only one pump was operating.

The pump station basin areas were divided into smaller sub-basins, and link data from the City's existing facilities maps was compiled. A "link" is the upstream manhole and the reach, or length, of pipe downstream to the next manhole. The link data includes length, ground elevation upstream and downstream, invert elevations upstream and downstream, pipe diameter, and pipe material.

The system data is entered through command and design parameter menus according to the requirements of the HYDRA program. HYDRA utilizes various commands for sanitary sewer analysis and modeling. Existing and proposed pipe criteria must be defined. Among these criteria are:

- Pipe roughness parameters
- Flow depth to pipe diameter (d/D)
- Minimum pipe slope
- Minimal flow velocity
- Flow injection method

HYDRA uses two different methods to "inject" flows into the system. These flows can be calculated by either population (per capita) or by land use (zoning).

In the population flow method, the number of people living within a region of the sewer system is entered along with an average flow per person per day (generally 80-100 gallons/day). HYDRA then compares the per capita data with the "link" data to determine the amount of flow through each pipe.

In the land-use flow method, each of the City's zoning codes is assigned a flow per acre value. These flows are based on the average number of houses that could be built within an acre of land, the average number of people per house, and the average flow per person. HYDRA then compares the land-use data with the links data to determine the amount of flow through each pipe. As previously discussed in Chapter 4, the method selected for this analysis was the Land Use – Sewer Service Basin Intersection Method.

The intersection of the established land use with the delineated sub-basin is then considered by HYDRA to be the flow from that sub-basin. HYDRA uses an established or input diurnal curve to "inject" the flow into the system. These flows are injected at select points, called nodes, within the sewer system and HYDRA calculates travel time to the link. The process then repeats until the total flow of the system reaches the "outfall" point. The last pipe segment into the treatment plant was chosen as the outfall point for this analysis.

The HYDRA model for the City of Duvall does not evaluate every segment of a wastewater collection system but models all of the main trunks of the system. Main trunks are considered pipe segments 8 inches in diameter or greater connected to individual collection lines serving less than 20 acres, and collection pipeline that could be extended to serve portions of the UGA and UGAR that are not being serviced. These segments were generally located along the southern and eastern edges of the City's existing system.

5.3.1 Existing Collection System, Existing Wastewater Flows

The initial hydraulic analysis of the City of Duvall wastewater collection system identified no system deficiencies that are attributed to capacity. The hydraulic analysis assumed existing wastewater flow conditions simulated by the HYDRA computer program. Existing flows were simulated by estimating the current percent of land build-out for each portion of the service area.

Parametrix established the percent of build-out within each of the land use areas through visual inspection of City of Duvall aerial photographs that were prepared by Washington Department of Transportation Aerial Mapping Group in the fall of 2000.

5.3.2 Existing Collection System, Future Wastewater Flows

The second phase of the hydraulic analysis identified deficiencies in the existing collection system assuming future build-out of the service area (UGA).

When analyzing service area for future build-out conditions, the I/I allowance for all further development within the collection system basins and any development within the unserved portions of the UGA and UGAR were all assumed to be 500 gpad. This assumption is based upon the premise that these extensions will be completed using gasketed polyvinyl chloride (PVC) pipe and gasketed pre-cast manholes, thereby lowering the potential I/I for these areas.

Pump stations with insufficient capacity for future wastewater flows are:

	Existing Capacity (cfs)	Projected Future Flow (cfs)
Depot Village	0.56	0.75
Cherry Valley	0.34	0.36

There were no gravity collection mains identified with insufficient capacity for future wastewater flows, with the exception of the final length of pipe into the WWTP headworks.

5.3.3 Future Collection System Extensions, Future Wastewater Flows

A product of the hydraulic analysis included the configuration and sizing of future collection system improvements necessary to serve portions of the UGA not currently connected to the City of Duvall wastewater system. Existing system capacity information generated in Sections 5.3.1 and 5.3.2 was used to decide where collection system extensions could occur with the least amount of impact to downstream collection system facilities. As shown on Figure 5-2 (located in pocket preceding the Appendices), extensions of the City's collection system are recommended where existing collection pipelines have sufficient hydraulic capacity to accommodate wastewater flows generated by build-out of the UGA. Once the collection system configuration was established as shown on Figure 5-2, the HYDRA computer program was used to size the various gravity pipelines based upon the wastewater flow volumes anticipating build-out of the individual basins. Through this iterative process, the following was determined:

- The area along 275th Avenue NE from approximately NE Stewart Street to the city limits should be connected to the existing collection system through the Cherry Valley Pump Station basin.
- The area east of 4th Avenue NE between Stephens and Bird, should be connected to the existing system directly to the "E" basin.
- The area identified as Rio Vista Ranchettes (the region bounded by NE 142nd on the south, NE 145th Street on the north, SR-203 on the west and 72nd Avenue NE on the east) on the City's

base map should connect to the existing system through a main to be located along NE 143rd Place.

- The area bounded by NE Big Rock Road on the south, NE 142nd on the north, 266th Avenue NE on the west, and 275th Avenue NE on the north, should connect to the system through a main to be located along NE Big Rock Road.

- The area bounded by Batten Road on the east, Big Rock Road on the west and south, and the City of Duvall limits on the north, should connect to the existing system through a main to be located along Big Rock Road.

- The area bounded by 284th Avenue NE on the west, NE 150th Street on the north, the section line for Section17/18 on the east, and the section line for Section 18/19 on the south should connect to the existing system through a new proposed pump station and force main. OK THROUGH CHAR[illegible] PLACE or 147th?

- The area bounded by the section line for Section 18/19 on the north and east, and by Batten Road on the west and south, should connect to the existing system through the mains installed in Big Rock Road.

5.4 RECOMMENDED SEWER SYSTEM IMPROVEMENTS

Recommended improvements are necessary to correct system deficiencies previously discussed in this chapter. Improvements include:

- Existing System Capacity Improvements

- Existing Collection Upgrades

Most of the system improvements shown on Figure 5-2 that are necessary to expand the City's wastewater collection system into unserved areas of the UGA and UGAR are assumed to be improvements constructed as part of a developer extension or formation of a ULID.

5.4.1 Existing System Capacity Improvements

Improvements to the existing collection system facilities include system expansion to provide adequate capacity to serve existing and future wastewater customers. These improvements include:

- **Depot Village Pump Station**

  Expansion of Depot Village Pump Station from a 251-gpm (0.56-cfs) station to a 336-gpm (0.75-cfs) station. The existing 4-inch force main should be adequate for the expanded flow.

- **Cherry Valley Pump Station**

  Expand the pump station capacity from 154 gpm (0.34 cfs) to a 160 gpm (0.36 cfs) facility at the end of its useful life.

5.4.2 Existing Collection Upgrades

System improvements requested by the City of Duvall's public works staff or recommended by Parametrix, Inc. include:

- **Sanitary Sewer Main Rehabilitation/Replacement Program**

  Currently, the City of Duvall has approximately 100,000 lineal feet of existing sanitary sewer main. Used as-built plan set information for the original installation in 1975 produced by Hammond, Collier & Wade-Livingstone *Town of Duvall Sanitary Sewers, ULID Project No. 1.*

  Construction of 41,400 lineal feet of the City's collection system took place in 1975. This means 41 percent of the existing system will be at the normal 50-year useful life expectancy of the installed collection pipes by the year 2025.

  If the City of Duvall were to initiate a 50 percent main rehabilitation/replacement program over a 25-year period, it would require the rehabilitation or replacement of 830 lineal feet each year.

  For main replacement, the average cost per lineal foot for an 8-inch main is approximately $300. Different rehabilitation methods can be broken into costs per lineal foot. Following is a summary of the different possible rehabilitation methods and an estimate of the associated costs:

  - Cast-in-Place (CIP) Pipe Lining: $75.00/lf
  - Fold and Form Pipe Lining: $55.00/lf
  - Link Pipe Stainless Steel Sleeve: $1,500 for 12 inches to $2,000 for 36 inches
  - CIP Spot Repair: $1,500 for 3 feet to $2,000 for 30 feet
  - Line Grouting:
    - Sealing: $15-$20 per joint
    - Side Sewer Grouting: $300 per side sewer

  Using an average cost per lineal foot for rehabilitation, or repair of $200 per lineal foot, the yearly cost for this program would be approximately $166,000 in 2001 dollars.

- **Infiltration and Inflow Program**

  The City staff continues to recognize the importance of the removal of extraneous stormwater I/I from the City's system. As such, the following is recommended:

  - Continue to follow the recommendations of the I/I study.

- **City of Duvall System Upgrades**

  The following is a list of improvements requested by City personnel that are appropriate for this facility plan. The list includes only the requested improvements that have not been addressed in prior sections of this chapter. Improvements include:

  - Install telemetry and flow meters on all pump stations.
  - Install of a 12-inch gravity main along Big Rock Road from 268th Avenue NE to the existing dry gravity mains located at 275th Way NE.

- Install 10-inch gravity main from the existing dry-gravity mains along Big Rock Road NE at 278th Place NE.
- Install 8-inch gravity mains from Cedar Pump Station south approximately 1,100 LF to the existing gravity system located along NE 140th Place.
- In lieu of installing the 8-inch gravity main, install a standby generator at the Cedar Pump Station.

The capital improvement projects have been summarized in Chapter 8. Cost estimates for individual collection system improvements are included in Appendix E.

6. EFFLUENT DISCHARGE AND REUSE

6.1 BACKGROUND

Prior to the summer of 2001, the City of Duvall used a side bank outfall for discharge of treated effluent into the Snoqualmie River. The side-bank discharge was constructed when the initial wastewater collection system and treatment plant was put into service in 1976. The 1976 wastewater treatment facilities were initially designed for a population equivalent of 2,000. These facilities were intended to be expanded through phased construction (Hammond, Collier, & Wade-Livingstone [HCW-L] 1990).

In 1990, an engineering report was prepared by HCW-L for the purpose of expanding the 1976 facilities to accommodate 4,000 additional population equivalents. The improvements recommended in the 1990 engineering report included extending the existing side bank outfall to a "... single center of river outfall" that provides reasonable protection to the river (HCW-L 1990). In 1992, the City of Duvall constructed the treatment plant expansion to accommodate the additional population; however, the recommended outfall improvements were not completed at that time.

When the City of Duvall received its National Pollutant Discharge Elimination System (NPDES) Waste Discharge Permit for the expanded treatment facility on October 9, 1992, the "Fact Sheet" portion of this permit required the City to construct a new outfall. Furthermore, an NPDES permit, "Stipulation and Order of Dismissal" (Pollution Control Hearings Board [PCHB] No 91-67) required the City of Duvall to construct the new center of the river outfall no later than October 1, 1994. The City of Duvall subsequently requested that the Department of Ecology extend the October 1, 1994 deadline. On March 10, 2000, Ecology granted an extension for completion of construction to July 31, 2004.

The City of Duvall was issued its latest revision to the NPDES permit on April 1, 2000. The April 2000 NPDES permit established discharge limits based upon the side-bank outfall. With the side-bank outfall configuration, the discharge requirements for total ammonia, certain metals, and other parameters that are subject to aquatic-life based water quality standards are very restrictive. This is due to the relatively poor mixing performance for this type of outfall. For this reason, the City decided to move forward with the new outfall permitting and construction prior to the revised deadline of July 31, 2004. The following documents were then prepared:

- City of Duvall, *Engineering Report Wastewater Treatment Plant Outfall Improvements*, (Parametrix, Inc. April 2000). The Engineering Report was prepared as a stand-alone document meeting the requirements of RCW 90.48.110 and WAC 173-240-010 through 180 in order to expedite construction of the new outfall. This report is contained in its entirety in Appendix I. The *Engineering Report* includes requisite information to obtain an NPDES permit for current to future year 2020 discharge through the new two-port submerged river outfall, including dilution modeling and a reasonable potential analysis for toxicants performed at a maximum month effluent flow of 1.75 million gallons per day. The April 2000 *Engineering Report* was approved by the Department of Ecology on June 12, 2000 (see Appendix I, John H. Glynn to Elizabeth Goode).

- City of Duvall, *Engineering Report Amendment, Wastewater Treatment Plant Outfall Improvements* (Parametrix, Inc. January 2001). One of the recommendations of the April 2000 Engineering Report was that "clean sampling" metals data be obtained to eliminate suspected sources of sample contamination. The purpose of the January 2001 *Amendment to the Engineering Report on the City of Duvall Wastewater Treatment Plant Outfall Improvements* was to incorporate clean sampling data collected following approval of the April 2000 Engineering Report and to address additional Ecology questions regarding the proposed two-port outfall configuration. The January 2001 *Engineering Report* was approved by the Department of Ecology on February 1, 2001 (see Appendix G, Pam Elardo to Elizabeth Goode).

6.2 NEW TWO-PORT OUTFALL CONSTRUCTION

In August 2001, the City of Duvall placed in operation the new two-port submerged outfall into the Snoqualmie River. The outfall improvements were constructed in the "fish window" from July 15 to September 15 in the summer of 2001. The construction design drawings for the submerged two-port outfall are contained in Appendix K (Parametrix, Inc. 2001). Permits obtained for the construction of the outfall included King County Grading/Clearing and Shoreline Substantial Development Permits and Hydraulic Project Approval from the Washington State Department of Fish and Wildlife. A Determination of Nonsignificance (DNS) for the project was issued by the City on July 25, 2000.

The outfall consists of two 18-inch tide flex check valves discharging perpendicular to the Snoqualmie River flow approximately 40 feet from the right bank. The tide flex check valves open in response to forward hydraulic pressure (increasing flow) and close in response to declining hydraulic pressure (reducing flow). The tide flex valves restrict aquatic life from entering the outfall, minimize head losses over the range of design flows, promote mixing, are resistant to corrosion, and are impact resistant. The outfall ports are separated by a downriver distance of 65 feet. Further design details are illustrated in Appendix K.

The City has recently requested that Ecology modify the April 1, 2000 NPDES permit to reflect the approved *Engineering Report for Wastewater Treatment Plant Outfall Improvements* (Parametrix, Inc. April 2000 as amended January 2001). The proposed revisions reflect the new dilution ratios, clean sampling data, TMDL compliance calculations, and the reanalysis of reasonable potential for toxicants (Elizabeth Goode, Director of Public Works to Laura Fricke, Washington State Department of Ecology, August 17, 2001). The reader is referred to the *Engineering Report Amendment for the Wastewater Treatment Plant Outfall Improvements* (Parametrix, Inc. January 2001) in Appendix G for specific recommendations for permit modification. Proposed effluent limitations for the expanded WWTP are contained in Table 8-3 (in Appendix G) of this document. As part of the permit modifications, the City is requesting that Ecology remove metals sampling requirements to reflect that no reasonable potential to exceed water-quality based standards for total ammonia, copper, mercury, silver, and zinc was shown for the new two-port outfall.

6.3 EFFLUENT REUSE FEASIBILITY

The feasibility of using treated plant effluent for reuse has been examined within the *City of Duvall Wastewater Treatment Plant Capacity Analysis* (Gray and Osborne, Inc., September 1999). The *Technical Memorandum – Wastewater Reclamation Evaluation* (prepared by Sverdrup Civil, Inc. with H.R. Esvelt Engineering and Fujiki and Associates, Inc., 1995) was included as Appendix G within the *Wastewater Treatment Plant Capacity Analysis*. Chapter 6 of the *Wastewater Treatment Plant Capacity Analysis and the Technical Memorandum – Wastewater Reclamation Evaluation* are included in Appendix I of this Facility Plan. Based upon the analysis in these documents, it was concluded that "reuse of reclaimed water does not appear to be economically feasible, as long as the City does not incur additional costs for effluent disposal to surface waters." The reader is referred to Appendix I for supporting analysis and discussion. At this time, continued discharge to the Snoqualmie River through the recently installed two-port outfall is recommended. Should regulations, water quality standards, water availability, or other factors change in the future, the feasibility of using reclaimed water will be reassessed.

7. WASTEWATER TREATMENT ALTERNATIVES

7.1 INTRODUCTION

Several wastewater disposal and reuse alternatives were evaluated in the previous studies (see Chapter 6). The preferred disposal method that emerged was discharging treated wastewater to the Snoqualmie River. Based on this review, three wastewater treatment processes were selected for evaluation. The three processes are:

- Oxidation Ditch Alternative
- Primary Clarifier Alternative
- Membrane Process Alternative

All three of these processes can meet the NPDES permit limits presented in the previous chapters. Each alternative is developed and discussed separately. Process flow diagrams, design criteria, and construction cost estimates for each alternative are presented. In Subsection 7.4, the alternatives are evaluated and compared.

All of the treatment processes evaluated are classified as activated sludge treatment. Typical annual average treatment efficiencies for the basic units of these processes would be as follows:

- Biological/physical biochemical oxygen demand (BOD) reduction – 85 percent or greater.
- Secondary clarifiers (or Membrane) – 90 percent solids removal or better.
- UV disinfection – 3.2 log reduction in bacteria or greater.

The annual average overall treatment process BOD and total suspended solids (TSS) removal efficiency for the processes evaluated are expected to be 85 percent or greater. The average overall ammonia removal efficiency for all of the processes are expected to be 70 percent or greater for the summer. On a seasonal basis, the effluent would typically average less than half the BOD, TSS, and ammonia concentrations presented in Table 7-1. Because process upsets do occur, however, weekly and monthly removal efficiencies will vary. These estimates are only approximate and cannot be used to judge plant performance.

Table 7-1. Duvall Wastewater Treatment Plant – Wasteload and Flow Projections

		Design Values	
Design Flow (mgd)	Year 1997/2000	Phase 1	Phase 2 (2021)
Wasteload lbs/day (avg)[a]			
BOD	888	1,560	2,525
TSS	712	1,385	2,320
Ammonia	60	220	375
Flow (mgd)			
Yearly ADF[b]	0.40	0.74	1.20
Maximum Month ADF	0.64	1.10	1.75
Peak-Day Flow	1.20	2.10	3.30
Peak-Hour Flow		3.10	5.25

a Existing maximum monthly load plus 0.2 lbs/capita-day for future population (0.03 lbs/day for ammonia).

b Average daily flow.

The WWTP classification would be Class II reliability. Standby equipment would be required for critical pumping, aeration, and disinfection equipment. A standby power system to energize critical system components during a power outage would also be required. An alarm system would be required to monitor equipment and system power, disinfection, high-water levels, etc. and notify an operator via audible alarm and/or auto dialer. The collection system sewer pump stations would have to meet Class 3 reliability. The plant operator would need to have a Class 2 certification.

One important characteristic of each alternative is the ability to reduce the ammonia in the wastewater. The process of converting ammonia to nitrates is called nitrification. A relatively long sludge age is necessary for nitrification to occur. Nitrification organisms (nitrosomonas) have a slower growth rate than bacteria that are typically maintained in an activated sludge plant for BOD reduction. Typical activated sludge processes have sludge ages of 5 to 15 days. The treatment alternatives selected for evaluation have sludge ages of 18 to 30 days.

Before the details of treatment alternatives are presented, wastewater flow rates and loads are discussed below.

7.2 EXISTING AND FUTURE WWTP FLOW AND LOAD

Because of the rapid growth that is projected for the City of Duvall, constructing a WWTP to handle year 2021 flows would be very costly and could place a large cost burden on the existing community.

Because of Duvall's financial situation (refer to Section 8), a phased approach to facility construction may be necessary to reduce the debt burden. Not all the processes, however, could be easily phased. Phasing could be done in two stages, Phase 1 and Phase 2. For the processes that could be phased, a WWTP design flow of 1.1 mgd (maximum month) was selected for Phase 1. The Phase 2 design flow or ultimate flow would be 1.75 mgd (maximum month).

7.2.1 Existing WWTP Flow and Load

The existing Duvall WWTP has been monitoring influent flow and waste strength since it began operation in 1976. To evaluate the existing plant and future flow and load, data from 1997 to the present was evaluated. Table 7-1 (see page 7-2) shows a wastewater flow and load summary of this data.

The first column of data shows the 1999 population, but the data is indicative of years 1997 to 2000. Even though the number of hook-ups has increased over the last few years, the wastewater BOD and TSS load has remained steady.

7.2.2 Future WWTP Flow and Load

To project future wastewater flows for Duvall to the year 2021, existing treatment plant flow, loading, and future population estimates were used. Total wastewater flows are the summation of residential, commercial, and industrial wastewater plus infiltration and inflow. The existing sewer flows are mainly residential, commercial, infiltration, and inflow. There is little industrial wastewater flow. Existing sewer flow, infiltration, and inflow are discussed in Section 1.4.

7.2.3 Industrial Flows

The projected industrial users for the City of Duvall are discussed in the City's Comprehensive Plan. The number of projected industrial users in the City is not expected to grow significantly over the next 20 years. The total number of acres occupied by industrial users is expected to be less than 1 percent of the total area of the City of Duvall. For this reason, a relatively small industrial flow was included with the flow projection for year 2021. The treatment facilities must also be designed to accommodate the design peak instantaneous flow rate.

7.3 EXISTING WWTP

The existing WWTP was constructed in two main phases. In 1976, sewers were installed in the City of Duvall and a new oxidation ditch in the WWTP was built. The original plant was rated to treat 0.2 mgd and consisted of grit removal, comminuter, two oxidation ditches, two secondary clarifiers, and a chlorine disinfection system. In 1992, the Duvall WWTP was upgraded to 0.9 mgd capacity. The upgraded facilities included a new selector, new oxidation ditch, two new clarifiers, a new chlorination basin, generator building, and laboratory building. In 1995, the chlorination system was replaced with a medium pressure ultraviolet (UV) disinfection system. Table 7-2 lists the process design criteria for the existing WWTP. A site plan of the existing facility is shown in Figure 7-1 (see page 7-6).

Table 7-2. Existing WWTP – Design Criteria

Design Flow	
Maximum Month Flow (mgd)	0.9
Maximum Day Flow (mgd)	1.5
Design Loading	
BOD (lbs/day)	900
Suspended Solids(lbs/day)	1,200
Bar Screen	
Number (ea)	1
Design Flow (mgd)	2.25
Selector	
Number of Cells	3
Total Volume (ft^3)	1,070
Detention time (min)	4/5/4
Oxidation Ditches (old)	2
Volume each (gal)	104,700
Detention time (hrs)	18
Aerator Capacity (hp)	15 ea
Mixed liquor suspended solids concentration (mg/ℓ)	3,000
Oxidation Ditch (new)	1
Volume (gal)	472,500
Detention time (hrs)	18
Aerator Capacity (hp)	60/30
Mixed liquor suspended solids concentration	3,000
Secondary Clarifiers	
Number (ea)	2
Average Depth (ft)	13.8
Diameter (ft)	40
Overflow rate (gpd/ft^2)	358
Maximum Day Rate	676
Return Sludge Pumps	
Number (ea)	3
Capacity each (gpm)	312
UV Disinfection	
Number of Banks	2
Number of Lamps/bank	4
Capacity (mgd)	2.25

Table 7-2. Existing WWTP – Design Criteria (Continued)

Sludge Holding Tank	
Number (ea)	1
Volume Total (ft^3)	1,668
Sludge Dewatering	
Somat (Number)	1
Feed Rate (gpm)	
Solids Concentration (% solids)	10

Several key components of the existing treatment facilities are operating near design capacity. Although the facility was originally rated for 0.9 mgd, the two old oxidation ditches are not in operating condition. Because of limited space at the existing plant site, future upgrades will need to be very thoroughly planned so the site can meet the City's demands for the next 20 years.

7.3.1 Existing WWTP Problems

In addition to upgrading the existing WWTP, there are certain facilities that are not operating efficiently or properly. The City is spending extra money on maintenance and operation costs because of this equipment. The problem areas at the existing WWTP are as follows:

- Influent screening
- Solids handling

The existing influent screen is not very effective at removing rags, plastics, and other large debris. The screen is also a prime area of odor generation. Because of these reasons and because of limited capacity, all of the plant upgrade alternatives include replacement of the existing bar screen with a fine screen and adding grit removal equipment. It is important to remove grit from the wastewater for two reasons: 1) the grit causes excessive wear on downstream mechanical equipment, and 2) grit settles in aeration basins using up treatment capacity. By removing grit immediately after the wastewater enters the WWTP, downstream equipment and aeration volume are protected from excessive grit.

The existing biosolids (sludge) pumps, sludge holding tank, and sludge dewatering equipment have many operational deficiencies. To keep these systems operating, the operators are spending an excessive amount of time performing operational and maintenance work. To ensure the solids dewatering equipment produces 10 percent or greater waste biosolids, the operators have to continuously monitor the Somat and chemical feed system and adjust as necessary. All of the plant upgrade alternatives include replacement of the existing solids handling system with new biosolids pumps, solids building, dewatering belt press, and chemical dosing system.

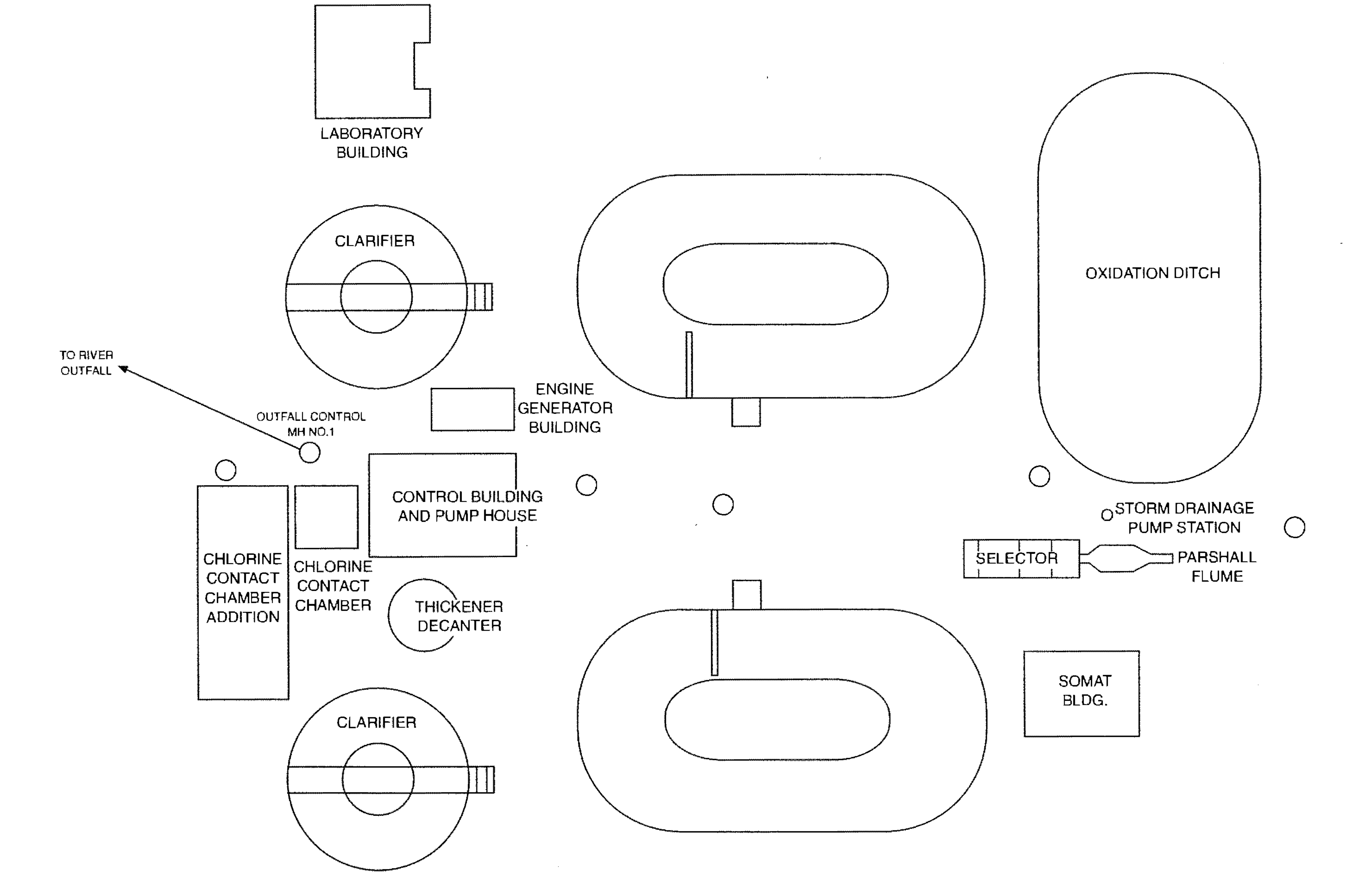

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Figure 7-1
Wastewater Treatment
Existing Site Plan

7.4 WASTEWATER TREATMENT SYSTEM ALTERNATIVES

The flow and load projections present in the previous subsection was used to develop design criteria for the treatment alternatives. Treatment processes were selected based on meeting the proposed effluent limits. The detailed evaluation and estimate of probable cost for the alternatives was completed based on the design criteria.

7.4.1 Oxidation Ditch Alternative

Because the existing WWTP is an oxidation ditch process, the first alternative considered would be to upgrade this process. The advantages of using this process are that most of the existing facilities can be used and the operators are very familiar with the process. The Oxidation Ditch Alternative would include the following facilities:

- Influent screen and grit removal
- New selector
- New oxidation ditch
- New secondary clarifier/RAS pumps
- Upgraded UV system
- New solids handling/dewatering
- Odor control biofilter

A process flow diagram for this alternative is shown in Figure 7-2.

The oxidation ditch process is essentially an extended aeration process. Originally, the extended aeration process was developed to minimize the production of waste activated sludge by providing a large endogenous decay of the sludge mass. The aeration period is 2 to 3 times longer than conventional activated sludge process and the organic loading is considerably less. The process is designed so that the mass of cells synthesized is equal to the mass of cells from endogenous decay, resulting in no net production of sludge. In actual practice, degrading cell waste (sludge) must be removed from the basin on a regular basis.

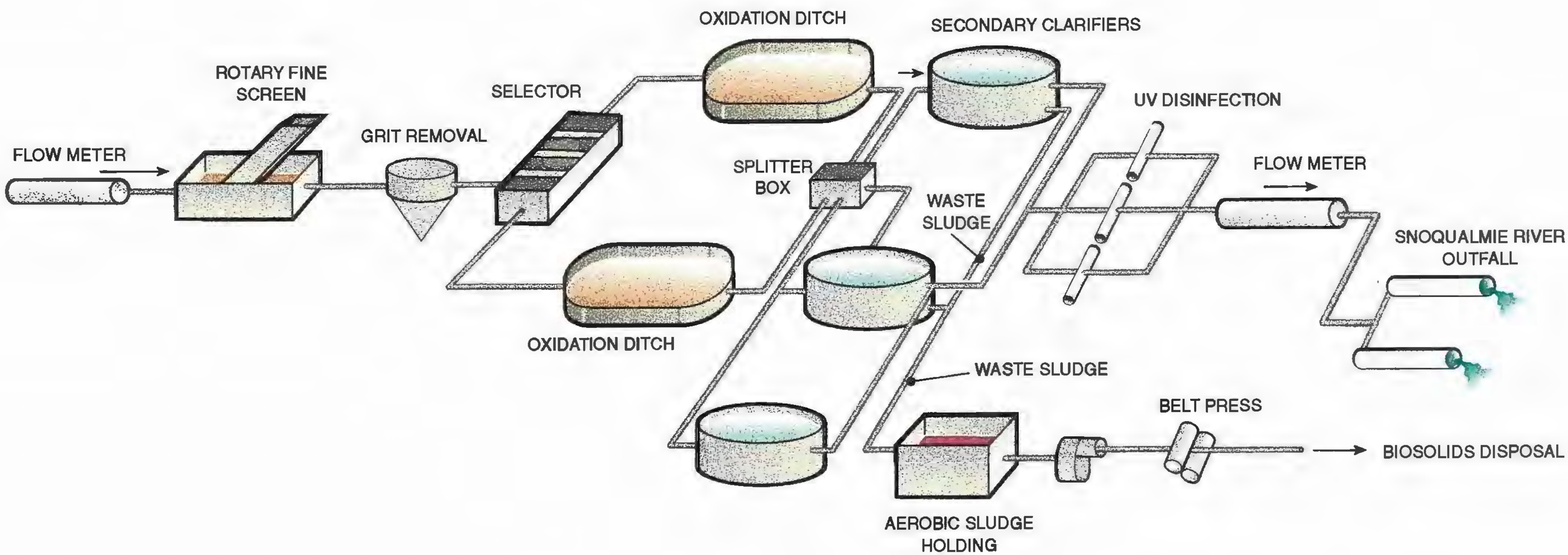

Figure 7-2
Oxidation Ditch
Process Diagram

The main upgrades to the existing oxidation process would be addition of a new large oxidation ditch and new secondary clarifier. Design criteria for the Oxidation Ditch Alternative are shown in Table 7-3. A site plan of the Oxidation Ditch Alternative is shown in Figure 7-3 (see page 7-11).

Table 7-3. Oxidation Ditch Alternative – Design Criteria

Design Flow	
Maximum Month Flow (mgd)	1.75
Maximum Day Flow (mgd)	3.3
Design Loading	
BOD (lbs/day)	2,525
Suspended Solids(lbs/day)	2,320
Ammonia (lbs/day)	375
Rotary Fine Screen	
Number (ea)	1
Bar Spacing (in)	0.25
Channel width (in)	24
Grit Chamber	
Number (ea)	1
Diameter (ft)	10
Selector	
Number of Cells	3
Total Volume (ft^3)	7436
Detention time (min)	12/12/23
Oxidation Ditches	2
Total Volume (gal)	1,100,000
Detention time (hrs)	15
Aerator Capacity (hp)	135
MLSS Concentration (mg/l)	3,500
Secondary Clarifiers	
Number (ea)	3
Average Depth (ft)	15
Diameter (ft)	40/55
Overflow rate (gpd/ft^2)	360
Maximum Day Rate	615
Return Sludge Pumps	
Number (ea)	4
Capacity each (gpm)	625/1,200

Table 7-3. Oxidation Ditch Alternative – Design Criteria (Continued)

Waste Sludge Pumps	
Number (ea)	3
Capacity (ea) (gpm)	250
UV Disinfection	
Number of Banks	3
Number of Lamps	12
Capacity (mgd)	5.8
Effluent Pump Station	
Number of Pumps	4
Capacity each (gpm)	1,215
Aerobic Sludge Holding Tanks	
Number (ea)	2
Volume Total (ft^3)	19,824
Sludge Processing Volume (lbs dry/day)	1,855
Sludge Dewatering	
Belt Press Width (ft)	6.6
Capacity (gpm)	160

7.4.2 Biosolids Disposal

For the Oxidation Ditch Alternative and the other two wastewater treatment processes considered, waste biosolids or sludge would be generated and would require proper disposal. The EPA Sewage Sludge and Use Regulations are defined in 40 CFR Part 503. These rules were developed to meet the requirements of the 1987 Clean Water Act. The regulations define sludge treatment in terms of two major classifications, Class A and Class B. In general, a Class B sludge is a digested or completely air-dried sludge. Class A sludge is a sludge that has undergone more treatment than a Class B sludge to further reduce pathogens. The 503 Regulation defines where Classes A and B treated sludges can be applied:

- Class B sludges can be applied to agricultural land, forest, rangeland, and public contact sites. Food crops cannot be harvested within 14 months of application and root crops cannot be harvested within 20 to 38 months of application. Animals cannot be allowed to graze on the land for 30 days after application.

- Class A sludges can be applied to agricultural land, forest, rangeland, public contact sites, and lawn or home gardens.

Waste biosolids are currently trucked by the City of Duvall to a composting facility in Monroe. Provided the solids content is greater than 10 percent, the facility does not charge extra. The composting facility is operated to achieve Class A compost. This disposal arrangement is still the preferred alternative. A complete review of sludge wasting alternatives is included in this Section in the event that the preferred alternative becomes unviable sometime in the future.

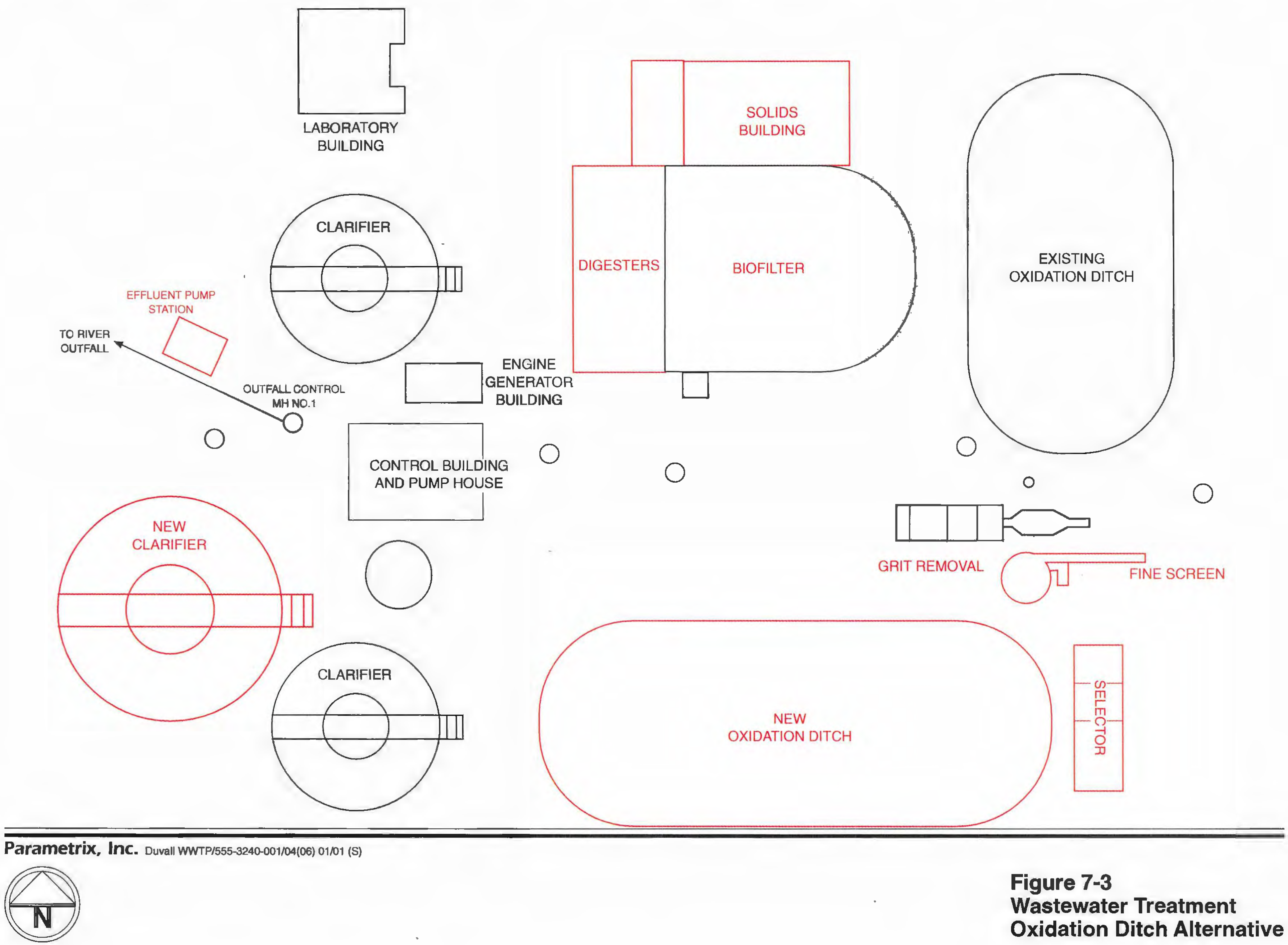

Figure 7-3
Wastewater Treatment
Oxidation Ditch Alternative

The community has several options regarding sludge disposal. Below is a list of well-suited options:

- On-site composting of sludge.
- Land application of sludge.

No land application site or contract disposal investigation work was done for this study and no potential compost customers were contacted. Before selection of an alternate sludge option (if the preferred option becomes unfeasible), site investigations of land disposal sites should be completed to determine site suitability. Winter soil conditions are an important consideration for land disposal. Before selecting a composting operation, a wood chip supplier and compost user would need to be located. Another disposal option would be to haul sludge to the Everett or Renton WWTPs.

Hauling biosolids to the composting facility in Monroe is still the preferred sludge disposal option. Cost estimates for land disposal and sludge composting were not identified. These options were considered to be secondary options because adequate land and materials are not enough for these options to be cost effective. Between now and project design, if the existing composting disposal option is removed from consideration, these alternate options could be evaluated.

7.4.3 Primary Clarifier Alternative

One disadvantage of the Oxidation Ditch Alternative is that it does not lend itself to phasing. Adding a primary clarifier upstream of the existing oxidation ditch would be a cost effective way to increase the plant capacity. A primary clarifier would upgrade the existing ditch capacity to approximately 1.1 mgd. The advantages of using this process are that it can be easily phased and most of the existing facilities can be used. The Primary Clarifier Alternative would include the following facilities:

- Influent screen and grit removal.
- New selector.
- New oxidation ditch.
- New secondary clarifier/RAS pumps.
- Upgraded UV system.
- New solids handling/dewatering.
- Odor control biofilter.

A process flow diagram for this alternative is shown in Figure 7-4.

The basic idea of the Primary Clarifier Alternative would be to add a primary clarifier upstream of the oxidation ditch to remove the settleable portion of the influent waste load. Approximately 30 percent of the influent waste load and most of the inert solids would be removed in the primary clarifier. By reducing the influent waste load and removing inert solids, the capacity of the downstream oxidation ditch process is increased by over 60 percent. For this reason, a primary clarifier can be a very cost-effective way to increase the capacity of a wastewater plant.

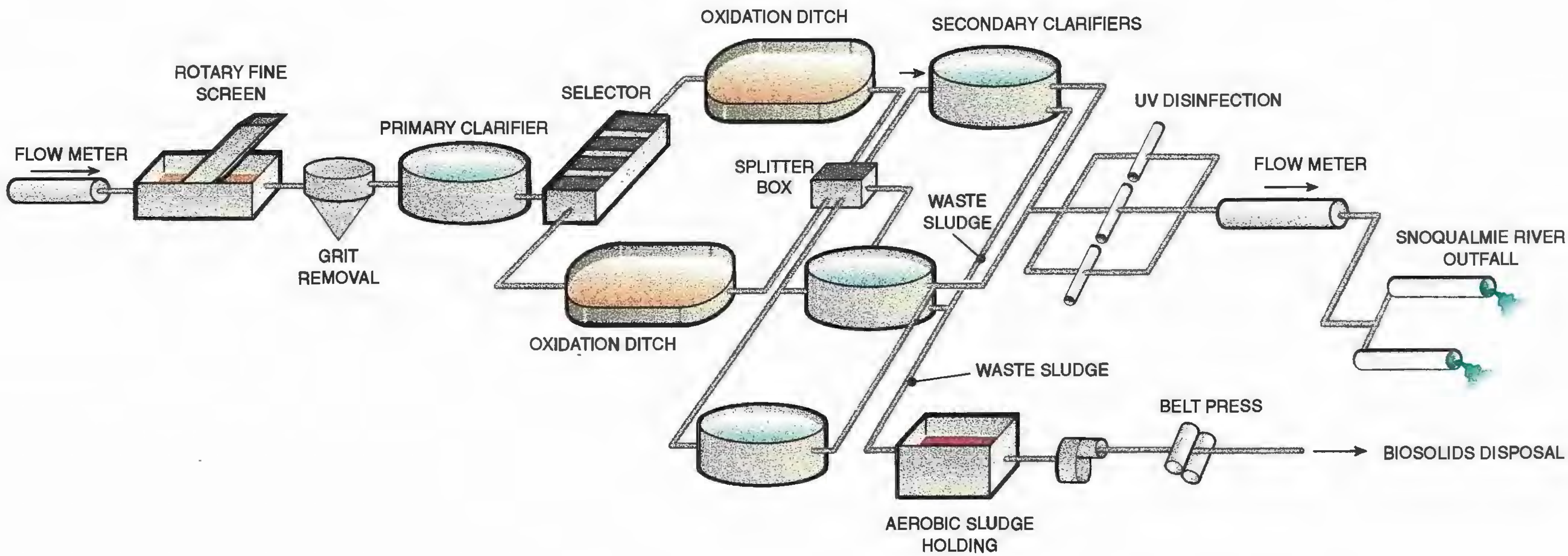

Figure 7-4
Primary Clarifier
Process Diagram

The main upgrades to the existing oxidation ditch process would be the addition of new primary and secondary clarifiers. A second oxidation ditch would not need to be added until Phase 2. Design criteria for the Primary Clarifier Alternative are shown in Table 7-4. A site plan of the Primary Clarifier Alternative is shown in Figure 7-5 (see page 7-16).

Table 7-4. Primary Clarifier Alternative – Design Criteria

Design Flow	
Maximum Month Flow (mgd)	1.75
Maximum Day Flow (mgd)	3.3
Design Loading	
BOD (lbs/day)	2,525
Suspended Solids(lbs/day)	2,320
Ammonia (lbs/day)	375
Rotary Fine Screen	
Number (ea)	1
Bar Spacing (in)	0.25
Channel width (in)	24
Grit Chamber	
Number (ea)	1
Diameter (ft)	10
Selector	
Number of Cells	3
Total Volume (ft^3)	7,436
Detention time (min)	12/12/23
Primary Clarifier	
Number (ea)	1
Average Depth (ft)	13
Diameter (ft)	53
Overflow rate (gpd/ft^2)	396
Maximum Day Rate	680
Oxidation Ditch	2
Volume (gal)	800,000
Detention time (hrs)	11
Aerator Capacity (hp)	110
MLSS Concentration	3,500

Table 7-4. Primary Clarifier Alternative – Design Criteria (Continued)

Secondary Clarifiers	
Number (ea)	3
Average Depth (ft)	15
Diameter (ft)	40/55
Overflow rate (gpd/ft^2)	360
Maximum Day Rate	615
Return Sludge Pumps	
Number (ea)	4
Capacity each (gpm)	625/1,200
Waste Sludge Pumps	
Number (ea)	3
Capacity (gpm)	250
UV Disinfection	
Number of Banks	3
Number of Lamps	12
Capacity (mgd)	5.8
Effluent Pump Station	
Number of Pumps	4
Capacity each (gpm)	1,215
Aerobic Sludge Holding Tanks	
Number (ea)	2
Volume Total (ft^3)	19,824
Sludge Processing Volume (lbs dry/day)	1855
Sludge Dewatering	
Belt Press Width (ft)	6.6
Capacity (gpm)	160

7.4.4 Membrane Process Alternative

The two treatment alternatives reviewed in the previous sections are able to meet the treatment requirements in the NPDES permit. To select a third alternative, the City of Duvall requested consideration of existing treatment standards and review of a process that could meet stricter standards that could be imposed in the future. The Membrane Process Alternative was selected because it offers a very high quality effluent that would be compatible with several different disposal alternatives, including land application. Because river discharge of effluent may not be allowed in the future, this alternative would offer more flexibility than the other options.

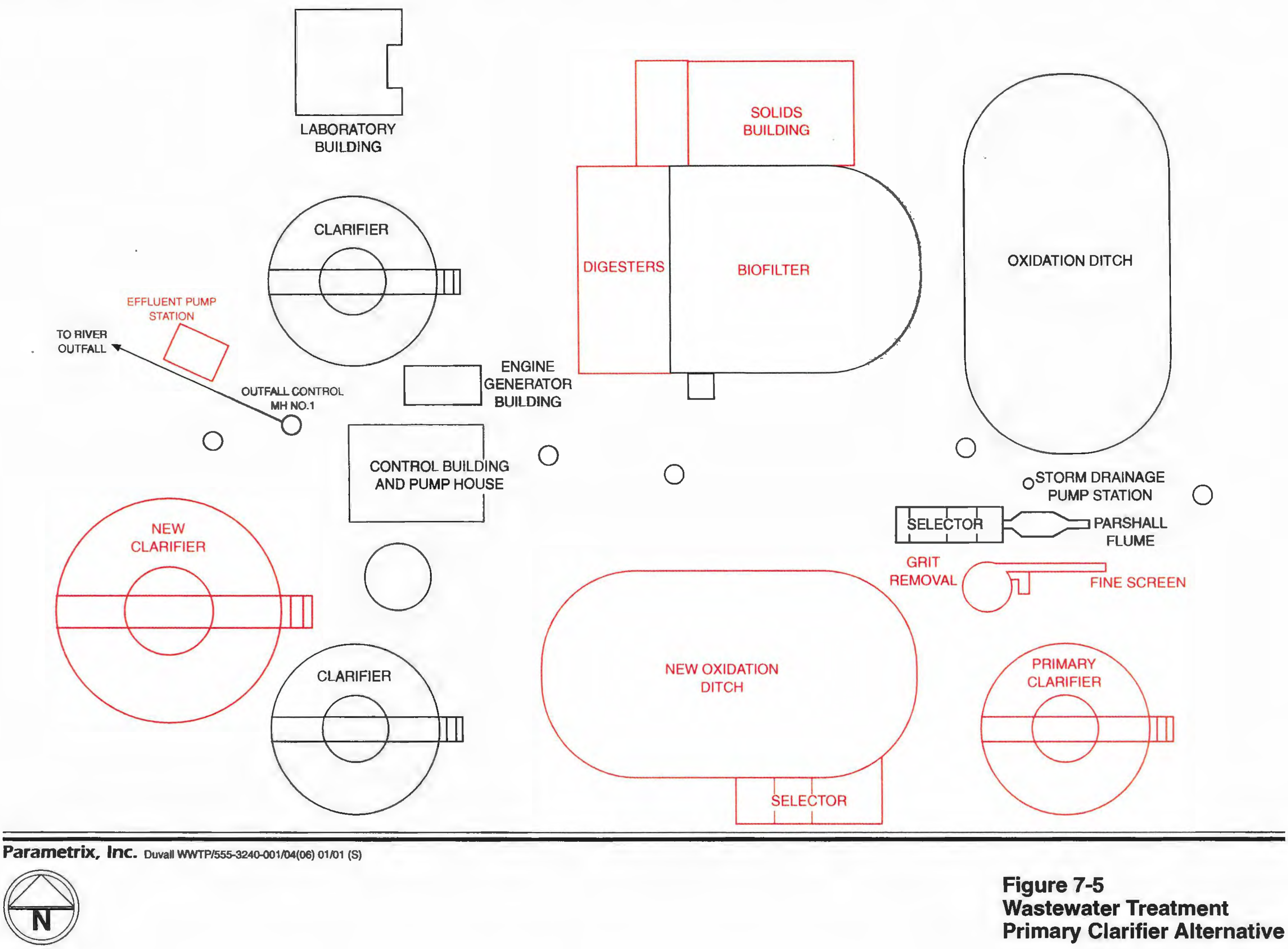

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Figure 7-5
Wastewater Treatment
Primary Clarifier Alternative

The Membrane Process Alternative would include the following facilities:

- Influent screen and grit removal
- Anoxic/Equalization Basin (EQ Basin)
- Membrane Reactors
- Upgraded UV system
- New solids handling/dewatering
- Odor control biofilter

A process flow diagram for this alternative is shown in Figure 7-6 (see page 7-18).

The Membrane Process is essentially the addition of a filtration process to an activated sludge facility. The advantage of the Membrane Process is that it is very space efficient and does not require construction of filtration basins and buildings. The filter membranes can be placed directly into an existing aeration basin. The aeration basin operates much the same as any activated sludge process except that effluent is drawn out of the basin through the filter membranes. The Membrane Process eliminates the need for secondary clarifiers, RAS pumps, piping, etc. The Membrane Process equipment includes membranes, frames, permeate pumps, backwash pumps, recirculation pumps, waste sludge pumps, aeration blowers, and cleaning tanks

Although this process would be a radical change from the existing process, most of the existing facilities could be used. The major changes to the existing oxidation ditch process would be the conversion of the existing oxidation ditch into an anoxic/EQ basin. During normal wastewater flows, this basin would provide anoxic volume for dentrification. During high wastewater flows, the basin would provide equalization volume to dampen influent flow surges. The existing secondary clarifiers would be a good location for two new Membrane reactors. Design criteria for the Membrane Process Alternative is shown in Table 7-5 (see page 7-19). A site plan of the Membrane Process Alternative is shown in Figure 7-7 (see page 7-21).

A biofiltration facility has been included with all the alternatives to reduce plant odor generation. Because the biofilter media depth would only be 5 feet, the old north oxidation ditch would be an ideal place to locate the biofilter.

During flood conditions, the existing outfall does not discharge all flow through the diffuser, but has a bypass discharge through one of the outfall manholes. Ecology has stated that this overflow condition must be eliminated. Because of this and because the capacity of the outfall is not adequate for the projected peak-hour flow (5.25 mgd), the existing outfall will need to be slip-lined and an effluent pump station would need to be added to operate during river flood conditions.

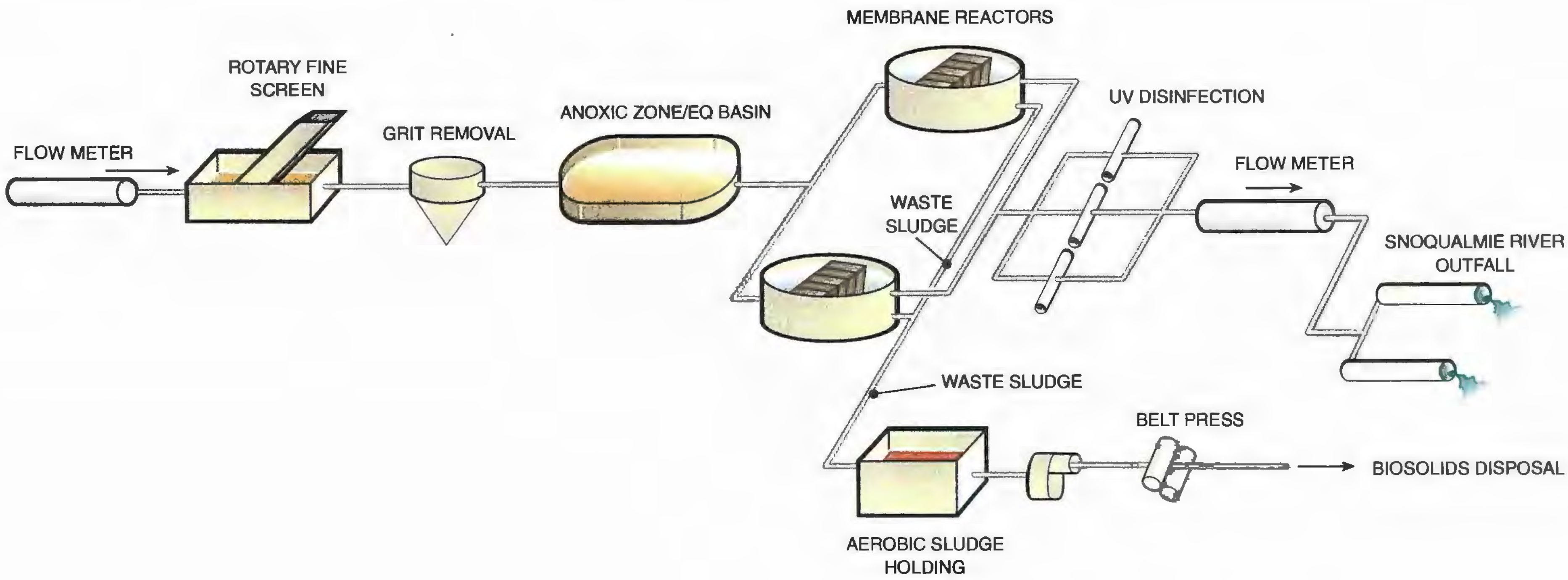

Figure 7-6 Membrane Process Diagram

Table 7-5. Membrane Process Alternative – Design Criteria

Design Flow	
Maximum Month Flow (mgd)	1.75
Maximum Day Flow (mgd)	3.3
Design Loading	
BOD (lbs/day)	2,525
Suspended Solids(lbs/day)	2,320
Ammonia (lbs/day)	375
Rotary Fine Screen	
Number (ea)	1
Bar Spacing (in)	0.25
Channel Width (in)	24
Grit Chamber	
Number (ea)	1
Diameter (ft)	10
Anoxic Zone/EQ	
Anoxic Volume (ft^3)	18,720
EQ Volume (ft^3)	44,110
Total Volume (ft^3)	62,830
Membrane Reactors	
Number of reactors	2
Aerobic Volume (ft^3)	36,582
Average Depth (ft)	14
Number of Trains	6
Number Cassettes	48
MLSS Concentration	8,000
Blowers	4
Permeate Pumps	4
Waste Sludge Pumps	
Number (ea)	3
Capacity (gpm)	250

Table 7-5. Membrane Process Alternative – Design Criteria (Continued)

UV Disinfection	
Number of Banks	3
Number of Lamps	12
Capacity (mgd)	5.8
Effluent Pump Station	
Number of Pumps	4
Capacity each (gpm)	1,215
Aerobic Sludge Holding Tanks	
Number (ea)	2
Volume Total (ft^3)	19,824
Sludge Processing Volume (lbs dry/day)	1,855
Sludge Dewatering	
Belt Press Width (ft)	6.6
Capacity (gpm)	160

7.5 TREATMENT ALTERNATIVE EVALUATION

Three wastewater treatment alternatives have been presented in this section. Each of the alternatives would meet the water quality requirements discussed in Section 6. Before selecting a preferred alternative, capital and operation and maintenance (O&M) costs should be evaluated.

7.5.1 Estimates of Probable Cost

One of the most important considerations in the selection of a wastewater treatment and disposal alternative is cost. The cost estimates shown below are based on construction of a WWTP to serve the Phase 2 demands. Detailed breakdown cost estimates are included in Appendix I.

Oxidation Ditch	$7.20 million
Primary Clarifier	$7.18 million
Membrane Process	$12.48 million

Estimates include 26 percent engineering, legal, and administration cost, plus geotechnical investigation, permitting, and interim financing. Included in the cost estimates is construction management and inspection.

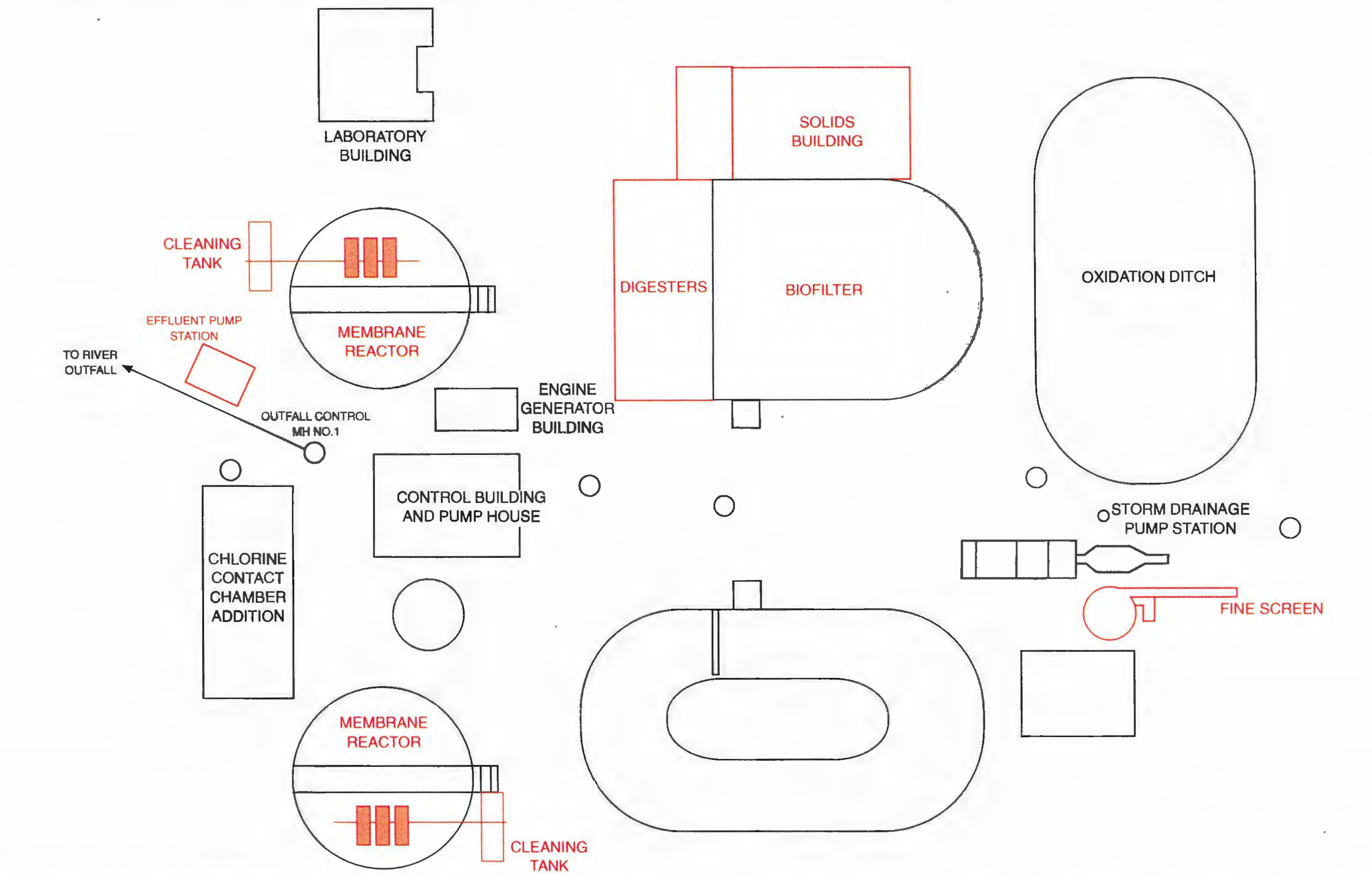

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Figure 7-7
Wastewater Treatment Membrane Site Plan

It should be noted that cost may not provide the best indication for alternative evaluation. The Membrane Process provides an effluent quality much greater than the other two alternatives. Thus, the higher cost may be justified.

The treatment alternative costs shown include earthwork, concrete tanks and vaults, mechanical equipment, piping, electrical equipment, and plant start-up. Biosolids, storage facilities, and equipment are also included in the estimate. All new treatment facilities (except for the outfall) will be placed above the 100-year flood level and the highest known flood level at the treatment plant. Further soil testing will be done prior to WWTP design; however, at this stage it appears the site soils are suitable. Other treatment plant sites considered were not cost effective.

7.5.2 Operations and Maintenance Costs

An important consideration when evaluating wastewater treatment/disposal is the O&M costs. The major O&M cost with all the alternatives would be labor. For this evaluation it was assumed that 2 to 3 operators would be needed to run the WWTP.

The estimated additional annual treatment plant and disposal O&M costs over and above the existing WWTP O&M cost would be as follows:

Oxidation Ditch	$69,800
Primary Clarifier	$65,230
Membrane Process	$91,200

O&M costs included in the above analysis are transportation, equipment repair, materials, operator training, tools, and power. Labor costs for approximately 2 to 3 operators were included in the estimates. In addition to the influent and effluent testing for BOD, TSS, TKN[1], etc., the mixed liquor and waste sludge would need to be tested for TSS, VSS[2], settleability, temperature, flow and DO. A total of $1^1/_2$ to 2 hours per day, on average, would be needed to perform these tasks.

7.5.3 Summary

The advantages and disadvantages of the wastewater treatment alternatives are summarized below.

- **Alternative 1 – Oxidation Ditch**
  - Advantages:
    - Simple process control.
    - Can be built with minimum disruption to existing process.
    - Lower O&M cost.

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[1] total Kjeldahl Nitrogen

[2] volatile suspended solids

- Disadvantages:
  - Phasing is not cost effective.
  - An add-on process would be required to meet Class A reuse criteria.

- **Alternative 2 – Primary Clarifier**
  - Advantages:
    - Lower capital cost.
    - Simple process control.
    - Lower O&M cost.
    - Phasing is relatively simple.
  - Disadvantages:
    - Potential odors from primary solids.
    - An add-on process would be required to meet Class A reuse criteria.

- **Alternative 3 – Membrane Process**
  - Advantages:
    - Produces Class A reuse effluent.
    - Phasing would be relatively simple.
  - Disadvantages:
    - Higher capital cost
    - Higher O&M cost

The City of Duvall spent several months performing an extensive evaluation of the treatment alternatives. One of the difficult parts of the evaluation was trying to compare the membrane alternative to alternatives that do not produce a Class A wastewater reuse effluent. The effluent from either the Primary Clarifier and Oxidation Ditch alternative would need to pass through a tertiary filtration system before it would equal the quality produced by the Membrane Process. Adding a tertiary treatment process would increase the cost, operation complexity, and the O&M costs for these alternatives considerably.

Based on these factors, the City selected the membrane alternative as the preferred alternative to provide treatment not only to meet existing standards, but also to meet future wastewater reuse standards that may be implemented within the life of the plant.

The preferred treatment alternative should meet the needs of the community for the next 20-year planning period. The facilities would be constructed on the existing WWTP site. Construction impacts to the existing facility would be less than the other alternatives. Although land application facilities are not included in this plan, they can be added relatively easily. In the event the preferred alternative becomes unfeasible for any reason, the City has selected the Primary Clarifier, and Oxidation Ditch Alternatives as the second and third choice alternatives.

8. PROPOSED WASTEWATER FACILITIES

8.1 COLLECTION SYSTEM IMPROVEMENTS

A summary of the preferred sewer collection system improvements and wastewater treatment plant upgrades is presented in this section.

Recommended collection system improvements were prioritized to assure that the most critical projects are completed first. The highest priority projects are improvements to the existing pump stations. This would include the electrical wiring correction for the Legacy Ridge Pump Station. Below are the remaining priorities:

- Identification and elimination of excessive I/I:
  - Infiltration and Inflow Program.
- System Upgrades:
  - Install standby generator at Cedar Pump Station.
  - Install telemetry and flow meters at all pump stations.
- Pump station improvements for future wet-weather peak-day flow:
  - Expand Depot Village Pump Station capacity.
  - Expand Cherry Valley Pump Station capacity.

The following Table 8-1 summarizes the collection system capital improvement projects:

Table 8-1. Collection System Capital Improvement Projects

Capital Improvement Project	Projected Cost (2001 Dollars)
Improvements to Existing System	
Electrical Repair – Legacy Ridge Pump Station	$5,000
Depot Village Pump Station Remodel	$48,100
Cherry Brooke Pump Station Remodel	$40,100
Taylor Ridge Pump Station Remodel	$42,000
Legacy Ridge Pump Station Remodel	$38,000
Install Standby Generator at Cedar Pump Station	$15,000
Pipe Main Rehabilitation/Replacement Program	$165,600
Infiltration and Inflow Program	$55,000
Telemetry Installation	$64,000
Improvements Future Customers	
Increase Capacity at Depot Village Pump Station	$59,300
Increase Capacity at Cherry Brooke Pump Station	$48,100

8.2 TREATMENT SYSTEM

Based on the evaluation of future requirements, economic, and other considerations Membrane Filtration was selected as the preferred alternative. In summary the alternative would include

- Rotary Fine Screen
- Grit Removal
- Anoxic/EQ Basin
- Membrane Filters
- UV Disinfection
- Effluent Pump Station
- Aerobic Digesters
- Belt Press

The facility would be sized to treat a maximum monthly wastewater flow of 1.75 mgd. The facility would be designed to meet anticipated summer effluent limits of 30 mg/l of BOD and TSS at maximum monthly load conditions. The plant would also be designed to meet summer a winter ammonia and CBOD limits presented in the January 2001, *Outfall Report Amendment* (Appendix G).

The estimated probable cost of the Phase 1 membrane treatment facilities would be $13.3 million. A cost breakdown of this estimate is included in Appendix I. A hydraulic profile of the facilities is included in Appendix K.

A financial analysis and funding strategy for the preferred collection and treatment alternatives is included in Section 9.

9. FINANCIAL ANALYSIS AND FUNDING STRATEGY

The purpose of this financial program is to provide a long-range plan that will guide the City of Duvall Sewer Utility to financially support necessary capital improvements identified in the *Capital Improvement Plan*. The underlying analyses also addresses rate and financing options for meeting those capital investment needs, including both capital and operating requirements.

9.1 FUNDING OPTIONS

The planned sewer treatment plant expansion, necessary to serve both the existing population and growth, will place a significant financial burden on the City.

Federal and state grant programs, once available for financial assistance, were mostly eliminated or replaced by low cost loan programs. Remaining miscellaneous grant programs are generally limited in application, lightly funded, and heavily subscribed. Nonetheless, the economic benefit of low interest loans makes the effort of applying worthwhile.

On January 22, 2001, the Joint Legislative Audit and Review Committee (JLARC) issued its *Investing in the Environment: Environmental Quality Grant and Loan Programs Performance Audit.* This report, passed by the legislature as House Bill (HB) 1785, provided for the further renovation of Washington's grant and funding programs. The report called for program agencies to shift from a distributive allocation process towards an "investment oriented" procedure—the financing of projects with high environmental returns.

The Committee proposed that agencies direct funds to two forms of projects: systematic and traditional issues. Systematic issues are higher risk, must be implemented over large geographical areas, and require individual entities to distribute information with all other agencies within the collective area. Further, the environmental benefits of systematic projects are difficult to determine in the short term. Traditional issues, conversely, occur at individual sites, with low risk, and have immediate environmental impacts. The City's proposed new sewer treatment plant falls within these parameters.

Most likely, the implementation of this report by the State's program agencies will favor non-point pollution control and environmental mitigation, stormwater facilities, and the upgrade of wastewater treatment facilities. Projects not oriented towards environmental or water quality, such as replacements of mains, will become low funding priorities. This may or may not affect the funding programs listed below, or the City's ability to secure financial assistance for its proposed capital program.

The impacts of HB 1785, notwithstanding state programs identified as potential funding sources for the utility improvements set forth in this plan, are summarized below:

- **Public Works Trust Fund**

  The Public Works Trust Fund (PWTF) is a low cost revolving loan program established to provide financial assistance to local governments for public works projects. Eligible projects include repair, replacement, rehabilitation, reconstruction, or improvement of public works systems to meet current standards for existing users. With recent revisions to the program, growth-related projects consistent with 20-year projected needs are now eligible.

The applicant must be a local government, such as a city, county, or special purpose district, and have an approved long-term plan for financing its public works needs. Local governments must compete for PWTF dollars since more funds are requested each year than are available. The Public Works Board evaluates each application and transmits a prioritized list of projects to the legislature. The legislature then indicates its approval by passing an appropriation from the Public Works Assistance Account to cover the cost of the approved loans. Once the Governor has signed the appropriations bill into law, the local governments receiving the loans are offered a formal loan agreement with the appropriate interest rate and term, as determined by the Public Works Board.

PWTF loans are available at interest rates of .5 percent, 1 percent, and 1.5 percent, with the lower interest rates given to applicants who pay a larger share of the total project costs. The loan applicant must pay a minimum of 5 percent towards the project cost to qualify for a 1.5 percent loan, 10 percent for a 1 percent loan, and 15 percent for a .5 percent loan. The useful life of the project determines the loan's terms up to a maximum of 20 years.

The maximum loan amount is $10 million per jurisdiction per biennium.

- **Community Economic Revitalization Board (CERB)**

Managed by the Department of Community Trade and Economic Development, CERB is strategically focused to help business and industry create and retain jobs in partnership with local communities. CERB's primary focus is to provide low interest loans or, in unique circumstances, grants to local governments to help finance the construction of public facility projects necessitated by private sector development. Job creation and/or retention are the primary goals of the CERB program.

Washington State counties, cities, towns, port districts, special purpose districts, and municipal corporations may apply for CERB funding. Eligible public facilities include bridges, roads, domestic and industrial water, sanitary sewer, storm sewer, railroad spurs, electricity, natural gas, buildings or structures, and port facilities. CERB funds public infrastructure that will result in specific private development or expansions in manufacturing, production, food processing, assembly, warehousing, industrial distribution, recycling facilities, or businesses that substantially support the trading of goods and services outside of the state's borders. Applications must include evidence that a private development or expansion is ready to occur and will only occur if CERB funds are provided. Applicants must demonstrate that no other timely source of funds are available at reasonably similar rates.

Interest rates generally match the most current rate of Washington State bonds but do not exceed 10 percent.

The maximum loan amount is $1 million and 80 percent of the CERB request or $300,000, whichever is the lesser amount, for a grant. In 1997-1999 biennium, there was $10 million available.

- **Community Development Block Grant (CDBG) Program**

  A federal government program administered by the Department of Housing and Urban Development (HUD), the CDBG program provides grants and loans for infrastructure improvements, including sewer projects, for business development that create or retain jobs for low- and moderate-income residents. Since 1974, CDBG has been the backbone of improvement efforts in many communities, providing a flexible source of annual grant funds for local governments nationwide.

  All cities and towns are eligible. The projects should (1) benefit low- and moderate-income families; (2) prevent or eliminate slums or blight; or (3) meet other urgent community development needs. These projects can include economic development projects or wastewater treatment systems for instance.

- **Department of Ecology (DOE) Water Quality Financial Assistance Program**

  The DOE administers the following grant and loan programs:

  - The Centennial Clean Water Fund – Provides grants and low-interest loans to construct wastewater treatment facilities and fund-related activities to reduce nonpoint sources of water pollution.

  - State Revolving Fund Loans – Provides low-interest loans to construct wastewater treatment facilities and related activities, or to reduce nonpoint sources of water pollution.

  - Section 319 Nonpoint Sources Grants Program – Provides grants to reduce nonpoint sources of water pollution.

  While most of the funding goes to wastewater programs, projects such as development and implementation of groundwater and wellhead protection programs are included. All DOE loans require a Facilities Plan which is more comprehensive than an engineering plan. There is only one application for all 3 loans and grant programs.

  The Department of Ecology expects to have $15,000,000 to $20,000,000 available through the Centennial Program, $2,000,000 through Section 319 and $53,000,000 available for SRF low-interest loans in 2002. The following interest rates would apply:

  - 0- to 5-Year Term: Fiscal Year 2002 interest rate is 0.5 percent

  - 6- to 20-Year Term: Fiscal Year 2002 interest rate is 1.5 percent

  Grants for nonpoint source activities are available for up to 75 percent of eligible project costs. Grants for constructing point source facilities are available only in financial hardship cases.

  The Department of Ecology considers hardship cases when capital projects require user fees to exceed 1.5 percent of the area's median household income. This is of particular interest to the City. Construction of the new treatment plant, if financed through revenue bonds, will far exceed this threshold. Year 2000 census information indicates that the City's current median household income is $50,967[3], setting the threshold at $63.71 per month.

- **USDA – Rural Development's Water and Wastewater Program**

  Provides grants and loans for water and waste disposal facilities in rural areas and towns of up to 10,000 people.

  Applicants must be unable to obtain needed funds from commercial sources at reasonable rates and terms. Applicant must also have the legal capacity to borrow and to repay loans, to pledge security for loans, and to operate and maintain the facilities. Grants may be provided when necessary to reduce user costs to a reasonable level. The grants can cover up to 75 percent of eligible facility development costs. The main criterion for eligibility is the inability to find funding from any other source (i.e., revenue bonds or bank loans). Typically a 50-percent grant is the maximum amount awarded. The awarding of grants are dispersed to help as many communities as possible.

  Three interest rates are used. The interest rates are set periodically based on an index of current market yield for municipal obligations. Poverty rate is currently 4.5 percent and applies when the purpose of the loan is to upgrade existing facilities or construct new facilities required to meet applicable health or sanitary standards, and the median household income (MHI) of the area is below the poverty line of the family of four or below 80 percent of the statewide nonmetropolitan MHI. Market rate is the average of the Bond Buy index and applies to applicants where the MHI exceeds the statewide nonmetropolitan household income. The intermediate rate is the poverty rate plus half the difference between the poverty rate and the market rate, not to exceed 7 percent (currently 5.0 percent). The City would be eligible for the intermediate interest rate unless the City can demonstrate a health or sanitary risk.

  Washington State's allocation for water and wastewater development in 2001 is $11 million in loans and $6 million in grants.

- **EPA Sustainable Development Challenge Proposals**

  These grants were given to communities who demonstrated an innovative way to solve problems with environmental impacts. Programs ranged from reducing chemical use in various industries to novel septic disposal programs. This program is in its last year of funding.

  Each of these programs might offer potential opportunities for below-market project funding, as compared to traditional revenue bond funding. However, as noted above, many of the loans programs offer limited benefit in terms of interest rates, while potentially introducing additional costs to comply. An exception to this is the PWTF program, which offers low interest rates without onerous qualification requirements. The Centennial and SRF programs could potentially offer the greatest financial support to the City.

[3] State of Washington Department of Financial Management.

Absent of assisted funding programs, the City will be forced to rely on revenue bonds to finance the construction of the capital program. There are some benefits to the use of revenue bonds. First, as with all debt, debt service will spread capital costs over the term of the bond. At present, the City's sewer utility is not in a financial position to pay for needed capital improvements with fund reserves or through rates on a pay-as-you-go basis. Further, revenue bonds implement a level of equity by dissipating the burden among current and future customers. This sense of shared responsibility should particularly appeal to the City in light of the anticipated growth. Finally, revenue bonds allow flexibility that the aforementioned assisted programs do not through the repayment options. For example, a bond issue may be structured all or in part as a term bond, which require only interest payments for a number of years, with "balloon payments" of principal at specific points in the amortization schedule. Balloon payments can have both positive and negative consequences. "Near loading" of debt principal may result in higher interest costs. However, such a structured debt may still be appealing for a utility, such as the City's, that is projected to experience rapid growth.

There are also several disadvantages to revenue bonds, which is why the City should only use them in the absence of outside assistance. If the growth does not occur, balloon payments and term bonds may leave the utility with large liabilities in the future years without adequate reserves to call bonds. Further, as previously mentioned, revenue bonds have higher interest rates than assisted programs. Finally, revenue bonds require the City to exceed otherwise sufficient rate revenues in order to meet coverage requirements. Bond coverage is a legal requirement binding the utility to demonstrate that revenues exceed expenses by a multiple of the debt service payment. This factor is usually at least 1.25. However, the City's Waterworks Utility (combined water and sewer utilities) has three outstanding revenue bonds, each with a minimum legal coverage requirement of 1.20.

Nevertheless, revenue bonds are perhaps the most common source of funds for construction of major utility improvements. To issue revenue bonds, the City will be required to commit to certain security conditions related to repayment, specifically reserve and coverage requirements. These conditions are included in the bond resolution to be adopted by the City, and essentially impose certain conservative financial practices on the City as a way to make the bonds more secure.

The reserve requirement commits the City to maintain a bond reserve, which could be used to meet payments if the utility is incapable of doing so. The 2000 bond ordinance defines this requirement as the least of "(a) 10 percent of the issue price of the Outstanding Parity Bonds and the [2000] Bonds, (b) Maximum Annual Debt Service on the Outstanding Parity Bonds and the Bonds and (c) 1.25 times Average Annual Debt Service on the Outstanding Parity Bonds and the Bonds." Since the reserve can be invested and earns interest, the net cost of providing the reserve is relatively small. The City has the option of borrowing the reserve requirement as part of the total loan amount, or can fund it over a 5-year period through rates.

The revenue bond coverage factor can require higher service rates than would otherwise be necessary, in order to meet the target. However, the scope of the coverage test is very specific, as defined in the bond resolution, and generally limited. For example, the requirement only considers operating expenses (capital outlays are not counted) and only includes revenue bond debt service or other debt issued on par with the revenue bonds (thus other loans or obligations would generally be excluded from or subordinate to the test).

The City's revenue bond ordinances define the "Waterworks Utility" to include both the water and sewer utilities, thus legally making debt service and the coverage requirement the joint responsibility of the two utilities. However, in evaluating revenue sufficiencies, each utility should be responsible for meeting all requirements applicable to bonds sold for that particular utility's behalf.

9.1.1 Utility Resources

The beginning operating fund (working capital) balance for January 1, 2001, is estimated to be $775,353. A reasonable allowance for working capital would be roughly 30 days of operating expenses, or $89,560 using the 2001 budget. Reserves above 60 days of operating expenses, $179,119, are assumed in the analysis to be available to support construction projects.

The cash in the Bond Reserve is restricted and is typically only available for payment towards the year-end payment of the bond. In accordance with the reserve requirement delineated by the 2000 Bond Resolution, the Bond Reserve Fund balance is assumed to be $144,916. The reserve requirement for the 1997 Bonds is $342,670. However, currently, the 1997 Bonds are being paid by the water utility. We have recommended to the City that the sewer utility gradually assume 100 percent proportional share of the debt service, phased-in over a 4-year period beginning in 2003.

9.1.2 General Facility Charges

General Facility Charges (GFC) are a source of revenue that the City uses to support its capital needs. Also known as capital connection charges, GFCs are authorized by the Washington Revised Code 35.92.025. General Facility Charges are imposed on new customers connecting to the sewer system as a condition of service, in addition to any actual cost incurred to physically connect or install a meter. The underlying premise of a GFC is to require growth to pay for all sewer system capital costs that have been or will be incurred on their behalf to provide service capacity (i.e., require growth to pay for growth).

General Facility Charges serve two basic functions: 1) to provide a revenue source to pay for capital projects, and 2) to recover an equitable level of investment in the system from new customers. Absent such charges, existing customers would be required to bear the burden of all capital costs, including capacity-related costs, through rates. Consequently, new customers would receive the benefit of sewer availability, without themselves paying for available capacity. In addition, the current customers' net investment in the utility would be diluted by the addition of new customers absent a GFC. This dilution would, in effect, be a subsidy to new customers.

Excluding installation expenses, the cost of the system to be recovered through GFCs can be defined in two parts:

- The cost of existing facilities of general benefit, such as mains, pump stations, treatment facilities, etc. Additionally, Washington State law allows collection of up to 10 years of simple interest on system assets based on the interest cost during the year of construction. These original costs are net of donated facilities, including grants, developer contributions, and ULIDs. This is a conservative approach in light of the recent court case, *Landmark Development v. City of Roy*, which suggests that a City is *not* required to deduct the value of grants and donations to the system. Cities have the option of not deducting these values whereas special sewer and water districts *must* deduct these values.

- The cost of future capital facilities. Statutes do not restrict the City from including future projects within the GFC basis. Again, however, projects funded by developers or special districts may not be included in this calculation. Because borrowing will be required to fund the City's proposed CIP, rates must be adequate to pay annual debt service as well as meet existing and future coverage requirements. This coverage requirement is a rate revenue test and excludes use of existing fund reserves or GFC revenues, even though the City plans to use the latter to pay a portion of its annual debt service.

The City plans to build the new sewer treatment plant in a 1-step process. They will seek assisted funding to limit the rate impact on their constituents. Consequently, we have calculated the appropriate General Facility Charge for both a base scenario (revenue bond financed) and a grant-supported funding approach. The same methodology applied to generate the 1999 GFC update, as approved by the City Attorney and City Council at that time, and was used to generate the updated GFC.

General Facility Charges are intended to reflect a proportional share of the sewer system's costs, and therefore shall be applied based on potential demand as reflected by meter size.

Table 9-1 (see page 9-8) displays the mathematical methodology for the General Facility Charge calculation. The "buy-in" portion of the GFC is comprised of the applicable portion of the existing facilities, along with 10 years of accumulated simple interest at 4.75 percent, the 1991 interest rate for High Grade Municipal Bonds. RCW 35.92.025 allows for the inclusion of "interest charges applied from the date of construction of the water or sewer system until the connection, or for a period not to exceed ten years, at a rate commensurate with the rate of interest applicable to the city or town at the time of construction or major rehabilitation of the water or sewer system, or at the time of installation of the water or sewer lines to which the property owner is seeking to connect, but not to exceed ten percent per year." The capacity increasing portion is summarized in the cost of the planned future facilities. Summing existing and future facility costs, a GFC per meter flow equivalent is calculated by dividing the sum by the total system Equivalent Residential Unit (ERU) capacity.

Three components make up the cost of facilities allocable to both current and future customers. First, we have included the principal, $3,838,000, of the 1991 sewer bond net of refunding for treatment plant upgrades along with ten years of simple interest. Also included is the principal, $2,880,000, of the 2000 revenue bonds sold to finance the acquisition of the land where the new treatment plant will be located. The City of Duvall's sewer utility operates on a cash basis and consequently has no record of existing assets. The principal balance on outstanding debt there by serves as a conservative estimate of total system cost. It is assumed that the City will use GFC receipts to pay debt service.

Future capital projects that will be constructed to provide additional capacity are allocated solely to growth. We have been conservative in assigning future costs by only including the present value of those projects, rather than escalating costs relative to capital cost inflation.

Table 9-1. City of Duvall Sewer Rate Analysis Base Scenario

	Amount
Cost of Existing Facilities	
Utility Plant-In-Service[a]	$3,838,000.00
• Plus: Construction Work In Progress[b]	2,880,000.00
• Less: Contributions In-Aid-Of Construction	–
Net Utility Plant	**$6,718,000.00**
• Plus: Accumulated Interest on Noncontributed Plant[c]	1,821,597.00
Net Allocable Existing Sewer Plant-In-Service Cost of Capital:	**$8,539,597.00**
Cost of Future Facilities/Improvements	
Cost of Planned Future Facilities for New Capacity[d]	$7,688,400.00
Cost of Planned Future Facilities and Nongrowth Improvements[e]	10,166,200.00
Total:	**$17,854,600.00**
Total Allocable Costs	
Total Allocable Existing Plant and Future Noncapacity Improvements	$18,705,797.00
Total Future Capacity Increasing Facilities Costs	7,688,400.00
Total Allocable Costs:	**$26,394,197.00**
Capacity Analysis in Equivalent Residential Units (ERUs)	
Current System Capacity – ERUs[f]	$1,958.00
Increase in Capacity with Improvements – ERUs	3,342.00
Total Estimated ERU Capacity with Improvements at 100 Percent Capacity:	**$5,300.00**
Calculation of General Facilities Charge	
(Existing Plant + Noncapacity Future Costs) / Total Capacity + (Future Capacity Costs / Growth)[g]	**$5,829.93**
General Facility Charge Less R&R of Mains:	**$5,048.80**

a 1991 Sewer Bond net of refunding for treatment plant upgrade.

b Bond issue of land acquisition for new sewer treatment plant.

c Ten years of simple interest of utility plant-in-service at 4.75 percent.

d Portion of new treatment plant to increase system capacity and thus allocable solely to growth.

e Portion of CDP for upgrading of existing system—allocable to current and future customers.

f Per Parametrix email March 7, 2001.

g Existing facilities plus nongrowth capital projects are divided by the total number of system ERUs, thus sharing expense proportionally among current and future customers ($18,705,797 / 5,300 = $3,529). Growth related capital is necessary to serve growth only, and thus the sole responsibility of growth ($7,688,400 / 3,342 – $2,301 per ERU).

Finally, we have allocated non-growth related future capital projects to current and future customers as a shared cost. In fact, the non-escalated costs of main repair and replacement over a 25-year period, as established in the CIP, are included in the GFC calculation above. The Plan calls for $165,600 per year in annual main upgrades, totaling $3,974,400 and comprising $781 of the total GFC. Repair and replacement of mains is generally paid for through rates. Also given the fact that the magnitude and timing of pipe replacement is somewhat uncertain, we have calculated an alternative charge that excludes main replacing, resulting in a GFC of $5,049 per meter equivalent. If the City does decide to collect the repair and replacement portion of the GFC, we recommend that those funds be set aside in order to finance these main replacement projects. Finally, revisions imposed by the Governmental Accounting Standards Board, under GASB 34, require cities to account for depreciation. If the City of Duvall, in accordance with GASB 34, begins to collect replacement funding through rates, the City will be required to remove replacement projects from the GFC calculation at that time.

If the City is able to secure grant funding, the GFC will necessarily decrease. Donated or contributed capital is removed from the total cost of the system. The donated portion of the system facilities places no burden on the utility or its ratepayers to provide available capacity, and consequently should not be a reimbursable cost of new customers. Scenario 2, provided in Table 9-2, assumes that the City will receive $5,000,000 in grant funding.

Table 9-2. General Facility Charge Assuming Grant Funding of $5 Million Calculation Summary

	Amount
Cost of Existing Facilities	
Utility Plant-In-Service[a]	$3,838,000.00
• Plus: Construction Work In Progress[b]	2,880,000.00
• Less: Contributions In-Aid-Of Construction	–
Net Utility Plant	**$6,718,000.00**
• Plus: Accumulated Interest on Noncontributed Plant[c]	1,821,597.00
Net Allocable Existing Sewer Plant-In-Service Cost of Capital:	**$8,539,597.00**
Cost of Future Facilities/Improvements	
Cost of Planned Future Facilities for New Capacity[d]	$2,688,400.00
Cost of Planned Future Facilities and Nongrowth Improvements[e]	10,166,200.00
Total:	**$12,854,600.00**

Table 9-2. General Facility Charge Assuming Grant Funding of $5 Million Calculation Summary (Continued)

	Amount
Total Allocable Costs	
Total Allocable Existing Plant and Future Noncapacity Improvements	$18,705,797.00
Total Future Capacity Increasing Facilities Costs	2,688,400.00
Total Allocable Costs:	**$21,394,197.00**
Capacity Analysis in Equivalent Residential Units (ERUs)	
Current System Capacity – ERUs[f]	$1,958.00
Increase in Capacity with Improvements – ERUs	3,342.00
Total Estimated ERU Capacity with Improvements at 100 Percent Capacity:	**$5,300.00**
Calculation of General Facilities Charge	
(Existing Plant + Noncapacity Future Costs) / Total Capacity + (Future Capacity Costs / Growth)[g]	**$4,333.82**
General Facility Charge Less R&R of Mains:	**$3,552.69**

[a] 1991 Sewer Bond net of refunding for treatment plant upgrade.

[b] Bond issue of land acquisition for new sewer treatment plant.

[c] Ten years of simple interest of utility plant-in-service at 4.75 percent.

[d] Portion of new treatment plant to increase system capacity and thus allocable solely to growth. Assumes $5,000,000 loan decreasing capacity related costs from $7,688,400.

[e] Portion of CIP for upgrading of existing system—allocable to current and future customers.

[f] Per Parametrix email March 7, 2001.

[g] Existing facilities plus nongrowth capital projects are divided by the total number of system ERUs, thus sharing expense proportionally among current and future customers ($18,705,797 / 5,300 = $3,529). Growth related capital is necessary to serve growth only, and thus the sole responsibility of growth ($2,688,400 / 3,342 – $804 per ERU).

9.2 PROJECTIONS OF FINANCIAL PERFORMANCE

The projections of financial performance are based on the City's existing financial condition and estimated impacts of recommended improvements and programs.

9.2.1 Current Expenses and Revenues

Current revenues and expenses are taken from the projected 2001 budget, as provided by the City, and estimated capital costs, as provided by Parametrix.

Based on current budget (operating and capital expenditures, as well as debt service coverage), the City faces a projected revenue deficiency of $300,686 in 2001. Approximately $350,000 was allocated from fund reserves for construction of the outfall. The project was complete as planned in the Summer of 2001. The following two key assumptions are built into the analysis (see Table 9-3):

- **Assumption 1**

  The Legacy Ridge pump station, elements of the infiltration and inflow program (flow monitoring, smoke testing, and video inspection), and the outfall will be paid for out of existing fund balances.

- **Assumption 2**

  The 2001 deficiency does not reflect the recommendation that the sewer utility pay an increasing portion of sewer system—related debt service, currently paid by water rate revenues, beginning in 2003. The share would increase incrementally over a 4-year period, at which time sewer system related debt service would become the sole responsibility of the sewer utility.

Table 9-3. 2001 Operating Summary

Description	Cash Flow	Coverage
Expenses		
Cash Operating Expenses[a]	$ 919,276.00	$ 919,276.00
Revenue Bonds (new and existing)	144,916.00	144,916.00
Revenue Bond Coverage Requirement	–	36,229.00
Other Debt Service	–	–
Additions to R&R Reserve	–	–
Machinery and Equipment	25,450.00	–
Additional Rate Funding for Capital Improvement Projects	–	–
Additions to Meet Minimum Operating Reserve	–	–
Total Expenses:	**$1,089,642.00**	**$1,100,421.00**
Revenues		
Sewer Charges	$ 740,000.00	$ 740,000.00
General Facility Charges[b]	144,916.00	–
Side Sewer Connections	35,000.00	35,000.00
Inspection Fees	2,000.00	2,000.00
Miscellaneous	500.00	500.00
Sewer Recovery Contract	–	–
Interfund Transfers	–	–
Interest Earnings[c]	26,771.00	46,687.00
Total Revenue:	**$949,187.00**	**$824,187.00**

Table 9-3. 2001 Operating Summary (Continued)

Description	Cash Flow	Coverage
Cash Flow	**($140,455.00)**	**($276,234.00)**
Additional Coverage/Capital Expense	(135,779.00)	–
Additional Taxes with Rate Increase	(24,452.00)	(24,452.00)
Net Cash Flow:	**($300,686.00)**	**($300,686.00)**

[a] Per Dwight Miller, Parametrix, 535 50 35 00 Repair and Replacement – $25,000 for R&R under O&M and $350,000 for outfall as capital – March 27, 2001.

[b] GFCs not available to fund operations. GFC revenues are restricted to paying debt service only.

[c] Bond resolution allows for inclusion of interest from the Bond Fund; interest from other semi-restricted funds is also used to meet bond test.

9.2.2 Existing Revenue Bonds

Table 9-4 is a summary of the sewer utility's outstanding revenue bond debt.

Table 9-4. Outstanding Revenue Bond Debt

Issued	Maturity	Debt Outstanding
1997	2011	$3,963,436.00
2000	2020	5,459,697.00
	Total:	**$9,423,133.00**

The sewer utility has no other outstanding debt.

9.2.3 Forecast Assumptions

The 2001 Budget is used as the basis for projecting future utility operation and maintenance expenses. A number of forecast assumptions are used in the analysis including:

- Growth escalation is assumed to be 100 equivalent residential units per year.
- General Cost Inflation – 3.00 percent.
- Labor Cost Inflation – 3.50 percent.
- Construction Cost Inflation – 3.50 percent.
- Fund Earnings – 4.50 percent.
- Additional O&M expense related to the new treatment facility and growth are shown in Table 9-5 (see page 9-13).
- Bond reserve requirements, when applicable, are assumed to be one year's debt service at level annual payments.

Table 9-5. Forecast Assumptions – Years 2002-2010

Additional O&M Expenses By 2010		2002	2003	2004	2005	2006	2007	2008	2009	2010
Additional Collection Expense (divided over period)										
– Additional FTEs: 1.5	Starting at 2003	–	$8,547	$8,846	$9,156	$9,476	$9,808	$10,151	$10,506	$10,874
Additional Treatment Expense (one time)										
– Additional FTEs: 2.0	In 2003	–	$79,772	–	–	–	–	–	–	–
Additional Financing Expense (divided over period)										
– Additional: $4,140	Starting at 2002	$536	$554	$574	$594	$615	$636	$658	$681	$705
Additional Engineering and Financing Expense (divided over period)										
– Additional:$114,829	Starting at 2002	$14,856	$15,376	$15,914	$16,471	$17,048	$17,644	$18,262	$18,901	$19,563

Notes:

1. Additional "Collection", "Financing", and "Engineering and Financing" are increased in incremental amounts. Thus, the total amount is divided into equal increments over the time in which it will be added. Additional treatment is a 1-time expense. Dollar amounts are escalated using labor cost inflation.
2. Additional FTEs are assumed to begin at a base salary of $28,642 plus an additional 30 percent for benefits. No salary escalation has been added beyond labor cost inflation. Consequently, these salary costs do not reflect future promotions or salary increases beyond inflation.

9.2.4 Revenue Projection Model

We have evaluated two separate scenarios to assess the ability of the City to finance the proposed CIP. Scenario One assumes that the City will receive funding both in the form of a grant and an SRF loan to help finance the new treatment plant. Scenario Two assumes the City does not receive outside assistance, and rather relies on the sale of revenue bonds.

Currently, the sewer utility is paying the debt service for the 2000 Revenue Bond Issue only. However, we have recommended that the utility accept responsibility for the 1997 Bond Issue, as well. In both scenarios, we have assumed, beginning in 2003, debt service will be phased in at 25 percent increments per year, culminating in 2006 with the sewer utility paying all of the 1997 Bond annual debt service.

9.2.4.1 Scenario One – Grant/SFR Financing Scheme

Scenario One assumes the City would receive $5,000,000 in the form of a State Revolving Fund (SRF) grant as well as a 1.5 percent low interest loan. The Washington Pollution Control SRF offers such loans with no additional coverage requirement, as imposed with revenue bonds. If the City were able to secure financial assistance, rates are projected to stabilize by 2006 at $79.17 per residential unit, as shown in Table 9-6 (see page 9-15).

9.2.4.2 Scenario Two – Revenue Bonds

The City has also considered financing the construction of its new sewer treatment plant through the sale of revenue bonds. Currently, the City has two revenue bond issues outstanding. Revenue bonds impose higher interest rates on the borrower and impose additional coverage requirements, as delineated in the bond resolution.

If the City were to issue new revenue bonds, rates would plateau at $129.55 by 2006, as shown in Table 9-7 (see page 9-17).

Unlike Scenario One, which assumes there is no additional coverage requirement, Scenario Two rate increases are driven by bond coverage requirement.

Both scenarios are contingent upon growth occurring at the rate projected by the City. GFC revenues are assumed to pay a portion of annual debt service. If, however, growth occurs at a rate slower than projected, the City will be compelled to raise rates to meet resulting revenue deficiencies.

Table 9-6. City of Duvall Sewer Rate Analysis – Scenario One – Grant/SRF

	2001	2002	2003	2004	2005	2006
Capital						
• Capital Costs						
➢ Capital Improvement Projects	$60,000	$13,847,265	$177,395	$183,604	$190,030	$196,681
➢ Equipment Replacement	–	–	–	–	–	–
Total Capital Costs:	**$60,000**	**$13,847,265**	**$177,395**	**$183,604**	**$190,030**	**$196,681**
• Funding						
➢ Grants	–	$5,000,000	–	–	–	–
➢ Capital Reserves	60,000	811,751	171,887	–	–	–
➢ Additional Rate Funding	–	–	5,507	183,604	190,030	196,681
➢ Alternative Debt Instrument	–	8,035,514	–	–	–	–
➢ Revenue Bonds	–	–	–	–	–	–
Total Funding Sources:	**$60,000**	**$13,847,265**	**$177,395**	**$183,604**	**$190,030**	**$196,681**
Required New Debt						
• Revenue Bonds	–	–	–	–	–	–
• Alternative Debt Instrument	–	$8,200,000	–	–	–	–
Revenues and Expenses						
• Operating Revenues						
➢ Rate Revenues	$740,000	$775,957	$811,914	$847,872	$883,829	$919,786
➢ General Facility Charges[a]	144,916	433,382	433,382	433,382	433,382	433,382
➢ Miscellaneous Revenues	37,500	39,313	41,126	42,940	44,754	46,569
➢ Interest Revenues	26,771	14,582	14,582	14,582	14,582	15,026
Total Cash Revenues:	**$949,187**	**$1,263,234**	**$1,301,005**	**$1,338,776**	**$1,376,547**	**$1,414,764**

Table 9-6. City of Duvall Sewer Rate Analysis – Scenario One – Grant/SRF (Continued)

	2001	2002	2003	2004	2005	2006
• Expenses						
➢ Operating and Maintenance	$919,276	$1,003,719	$1,063,139	$1,123,870	$1,187,505	$1,254,175
➢ Additional City Utility and State Taxes	24,452	34,974	45,185	71,003	82,576	93,719
➢ Debt Service – Principal and Interest	144,916	628,395	715,806	805,600	893,342	979,928
➢ Additions to Meet Minimum Operating Reserve	–	–	–	–	9,882	13,214
➢ Machinery and Equipment	25,450	26,214	27,000	27,810	28,644	29,504
➢ Rate Funded CIP	–	–	5,507	183,604	190,030	196,681
➢ Additional Coverage/Capital	135,779	–	–	–	–	–
Total Cash Expenses:	**$1,249,873**	**$1,693,301**	**$1,856,638**	**$2,211,887**	**$2,391,980**	**$2,567,220**
Revenue Deficiency (Surplus)	**$300,686**	**$430,067**	**$555,633**	**$873,111**	**$1,015,433**	**$1,152,456**
Annual Rate Increase	**40.63%**	**10.52%**	**8.37%**	**20.51%**	**5.87%**	**4.84%**
• Increase Over Current Rates	40.63%	55.42%	68.43%	102.98%	114.89%	125.30%
• Single Family Sewer Rate ($35.14)	$49.42	$54.62	$59.19	$71.33	$75.51	$79.17

[a] GFCs not available to fund operations. GFC revenues are restricted to paying debt service only.

Table 9-7. City of Duvall Sewer Rate Analysis – Scenario Two – Revenue Bonds

	2001	2002	2003	2004	2005	2006
Capital						
• Capital Costs						
➢ Capital Improvement Projects	$60,000	$13,847,265	$177,395	$183,604	$190,030	$196,681
➢ Equipment Replacement	–	–	–	–	–	–
Total Capital Costs:	**$60,000**	**$13,847,265**	**$177,395**	**$183,604**	**$190,030**	**$196,681**
• Funding						
➢ Developer Contributions/LID	–	–	–	–	–	–
➢ Grants	–	–	–	–	–	–
➢ R&R Reserves	–	–	–	–	–	–
➢ Capital Reserves	$60,000	$811,751	$177,395	$183,604	$190,030	$196,681
➢ Additional Rate Funding	–	–	–	–	–	–
➢ Alternative Debt Instrument	–	–	–	–	–	–
➢ Revenue Bonds	–	13,035,514	–	–	–	–
Total Funding Sources:	**$60,000**	**$13,847,265**	**$177,395**	**$183,604**	**$190,030**	**$196,681**
Required New Debt						
• Revenue Bonds	–	–	–	–	–	–
• Alternative Debt Instrument	–	$13,050,000	–	–	–	–

Table 9-7. City of Duvall Sewer Rate Analysis – Scenario Two – Revenue Bonds (Continued)

	2001	2002	2003	2004	2005	2006
Revenues and Expenses						
• Operating Revenues						
➤ Rate Revenues	$740,000	$775,957	$811,914	$847,872	$883,829	$919,786
➤ General Facility Charges[a]	144,916	582,993	582,993	582,993	582,993	582,993
➤ Miscellaneous Revenues	37,500	39,313	41,126	42,940	44,754	46,569
➤ Interest Revenues	26,771	14,582	79,092	80,184	81,328	82,454
Total Cash Revenues:	**$949,187**	**$1,412,845**	**$1,515,127**	**$1,553,990**	**$1,592,904**	**$1,631,803**
• Expenses						
➤ Operating and Maintenance	$919,276	$1,003,719	$1,063,139	$1,127,096	$1,190,785	$1,257,512
➤ Additional City Utility and State Taxes	24,452	$164,005	172,703	182,970	191,949	200,969
➤ Debt Service – Principal and Interest	144,916	1,369,111	1,456,522	1,546,316	1,634,058	1,720,644
➤ Additions to Meet Minimum Operating Reserve	–	18,062	–	–	–	–
➤ Machinery and Equipment	25,450	26,214	27,000	27,810	28,644	29,504
➤ Adjustment to Levelize Rates	–	–	–	–	–	–
➤ Additional Coverage/Capital	135,779	848,479	919,472	919,756	907,845	894,461
Total Cash Expenses:	**$1,249,873**	**$3,429,590**	**$3,638,837**	**$3,803,947**	**$3,953,281**	**$4,103,090**
Revenue Deficiency (Surplus)	**$300,686**	**$2,016,745**	**$2,123,710**	**$2,249,958**	**$2,360,377**	**$2,471,287**
Annual Rate Increase	**40.63%**	**155.92%**	**0.46%**	**1.05%**	**0.46%**	**0.44%**
• Increase Over Current Rates	40.63%	259.90%	261.57%	265.37%	267.06%	268.68%
• Single Family Sewer Rate ($35.14)	$49.42	$126.47	$127.06	$128.39	$128.99	$129.55

[a] GFCs not available to fund operations. GFC revenues are restricted to paying debt service only.

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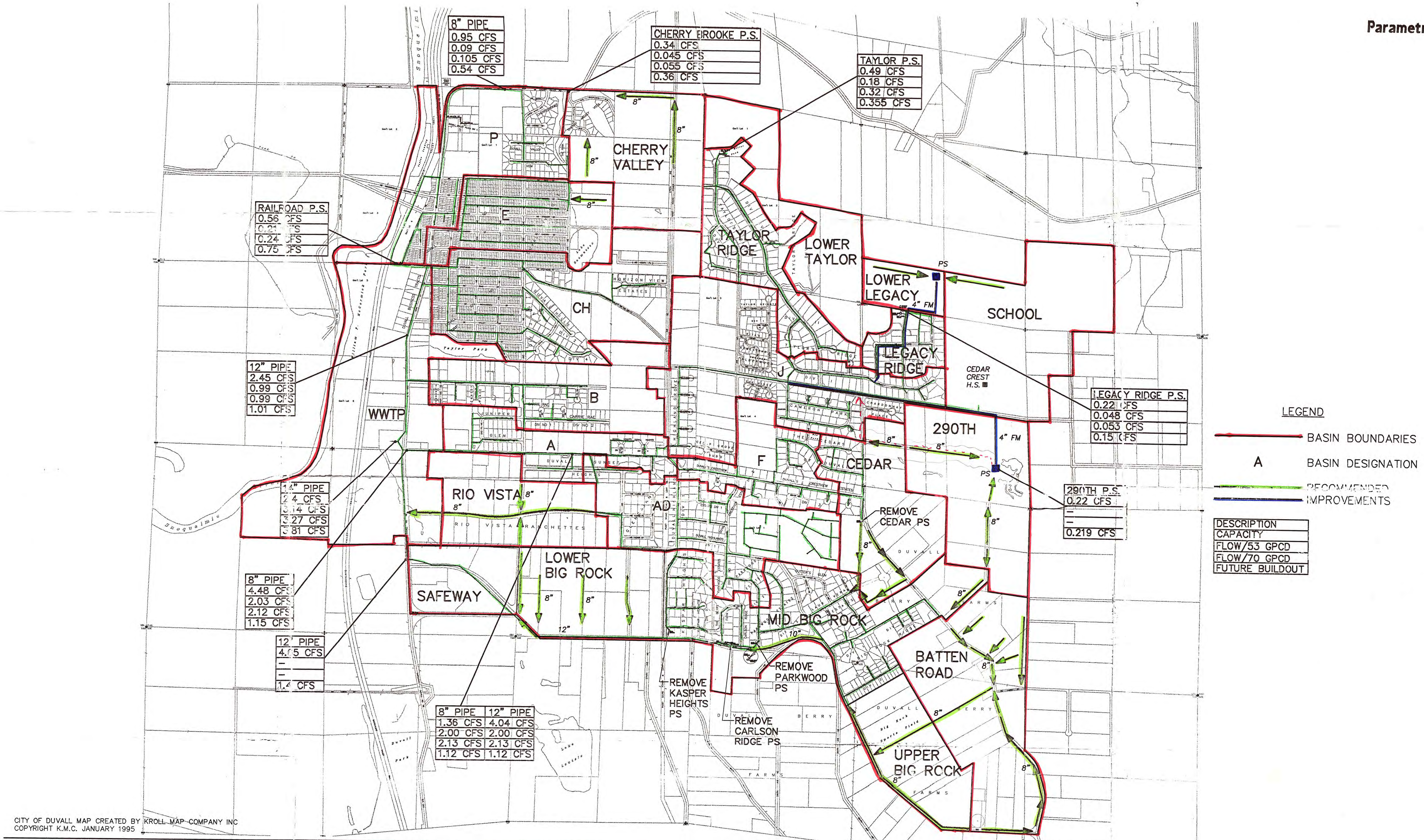
Figure 5-2
UGA Impacts on Exist Collection System
Wastewater Facilities Plan
City of Duvall

Parametrix, Inc.



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DATE: 02/05/01

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SCALE IN FEET

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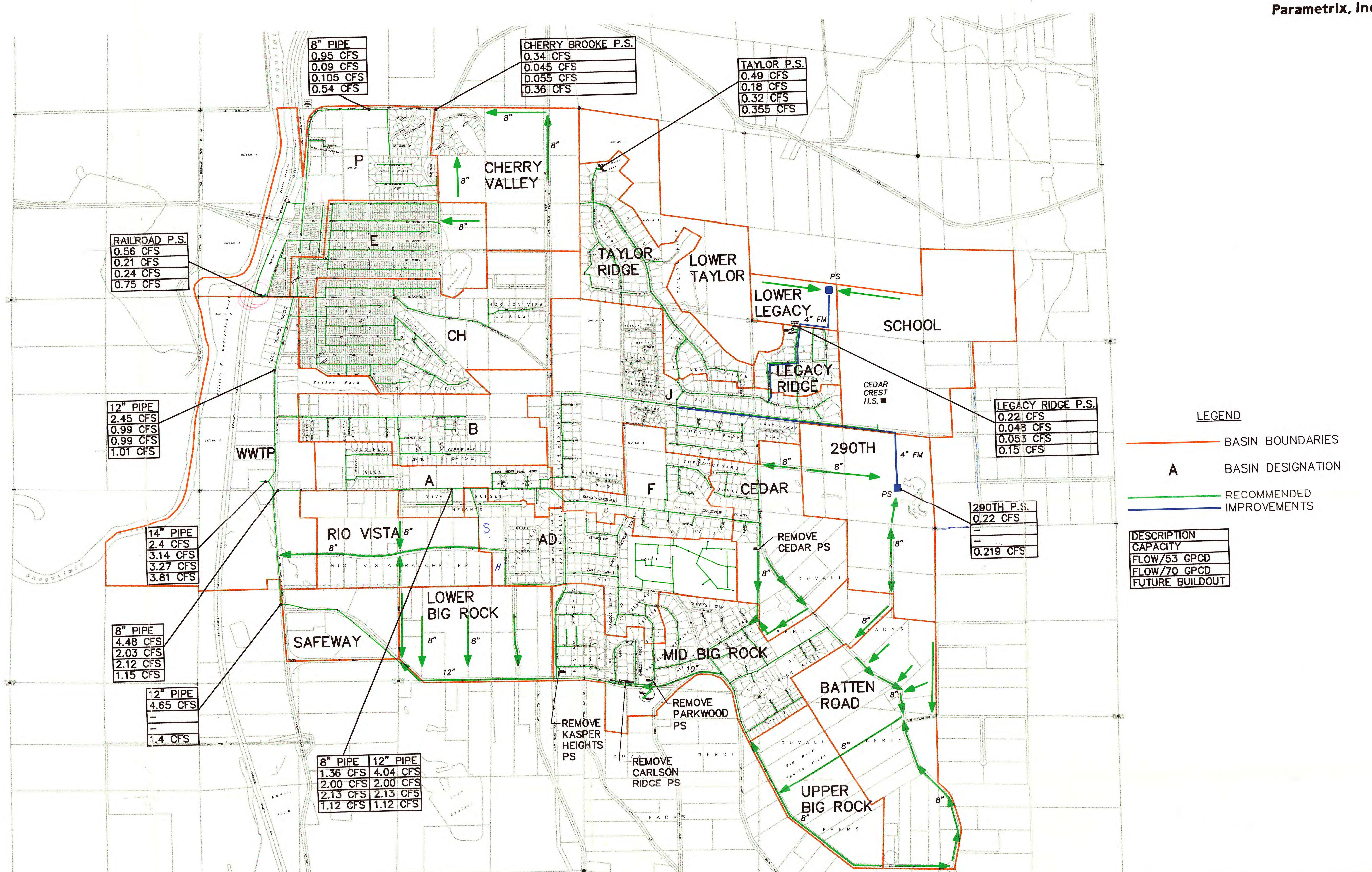
Figure 5-2
UGA Impacts on Exist Collection System
Wastewater Facilities Plan
City of Duvall

Parametrix, Inc.



CITY OF DUVALL MAP CREATED BY KROLL MAP COMPANY INC
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Figure 5-2
UGA Impacts on Exist Collection System
Wastewater Facilities Plan
City of Duvall

APPENDIX A

Collection System Industrial User Survey

Survey Report
DUVALL

December 1999

Local Hazardous Waste Management Program in King County

Produced by the Local Hazardous Waste Management Program Survey Team.

For more information about this report, or to request additional copies, contact Richard Thompson at (206) 263-3074.

Executive Summary

SURVEY OVERVIEW

The Local Hazardous Waste Management Program (LHWMP or the Program) Survey Team visited 50 businesses in Duvall in May 1999 and June 1999. The purpose of these visits was to:

- provide information to businesses about the LHWMP,
- obtain information about the types and quantities of hazardous wastes generated by small businesses, and
- provide information and technical assistance about proper hazardous waste management and pollution prevention.

The 50 businesses visited represent 11 different industries. At least 4 of the businesses, or approximately eight percent, generate at least one type of hazardous waste. Attachment B lists the types and estimated amounts of wastes generated among all sites visited.

HAZARDOUS MATERIALS MANAGEMENT ISSUES

Over the course of their visits, Survey Team Investigators identified the following areas in which businesses could improve their management of hazardous materials:

Waste disposal. Four generators (100 percent of all generators) disposed of their waste improperly. The most common problem involved improper hazardous waste disposal method. The next most common problem was improper discharges of waste to the ground, which can contaminate soil or groundwater.

Spill management. Three generators (75 percent of all generators) lacked adequate planning and/or equipment to respond to spills of environmentally damaging materials. The most notable problem was; lack of appropriate spill management materials, such as sorbents or neutralizers.

Hazardous waste storage. Three generators (75 percent of all generators) stored their waste improperly. The most common problem was hazardous waste stored in open containers that were improperly labeled or not labeled at all. The next most common problems was: hazardous waste stored in inadequate or degraded containers. These containers were stored in areas where they were exposed to the elements and the waste was contaminating the surrounding soil and could potentially contaminate the ground water.

Documentation. Two generators (50 percent of all generators) lacked adequate records—usually lack of shipping manifests or receipts documenting proper disposal —regarding their hazardous wastes.

Product storage. Two generators (50 percent of all generators) stored hazardous products or materials improperly. The most common problem involved inadequate material labeling. The next most common problem was lack of secondary containment for products. Some of these containers were stored in areas where they were exposed to the elements. The products in the containers were contaminating the surrounding soil and could potentially contaminate the ground water. One generator had 1500 gallons of gasoline stored outside in two rusty tanks without secondary containment. The tanks were stored next to a wooded area and next to several wood storage sheds.

Health and safety. Three generators (75 percent of all generators) lacked sufficient health and safety equipment, procedures, or information for their workers. The most common problem was lack of Material Safety Data Sheets (MSDSs) on site or insufficient "worker right-to-know program" implemented and inadequate employee safety training.

NOTE

Investigators discussed specific deficiencies with each business contact, and made recommendations about how to correct them.

A WORD ABOUT WATER QUALITY

In October 1998 representatives from the Duvall Waste Water Treatment Plant contacted the LHWMP and expressed concern that the waste water treatment plant had recorded waste water discharges from the plant that were over the permissible discharge limits for heavy metals set by the Department of Ecology (specifically copper and silver). One representative each from The Survey and On-site Consultation Teams met in November 1998 with the staff at the waste water treatment plant to discuss how the On-site Team and Survey Team representatives would conduct visits to the businesses in Duvall. They would offer technical assistance to the local businesses to help them reduce the amount of heavy metals disposed of into the sanitary sewer to meet Department of Ecology discharge limits.

After discussions with the Cecelia Boulais, Duvall Recycling Coordinator, the On-site Team agreed to visit all the businesses in December 1998 of the type that typically generate waste that contain silver or copper. The Survey Team agreed to visit the other businesses in Duvall in the Spring and Summer of 1999 and continue to look for waste that contains silver or copper.

The On-site Consultation Team initial visits were completed in December 1998 and their first series of follow-up visits were completed in July, 1999. The On-Site Team will continue conducting follow-up visits to the businesses that generate waste that contains copper or silver until they are satisfied that appropriate waste reduction has occurred.

Contents

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Explanation of Terms

Throughout this report, various "generator status" terms are used to identify different categories of businesses based on their hazardous material usage and/or hazardous waste generation practices. Some generator status terms (such as SQG, MQG, and LQG) have strict definitions under the Washington State Dangerous Waste Regulations (WAC 173-303). The LHWMP uses additional generator status terms (NQG and BMP-C) to further categorize businesses. These terms are explained below.

It is also important to note that some types of hazardous wastes are regulated, while others are not. These differences impact a business' generator status. "Regulated" hazardous wastes are those chemical-containing wastes that are regulated under the Dangerous Waste Regulations. These wastes are referred to as "dangerous waste" or "extremely hazardous waste." Some types of wastes are regulated because they are specifically identified (or "listed") in the Dangerous Waste Regulations. Other wastes are regulated because they are toxic, ignitable, reactive, or corrosive beyond specific levels. Sometimes some regulated hazardous wastes may become exempt or "non-regulated" if they are managed in certain ways, such as recycling.

- A ***small quantity generator*** (SQG) generates less than 220 lbs of dangerous waste or less than 2.2 lbs of extremely hazardous waste per month, and accumulates less than 2,200 lbs of dangerous waste or less than 2.2 lbs of extremely hazardous waste on site, at any time, prior to disposal.

- A ***medium quantity generator*** (MQG) generates between 220 and 2,200 lbs of dangerous waste per month, including less than 2.2 lbs of extremely hazardous waste, and accumulates less than 2,200 lbs of dangerous waste on site, including less than 2.2 lbs of extremely hazardous waste, at any time, prior to disposal.

- A ***large quantity generator*** (LQG) generates 2,200 lbs or more of dangerous waste or 2.2 lbs or more of extremely hazardous waste per month, or accumulates this amount on site, at any time, prior to disposal.

- A ***non-generator*** (NQG) is a business that typically does not generate hazardous wastes, does not have appreciable amounts of hazardous chemicals on site (the most hazardous chemical products used on site may include office products such as "white-out" and/or household grade cleaning products), and is considered by the Investigator to pose no threat to the environment due to chemical usage. Typical NQG businesses include restaurants, administrative offices (such as law firms, insurance brokers, banks), and many retail stores.

- A ***best management practices conformant*** (BMP-C) business is one that stores or uses hazardous materials on site, but through proper handling or good fortune, it does not generate any "regulated" hazardous wastes. A business designated as "BMP-C" also could generate non-regulated hazardous wastes (such as uncontaminated waste oil that is recycled).

The Survey Team determines the generator status of a business based on observations at the business site, information provided by the business contact, and the Investigator's best judgment. When a site contact does not provide sufficient information to the Investigator or if the Investigator is unable to adequately observe the business site, then the Investigator is unable to assess the business' generator status. Unknown generator status' are indicated in this report with a "?" symbol.

Introduction

From May 1999 to June 1999, the Local Hazardous Waste Management Program's (LHWMP) Survey Team visited 50 businesses in the city of Duvall. This report provides a record of the Survey Team's field activities and documents the information the Team collected during site inspections and interviews with business representatives. This report does not provide a complete account of all hazardous waste management practices at the businesses visited in the Duvall survey area; rather it provides a "snapshot" account of those practices observed by Survey Team Investigators or described by business representatives.

The report also provides background information about the LHWMP and historical information about other LHWMP activities in the Duvall area to date (since the beginning of computerized record keeping).

Background

ABOUT THE LHWMP

The LHWMP is a multi-agency program that helps businesses and households in King County reduce and properly manage hazardous waste. Participating agencies include the King County Department of Natural Resources' Water and Land Resources and Solid Waste Divisions, Public Health – Seattle & King County, the Seattle Solid Waste Utility, and the Suburban Cities Association.

Household services

- Hazardous waste education (for the public and the schools)
- Hazardous waste collection (Wastemobile and fixed collection sites)
- Hazards Line – (206) 296-4692 (household hazardous waste information)

Business services

- Education, technical assistance, and compliance assistance
- SQG waste management incentive and recognition programs (Voucher Program, EnviroStars)
- Industrial Materials Exchange (IMEX)
- Hazardous Waste Library
- Business Waste Line – (206) 296-3976 (hazardous waste information for businesses)

ABOUT THE SURVEY TEAM

The Survey Team is one of four field teams in the LHWMP that conducts field visits to businesses in both incorporated and unincorporated areas of King County. The objectives of the Survey Team are to:

- Inform businesses about Local Hazardous Waste Management Program services
- Collect information from businesses about their hazardous waste management practices

- Inform businesses about their regulatory compliance status and hazardous waste management responsibilities
- Provide technical assistance to businesses
- Identify hazardous-waste-generating businesses that don't self-identify as generators

Data collected by the Survey Team are used to develop educational materials and to identify business types for future Program efforts.

Methods

HOW SURVEYS ARE CONDUCTED

To meet their objectives, the Survey Team systematically visits businesses door-to-door in selected geographic areas, usually without prior notification. During each visit, Team members attempt to help businesses to:

- reduce their hazardous waste generation
- dispose of their hazardous wastes properly
- increase their regulatory compliance
- reduce their liability

During a typical visit, the Survey Team Investigator introduces him or herself, describes the LHWMP and its services, and determines the type and nature of the business being visited. Each visit can last from a few minutes to a few hours, depending on a business' generator status, production processes, waste management practices, level of interest, and willingness to provide and receive information.

Visits to hazardous waste generators and potential generators. When visiting known or potential generators, the Investigator collects information about the business' hazardous material and waste management practices. The Investigator also reviews guidelines for disposal of waste to the sewers, storm drains, surface waters, air, soil, and solid waste utilities. Finally, the Investigator addresses any obvious health and safety hazards.

If the Investigator discovers a practice that conflicts with regulatory requirements or best management practices, he or she provides verbal and/or written guidance to the business, or refers the business to other agencies or LHWMP staff for further assistance. The Investigator may also provide further assistance to the business regarding waste minimization and pollution prevention opportunities.

Visits to non-generators. Because the Survey Team operates in a door-to-door fashion and actively seeks businesses that don't readily self-identify as hazardous waste generators, the Team inevitably visits businesses that do not generate hazardous waste. During these visits, which usually take only a few minutes, the Investigator informs the business about the LHWMP and provides information about household hazardous waste. To reduce the number of visits to non-generators, the Team normally does not visit restaurants, taverns, dry-goods stores and other businesses easily recognized as non-generators.

DATA COLLECTION AND TRACKING

During each visit, Survey Team Investigators use a standardized field form (see Attachment C) to ensure consistent, thorough documentation of each company's compliance status and environmental management practices. The form is also used to record Investigator comments and recommendations, services provided to the business, and brochure disbursement.

Data from the forms is entered into a database for tracking and analysis. The data support the development of outreach information, technical assistance programs, business resources, and reports like this.

FOLLOW-UP WORK

For businesses that generate hazardous waste—particularly those businesses whose waste management practices conflict with regulatory requirements or best management practices—the Survey Team may perform any of several follow-up activities:

Research. During the initial site visit, a business contact may ask the Survey Team member a question that cannot be answered immediately. In some cases a problem is noted that cannot be resolved at the time of the visit, or the business may request additional information. To provide the best service possible, the Team member may have to research an issue or locate information, then follow up with the business contact later.

Referrals to other LHWMP teams. The Survey Team refers businesses that request more assistance to the On-site Consultation Team, which provides customized support, education, and technical assistance to hazardous waste generators. For businesses unwilling to address certain significant compliance issues, the Survey Team may call the Response Team, which deals with complaint calls.

Follow-up visits. Within a few months of surveying a particular area, the Survey Team revisits several businesses in that area to see if the recommendations provided during the initial visit have been implemented. The Team normally revisits those businesses considered to have the most serious, or most numerous, problems or deficiencies. This increases the likelihood that those deficiencies are corrected, and also enables the Team to evaluate the Program's effectiveness.

Duvall Survey Planning

PRE-SURVEY PLANNING MEETING

At a planning meeting at the end of 1998, the Survey Team selected Duvall as an area in which to focus its field activities for May and June, 1999. A meeting was scheduled and city officials representing Duvall, Carnation, North Bend and Snoqualmie were invited to attend.

The meeting was held at Duvall City Hall on March 17, 1999, at 10:00 a.m. The Team presented an overview of the LHWMP, reviewed each aspect of the Team's operation, and discussed the representatives' specific concerns and priorities. The meeting was attended by the following people:

LHWMP
Diana Davis, Survey Team
Laurie Foster, Survey Team
Sherry Laughlin, Survey Team
Richard Thompson, Survey Team Lead

City of Duvall
Cecelia Boulais, Snoqualmie Valley Recycling Coordinator
Joanie Ramsey, Chair of the Duvall Chamber of Commerce
Mike Marty, Sewage Plant Operator

City of Carnation
John Aronica, Carnation Public Works Director

SURVEY BOUNDARIES

At the March 17 pre-survey meeting, Duvall staff recommended that the Team focus initially on the businesses in and around the City of Duvall followed by areas in and around the cities of Carnation, Snoqualmie and North Bend. The Survey Team agreed to focus on this area (see Figure 1).

SURVEY SCHEDULE

The Team conducted all of its primary field activities of Duvall between May 19, 1999 and June 10, 1999.

Duvall

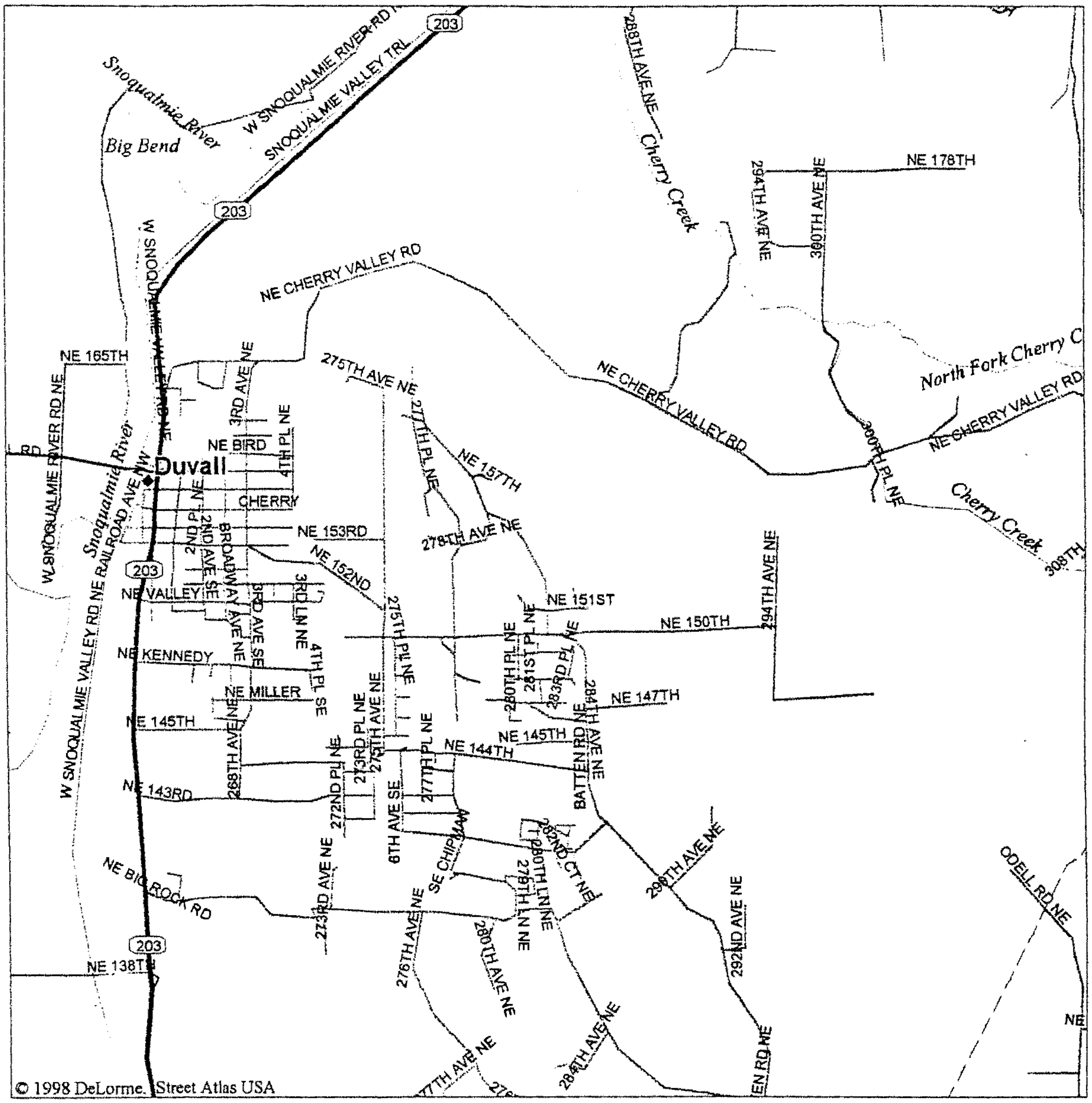


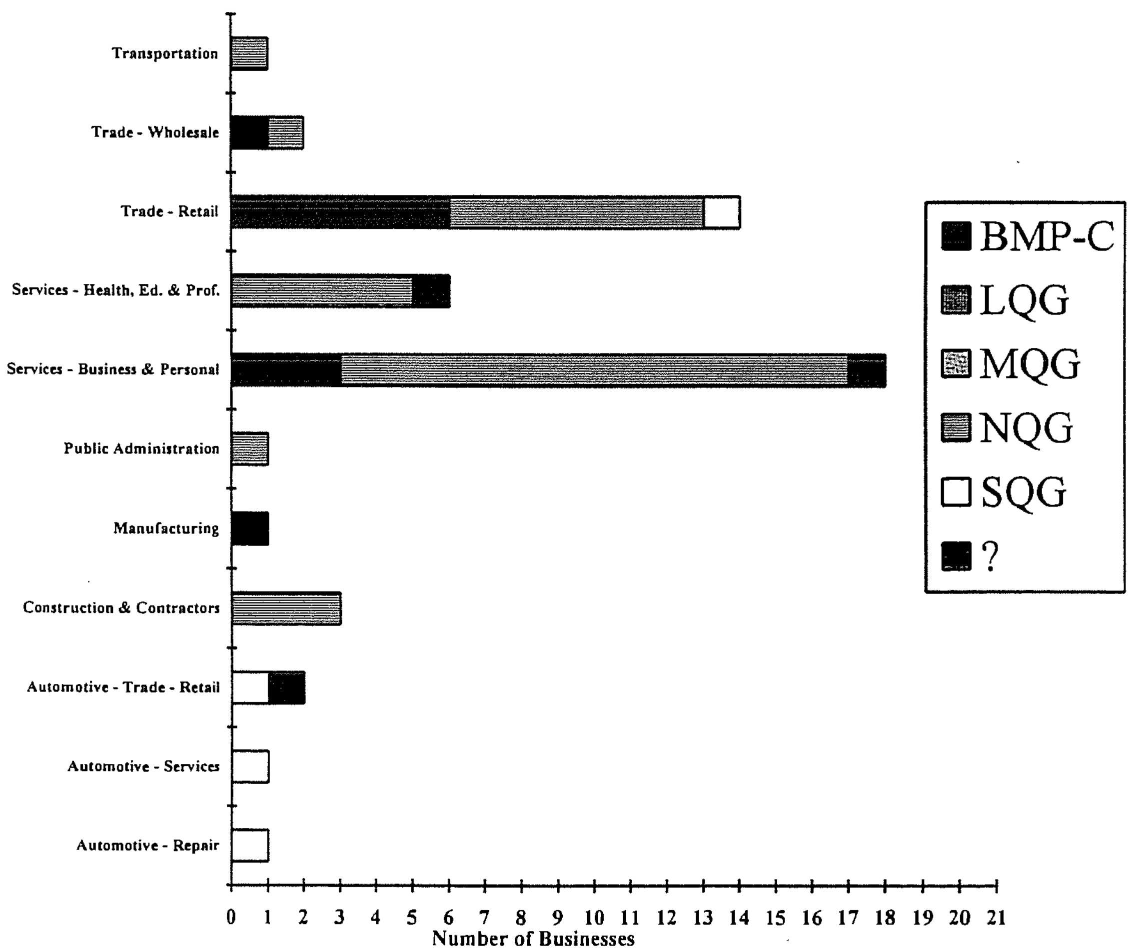
Figure 1. Survey Area

Survey Findings

INDUSTRIAL PROFILE

The Survey Team visited 50 businesses in Duvall between May 19,1999 and June 10, 1999. These businesses represent 11 different industries. The survey area consisted mainly of personal services businesses (36 percent of all businesses), and retail trade businesses (34 percent of all businesses.) Attachment A lists the businesses visited, their location, industrial classification, business type, and primary product or service. Figure 1 shows the areas in which these businesses are located. Figure 2 shows the number of businesses in each industry and their generator type.

Figure 2. Businesses By Industry Classification And Generator Status



HAZARDOUS WASTE GENERATION SUMMARY

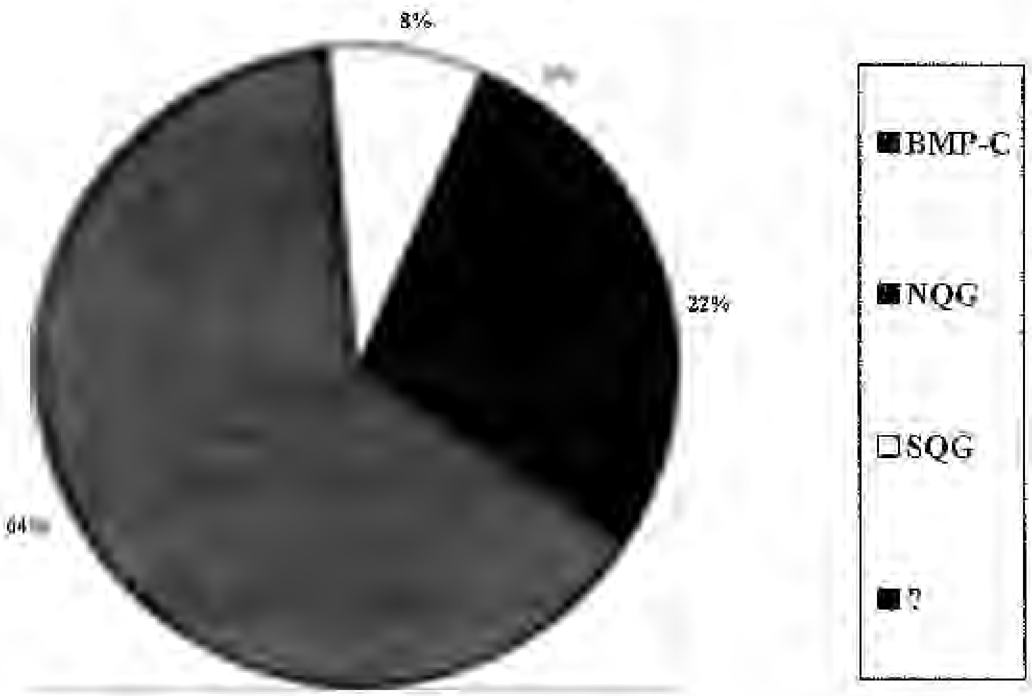
NOTE

Because Survey Team Investigators may not perform full investigations at every business they visit, these findings are based only on the wastes and practices directly observed by investigators or stated by business representatives. The actual amounts of wastes and number of deficiencies in the survey area may be greater than reported here.

Of the 50 businesses visited, at least four (8 %) generated some type of hazardous waste (see Figure 3).

The four hazardous waste generators visited generated a total of 12 different types of waste (some of which may not be regulated) and disposed of these wastes by seven different methods (see Attachment B). The most frequently observed waste was lubricants/hydraulic fluids/oils.

Figure 3. Generator Status of Businesses Surveyed



HAZARDOUS MATERIALS MANAGEMENT ISSUES

The Survey Team identified six hazardous materials management issues that generators could address to improve their hazardous waste and product management practices. The accompanying table lists these issues, as well as the specific deficiencies noted, in descending order, according to how frequently the deficiencies were observed. Investigators discussed the deficiencies with each business contact, and made recommendations about how to correct them.

Figure 4. Table of Deficiencies Observed

Hazardous Materials Management Issues	Deficiencies Observed*
Waste Disposal *Four generators (100 percent of all generators) disposed of their hazardous waste improperly.*	• Improper hazardous waste disposal method (4) • Improper discharges of waste to the ground, which can contaminate soil or groundwater (2) • Improper recycling methods (1) • Releases of hazardous waste (such as waste solvents) to air (1)
Spill Management *Three generators (75 percent of all generators) lacked adequate planning and/or equipment to respond to spills of environmentally damaging materials.*	• Lack of appropriate spill management materials, such as adsorbents or neutralizers (2) • Lack of appropriate spill management procedures (1)
Hazardous Waste Storage *Three generators (75 percent of all generators) stored their hazardous waste improperly.*	• Hazardous waste stored in inadequate or degraded containers (2) • Hazardous waste stored in open containers (2) • Containers improperly labeled or not labeled at all (2) • Inappropriate hazardous waste storage method or storage area (such as unsecured or high-traffic areas, or areas where waste containers are exposed to the elements) (2) • Hazardous waste stored on site beyond accumulation time limits (1) • Insufficient secondary containment or no secondary containment of wastes (1)
Documentation *Two generators (50 percent of all generators) were unable to produce adequate documentation when asked.*	• Lack of shipping manifests or receipts documenting proper disposal (2)

Product Storage *Two generator (50 percent of all generators) stored hazardous products improperly.*	• Improper storage of flammable materials (1) • Inadequate material labeling (1) • Lack of or inadequate secondary containment for products (1) • Inappropriate hazardous material storage method or improper storage area (1) Lack of proper hazardous material warning signs (1)
Health and Safety *Three generators (75 percent of all generators) lacked sufficient health and safety equipment, procedures and/or information for their workers.*	• No eye wash station available (1) • Fire hazards (1) • Lack of Material Safety Data Sheets (MSDSs) (1) • Insufficient "worker right-to-know program" implemented (1) • Insufficient personal protection equipment (1) • Inadequate employee safety training (1) • Lack of proper warning signs (1)
* The number in parentheses after each deficiency indicates the number of businesses at which that deficiency was observed and recorded. Some businesses may have multiple deficiencies.	

A WORD ABOUT WATER QUALITY

In October 1998 representatives from the Duvall Waste Water Treatment Plant contacted the LHWMP and expressed concern that the waste water treatment plant had recorded waste water discharges from the plant that were over the permissible discharge limits for heavy metals set by the Department of Ecology (specifically copper and silver). One representative each from The Survey and On-site Consultation Teams met in November 1998 with the staff at the waste water treatment plant to discuss how the On-site Team and Survey Team representatives would conduct visits to the businesses in Duvall. They would offer technical assistance to the local businesses to help them reduce the amount of heavy metals disposed of into the sanitary sewer to meet Department of Ecology discharge limits.

After discussions with the Cecelia Boulais, Duvall Recycling Coordinator, the On-site Team agreed to visit all the businesses in December 1998 of the type that typically generate waste that contain silver or copper. The Survey Team agreed to visit the other businesses in Duvall in the Spring and Summer of 1999 and continue to look for waste that contains silver or copper.

The On-site Consultation Team initial visits were completed in December 1998 and their first series of follow-up visits were completed in July, 1999. The On-Site Team will continue conducting follow-up visits to the businesses that generate waste that contains copper or silver until they are satisfied that appropriate waste reduction has occurred.

During the routine Survey Team visits in Duvall one additional office was found that generated waste that contains silver (photo-processing x-ray fixer). This office had their x-ray fixer treated off site by a reputable vendor.

Summary of Services Provided to Duvall

The following is a summary of services provided to Duvall during this most recent Survey Team activity and over the lifetime of the Local Hazardous Waste Management Program.

RECENT SERVICES

Survey Team Investigators provided to businesses verbal and/or written guidance about regulatory requirements and best management practices. Investigators also identified specific waste minimization and pollution prevention opportunities. When appropriate, Investigators referred businesses other LHWMP staff for further assistance.

Business Site Visits. The Team conducted 50 site visits to 50 businesses during the period of field activity described in this report.

Written information. The Team distributed brochures covering general Program information, specific hazardous waste management information for the businesses, and some household information.

Referrals. The Team referred one business directly to another LHWMP team for further assistance.

Vouchers. The Voucher Program reimburses qualified businesses for half the cost (up to $500 lifetime) of managing hazardous wastes, including oils, solvents, sludges, paints, and thinners. Management costs may include shipping, storing, treating or recycling wastes through a permitted handler. Vouchers may also be used for the purchase of equipment to properly manage hazardous material. There has been one voucher issued in the Duvall area.

EnviroStars. The EnviroStars program recognizes businesses that properly manage and/or reduce hazardous waste. Window decals with two, three, four, or five stars are given to qualified SQGs that apply. Other forms of recognition include ads, wall certificates, and nominations for other awards. One business in the Duvall area has received EnviroStar recognition by the LHWMP:

- Seattle Public Utilities, Tolt River Maintenance Shop – 3 Stars.

HISTORICAL SERVICES

In addition to the recent Survey Team activities discussed in this report, other Program elements have recorded providing the following services to the Duvall area as of this report date:

> ***NOTE***
>
> *Because of the way the Business Waste Line, the Hazards Line and IMEX are tracked, records of these services may reflect the entire Duvall area and not specifically the incorporated area of Duvall.*

Business Waste Line. The Business Waste Line, which provides confidential waste management information to businesses, has received 26 calls from the Duvall area since June 1993.

Hazards Line. The Hazards Line, which provides confidential household hazardous waste management information to homeowners, has received 144 calls from the Duvall area since June 1992.

Field team visits. Members of the Audit Team and On-Site Consultation Team have conducted a total of 39 site visits in the Duvall area since 1992. The Survey Team has conducted a total of 75 visits to businesses in Duvall since 1992.

Industrial Materials Exchange. IMEX matches businesses that produce wastes or surplus materials with businesses that need them. In the Duvall area three businesses are on the IMEX mailing list and receive the IMEX catalog bi-monthly. Since December 1991, the program has recorded five transactions involving businesses in the Duvall area.

Anecdotes and Comments

Most business contacts in Duvall were friendly and receptive to site visits by team members. Most of the contacts at businesses generating hazardous wastes seemed interested in the information staff provided and welcomed assistance from the Program. Contacts at businesses that did not generate hazardous wastes (and many at those that did) were interested in the household hazardous waste information provided and seemed enthusiastic about the Program. The Team received several questions about household hazardous wastes and the Wastemobile.

Survey Team Report For Duvall - Zip Code(s) 98019

Businesses Visited

Attachment A

Company Name	Location	Industrial Classification	Business Type	Primary Product or Service
Automotive Specialties, Inc.	15729 Main St	Automotive - Repair	Cars and Passenger Trucks	General Auto Repair
Bald Bob's Mattress & Futon Warehouse - Duvall	15906 Main St	Trade - Retail	Furniture & Homefurnishings Stores	General Furnishings
Builders Concept Inc.	26425 NE Allen St # 201	Services - Health, Educational & Professional	Professional - Engineering, Management & Accounting Services	Engineering/Architectural/Surveying Services
C. & F. Auto Wrecking, Inc.	29017 NE Big Rock Rd	Automotive - Trade	Wholesale/Retail - Auto & Truck Dismantlers	Salvage Yard - with Used Parts Sales
CDK Construction Services	26405 NE Valley St	Construction & Contractors	General Building Contractors	General Contractors - Commercial
Coast to Coast Total Hardware - Duvall	15320 Brown Ave	Trade - Retail	Building Materials & Garden Supplies	Hardware Store
Coldwell Banker Bain Associates - Duvall	15410 Main St NE # E	Services - Business & Personal	Finance, Insurance, Real Estate, & Property Management Offices	Real Estate/Leasing/Escrow/Appraisal
Country Kitchen & Bath	14701 Main St # A-1	Trade - Wholesale	Hardware, Plumbing, & Heating Equipment	Plumbing Equipment/Supplies
Cyberprise - Duvall	15315 1st Ave NE # 10	Services - Business & Personal	Computer Services	Programming/Software Development
Davidson, Czeisler, Kilpatric & Zeno, P.S. - Duvall	15715 Main St # 201	Services - Business & Personal	Finance, Insurance, Real Estate, & Property Management Offices	Real Estate/Leasing/Escrow/Appraisal
Duvall Books	15635 Main St	Trade - Retail	Misc. Retail Trade	Books/Music Store
Duvall Family Center	15904 Main St	Services - Health, Educational & Professional	Social Services	Childcare
Duvall Family Drugs	15325 Brown Ave NE	Trade - Retail	Drug Stores & Proprietary Stores	Drug Store or Pharmacy
Duvall Haircuts Plus	26401 NE Richardson St # 201	Services - Business & Personal	Personal Services	Beauty Salon/Nail Salon
Duvall Handcrafters	15315 1st Ave NE	Trade - Retail	Misc. Retail Trade	Gifts/Notions/Toys/Games/Hobbies/Crafts Supplies

Company Name	Location	Industrial Classification	Business Type	Primary Product or Service
Duvall Physical Therapy Clinic	15435 Main St # 101	Services - Health, Educational & Professional	Health - Offices & Clinics	Physical Therapy
Duvall Towing	16409 Main St	Automotive - Services	Auto Services - Except Repair & Carwashes	Towing
Duvall Video Factory	15410 Main St # A	Services - Business & Personal	Motion Pictures, Theater	Video Tape Rental
Energyline	15715 Main St # 202	Services - Business & Personal	Computer Services	Programming/Software Development
Farmers Insurance Group of Companies - Duvall	15315 1st Ave NE	Services - Business & Personal	Finance, Insurance, Real Estate, & Property Management Offices	Insurance Company/Broker
Fran's Duvall Pet Shoppe	26331 NE Valley St	Trade - Retail	Misc. Retail Trade	Pets/Pet Supplies
Gardens & Sunspaces - Main Street Gallery	15611 Main St	Trade - Retail	Building Materials & Garden Supplies	Retail Nursery/Lawn/Garden Supply Store
Hair Tech	15410 Main St NE # B	Services - Business & Personal	Personal Services	Beauty Salon/Nail Salon
Houston Barclay CPA CMA	26502 NE Valley St	Services - Health, Educational & Professional	Professional - Engineering, Management & Accounting Services	Accounting/Tax Preparation/Bookkeeping
Jeff's Custom Framing	15705 Main St	Trade - Retail	Furniture & Homefurnishings Stores	Art Store/Frame Shop
John L. Scott Real Estate Duvall - NE Valley St.	26311 NE Valley St	Services - Business & Personal	Finance, Insurance, Real Estate, & Property Management Offices	Real Estate/Leasing/Escrow/Appraisal
Julie Lemery Insurance Agency	15315 1st Ave NE # 6	Services - Business & Personal	Finance, Insurance, Real Estate, & Property Management Offices	Insurance Company/Broker
Kallander's	15705 Main St	Trade - Retail	Misc. Retail Trade	Gifts/Notions/Toys/Games/Hobbies/ Crafts Supplies
King County Library - Duvall	15619 Main St	Public Administration	Justice, Public Order, & Safety	County - Administration
Main Street Music Store	15315 1st Ave NE # 7A	Trade - Retail	Misc. Retail Trade	Books/Music Store
McCoy's Mercantile	15515 Main St	Trade - Retail	Misc. Retail Trade	Gifts/Notions/Toys/Games/Hobbies/ Crafts Supplies
Old Memories Antiques & Things	15925 Main St	Trade - Retail	Furniture & Homefurnishings Stores	Antique Store
Postal Service - Duvall	26400 NE Valley St	Transportation	U.S. Postal Service	Administration

Company Name	Location	Industrial Classification	Business Type	Primary Product or Service
R.P. Signs	14701 Main St # C1	Manufacturing	Printing	Screenprinting
Radiant Imaging	26425 NE Allen St # 203	Services - Business & Personal	Commercial Art & Graphic Design	Design Services - N.E.C.
Rocking "E" Feeds	15912 Main St	Trade - Retail	Misc. Retail Trade	Pets/Pet Supplies
Rod Nordberg - Duvall	26452 NE Allen St # 204	Services - Health, Educational & Professional	Health - Offices & Clinics	Dental Practitioner
Select-Rate Inc.	26425 NE Allen St # 103	Services - Business & Personal	Finance, Insurance, Real Estate, & Property Management Offices	Insurance Company/Broker
Simon's & Son Drycleaning	15327 Brown St	Services - Business & Personal	Laundry, Dry Cleaning, Carpet Cleaning & Garment Services	Offsite Dry Cleaning
Sno - Valley Glass & Interior Design Inc.	14701 Main St # A-3	Construction & Contractors	Special Trade Contractors - N.E.C.	Glass & Glazing
Texaco - Duvall	15410 Main St	Automotive - Trade	Retail - Gasoline Service Stations	Fuel Dispensing - No Repair
The Duvall Church	15520 Main St	Services - Business & Personal	Membership Organizations	Religious Organization
Travel Amerika International	15410 Main St # C	Services - Business & Personal	Transportation Services	Travel Agency/Ticket Sales
Tuxedo's Junction Antique Mall	15918 Main St	Trade - Retail	Furniture & Homefurnishings Stores	Antique Store
Valley Hair Design & Tanning	26331 NE Valley St	Services - Business & Personal	Personal Services	Beauty Salon/Nail Salon
Valley Mailbox	26331 NE Valley St # 5	Services - Business & Personal	Business Services	Mail Services
Voiss Construction	26502 NE Valley St	Construction & Contractors	General Building Contractors	General Contractors - Commercial
Wentworth Sales, Inc.	14701 NE Main St # C5	Trade - Wholesale	Chemicals & Allied products	Aerosol products dist.
Whitfield's United Insurance Agencies Inc. - Duvall	15715 Main St	Services - Business & Personal	Finance, Insurance, Real Estate, & Property Management Offices	Insurance Company/Broker
Wilderness Awareness School	15715 Main St # 203	Services - Health, Educational & Professional	Education Services - N.E.C.	Specialty Schools & Educational Services

Survey Team Report For Duvall - Zip Code(s) 98019

Waste Types Observed — **Attachment B**

Description of Waste	Disposition	Amount*	Units/Month	Average LBS/Year
Absorbants - Contaminated	Burned on site for energy recovery	1.25	LBS	15.00
Absorbants - Contaminated	Solid waste	0.50	LBS	6.00
Antifreeze	Recycled on site	0.00	GAL	0.00
Antifreeze	TSD or Recycler/Reclaimer	0.00	GAL	0.00
Batteries	TSD or Recycler/Reclaimer	0.00	LBS	0.00
Filters	Never disposed	0.00	EA	0.60
Filters	Solid waste	160.00	EA	0.00
Filters	TSD or Recycler/Reclaimer	0.08	EA	0.00
Fuels	Never disposed	0.00	GAL	0.00
Lubricants/ Hydraulic Fluids/ Oils	HHW drop off site	0.00	GAL	0.01
Lubricants/ Hydraulic Fluids/ Oils	Never disposed	0.00	LBS	0.00
Lubricants/ Hydraulic Fluids/ Oils	TSD or Recycler/Reclaimer	192.00	GAL	2,841.60
Metals - Recoverable	TSD or Recycler/Reclaimer	3.00	EA	
Parts Washer Liquids	TSD or Recycler/Reclaimer	10.00	GAL	0.00
Photoprocess/ X-ray Materials	TSD or Recycler/Reclaimer	0.60	GAL	
Shop Towels/ Wipers - Contaminated	Solid waste	0.50	EA	0.00
Stockpiled/ Expired Chemicals & Unknowns	Never disposed	0.00	EA	0.60
Wastewaters	Discharged to sanitary sewer	0.00	GAL	0.00

* Zero quantities indicate that site guide didn't know the amount of waste generated (unknown).

Attachment C

Survey Team Field Investigation Form

Local Hazardous Waste Management Program in King County

Background Information

Business Name: ______________________ Also known as: ______________________

Site Address:

Street: ______________________

City: ______________ Zip: ______________

County: King | P | S ☐ Unincorporated area

Mail Address:

Street/PO Box: ______________________

City: ______________ Zip: ______________

Gov't: ☐ HBB: ☐ More than one site ☐

Site Guide: ______________________ Owner/Mgr.: ______________________

Position / Title: ______________________ Phone No.: ______________________

Phone No.: ______________ # employees @ location: ______ Latitude: ______________ Longitude: ______________

Generator Status: BMP-C | NQG | SQG | MQG | LQG | ? | OOB Status Due to Accum.: ☐ EPA/Generator ID #: Y | N | N/A | ?

Business Type: ______________________ Priority Industry: ☐ Type: ______________

Visit Quality: ______________ Form Filled By/Lead Investigator: ______________________

Time Spent On Site: ______________ Other Investigators/Visitors: ______________________

Date: ______________

Date revisit needed (mo/yr): ______________ **Type of follow-up needed: Visit / Phone** **Written Obs. and Recs:** ☐

Record ID: ______________ **Team Contact #:** ______ **Type of Contact: Visit / Phone**

Comments: ____

Business Referred To:

☐ Audit Team ☐ Response Network # ______________

☐ On-Site Consultation ☐ TAP2 ☐ Other

Name: ______________________

Organization: ______________________

Date : ______________ Phone # : ______________

Referral Priority: ☐ Urgent ☐ High ☐ Medium ☐ Low

STATUS CODES			
	Not Observed/Don't Know	+	Properly Handled
N	Not Applicable	-	Not Properly Handled
V	Deficiency Corrected During Visit		
P	Recommended Changes Physically In Progress		

Inspector's Checklist

			Ref.	Obs	Comments
1. Waste Disposal					
A		Hazardous Waste Disposal			
B		Recycling Method			
C		Release to Air			
D		Sanitary Discharge			
E		Septic Discharge			
F		Soil Discharge			
G		Solid Waste Disposal			
H		Storm Drain Discharge			
I		Surface Water Discharge			
J		Other			
2. Spill Management					
A		Spill Management Materials			
B		Spill Management Procedures			
C		Other			
3. Haz Waste Storage					
A		Accumulation Time			
B		Compatibility			
C		Container Condition			
D		Container Sealed/Closed			
E		Labeling			
F		Secondary Containment			
G		Storage Area/Location/Method			
H		Other:			
I		Label Visibility/Aisle Space			
J		Inspection Log			
K		Satellite Accumulation			
L		Warning Signs			
4. Documentation					
A		Manifests/Receipts			
B		Other			
C		Annual Reports			
D		EPA ID Number			
E		Land Ban Forms			
F		P2 Plan			

5. Materials Present (team use)

A ☐ Acids
B ☐ Aerosols
C ☐ Antifreeze
D ☐ Batteries
E ☐ Caustics
F ☐ Dyes or Inks
G ☐ Gases
H ☐ Oxidizers
I ☐ Paints (oil based)
J ☐ Paints (water based)
K ☐ Pesticides / Herbicides
L ☐ Petroleum / Oils
M ☐ Photochemicals
N ☐ Reactives
O ☐ Solvents
P ☐ Other

6. Product Storage ☐

A Compatibility
B Flammable Storage
C Labeling
D Secondary Containment
E Storage Location/Method
F Other

7. Health and Safety ☐

A Air Quality
B Chemical Handling
C Dust
D Eye Wash
E Fire Hazards
F Fumes
G Health & Safety Hazards
H MSDS
I P P Equipment
J Sound/Noise
K Training
L Warning Signs
M Other

Ref.	Obs	
		Revision 8/20/96 H:\Survey\Forms\Survform.xl

Incentive Items:

Voucher Numbers: ____________

EnviroStar [ ] Voucher Issued [ ]

Certificate of Completion [ ] Date Issued: ____________

Evaluation:

Waste Reduced [ ] Behavior Change [ ] Anecdote [ ]

Compliance Items:

Negotiated Compliance [ ] Cooperative Agreement [ ]

Beneficial Process & Material Substitution:

Yes: [ ] Maybe: [ ] Treat Test Kit: [ ]

Describe Below

Brochure Disbursement

Brochure Code is available from your reference sheets.

Brochure Code		Qty	Brochure Code		Qty	Brochure Code		Qty
PROG-1(5/95)	(Library Brochure)		SQG-OTHER-1(6/94)	(Business & Metro)		SQG-CONSTRUCT-2(1/96)	(CDL Waste)	
PROG-2a(4/95)	(Working Together)		SQG-OTHER-7(1/96)	(Generator Checklist)		SQG-DENTAL-2(7/93)	(Dental Guidebook)	
SQG-BWL-1a(4/93)	(Business Waste Line)		SQG-OTHER-8(91)	(Gen Checklist Prts 1-10)		SQG-DENTAL-3(1/96)	(Dental Poster)	
SQG-BWL-2a(4/93)	(Watching Your Waste)		SQG-OTHER-10(12/94)	(Free L&I Assist)		SQG-DRY-2(91)	(Dry Clean Do's & Dont's)	
SQG-ESTARS-1(nd)	(EnviroStar Intro)		SQG-OTHER-11(1/95)	(Haz Chem: R to K)		SQG-DRY-4(nd)	(Fact Sht-Dry Clean)	
SQG-ESTARS-2(nd)	(EnviroStar Wrksht)		SQG-OTHER-12(nd)	(MSDS Explanation)		SQG-LABS-1(9/94)	(Lab Guide)	
SQG-IMEX-1(9/94)r 9/96	(IMEX Brochure)		SQG-OTHER-13(4/93)	(Biz Recycling Prog)		SQG-PHOTOF-1(nd)	(Photo Guide)	
SQG-IMEX-2	(IMEX Catalog)		SQG-OTHER-14(3/96)	(Transporting HW)		SQG-PHOTOF-2(91)	(Photo Do's & Dont's)	
SQG-OSC-1(7/95)	(On-Site Consult)		SQG-OTHER-17(4/96)	(What's an SQG)		SQG-PRINTING-1(91)	(Print Do's & Dont's)	
SQG-SURVEY-1(5/95)	(Someone Visited)		SQG-TOWELS-1(7/92)	(Used Shop Towels)		SQG-PRINTING-2(nd)	(Litho Guide)	
SQG-VOUCHER-1(4/96)	(Voucher Fact Sheet)		SQG-ABODY-1(92)	(Autobody Guide-DOE)		SQG-SCREEN-1(5/94)	(Scrnprt Guide-LHWMP)	
SQG-VOUCHER-	(Voucher Brochure)		SQG-ABODY-2(nd)	(Autobody P2 Tips)		SQG-SCREEN-2(nd)	(Scrnprt Guide-DOE)	
SQG-RR-2(9/94)	(Solvent Stills)		SQG-AMOTIVE-3(10/91)	(Oil Filters)		HHW-GEN-1(nd)	(Haz. on Homefront)	
SQG-GEN-1(96)	(Yellow Book)		SQG-AMOTIVE-4(92)	(Auto Dealers)		HHW-GEN-3a(nd)	(Buy Smart Buy Safe)	
SQG-GEN-2(5/93)	(Drains)		SQG-AMOTIVE-5(92)	(Auto Machine)		HHW-GEN-5(nd)	(Five Steps)	
SQG-GEN-3(4/94)	(Do You Lease Space)		SQG-AMOTIVE-6(92)	(Auto Repair)				
SQG-GEN-4(4/94)	(Manifests & Shipping)		SQG-AMOTIVE-7(92)	(Radiator Repair)				
SQG-GEN-5(nd)	(How to Store HW)		SQG-AMOTIVE-8(92)	(Service Stations)				
SQG-GEN-6(nd)	(How to Handle Empty)		SQG-AMOTIVE-9(92)	(Tire Dealers)				
SQG-GEN-7(nd)	(Facts About Labeling)		SQG-AMOTIVE-10(92)	(Transmission Rep)				
SQG-GEN-8(nd)	(What's in Your Drum?)		SQG-AMOTIVE-12(nd)	(Battery Storage)				
SQG-GEN-10(7/96)	(Land Ban Forms)		SQG-AMOTIVE-13(1/96)	(Antifreeze DOE Letr)				
SQG-GEN-	(Choosing a Vendor)		SQG-AMOTIVE-	(Antifreeze Brochure)				

WASTE INFORMATION

Waste Description	Major Components	Quantities				Disposition				Storage					Vendor	Samples Taken?
		Waste Units	Amount normally accumulated prior to disposal	Monthly generation rate	Amount observed accumulated on site	Method Code	Disposition method acceptable?			Secondary containment provided for amount on site?				Amount not contained?		
							Y	N	?	Y	N	N/A	?			

PRODUCT CONTAINMENT

Product Description	Amount Stored	Units	Secondary Containment?			Location/Notes
			Y	N	N/A	

PROCESS & MATERIALS INFORMATION FORM

Company Name: **Date:**

WASTE INFORMATION																
Waste Description	Major Components	Quantities				Disposition				Storage					Vendor	Samples Taken?
		Waste Units	Amount normally accumulated prior to disposal	Monthly generation rate	Amount observed accumulated on site	Method Code	Disposition method acceptable?			Secondary containment provided for amount on site?				Amount not contained?		
							Y	N	?	Y	N	N/A	?			

Disposition Method Codes:

AIR = Air release
B = Burned on site for energy recovery
HHW = HHW drop off site
IMEX = IMEX
LI = Laundered industrial
LS = Self laundered
ND = Never disposed
NTSD = Off-site treatment, disposal or recycling by non-TSDF
OIL = King County used oil collection
OT = Other (please specify in the field)
REC = Recycled on site
SD = Discharged to storm drain
SEP = Discharged to septic system
SS = Discharged to sanitary sewer
SW = Solid waste
TBG = Treatment by generator
TSD = Off-site treatment, disposal or recyling by TSDF
UN = Unknown

Waste Unit Codes:

GAL = Gallons
LB = Pounds
EA = Each

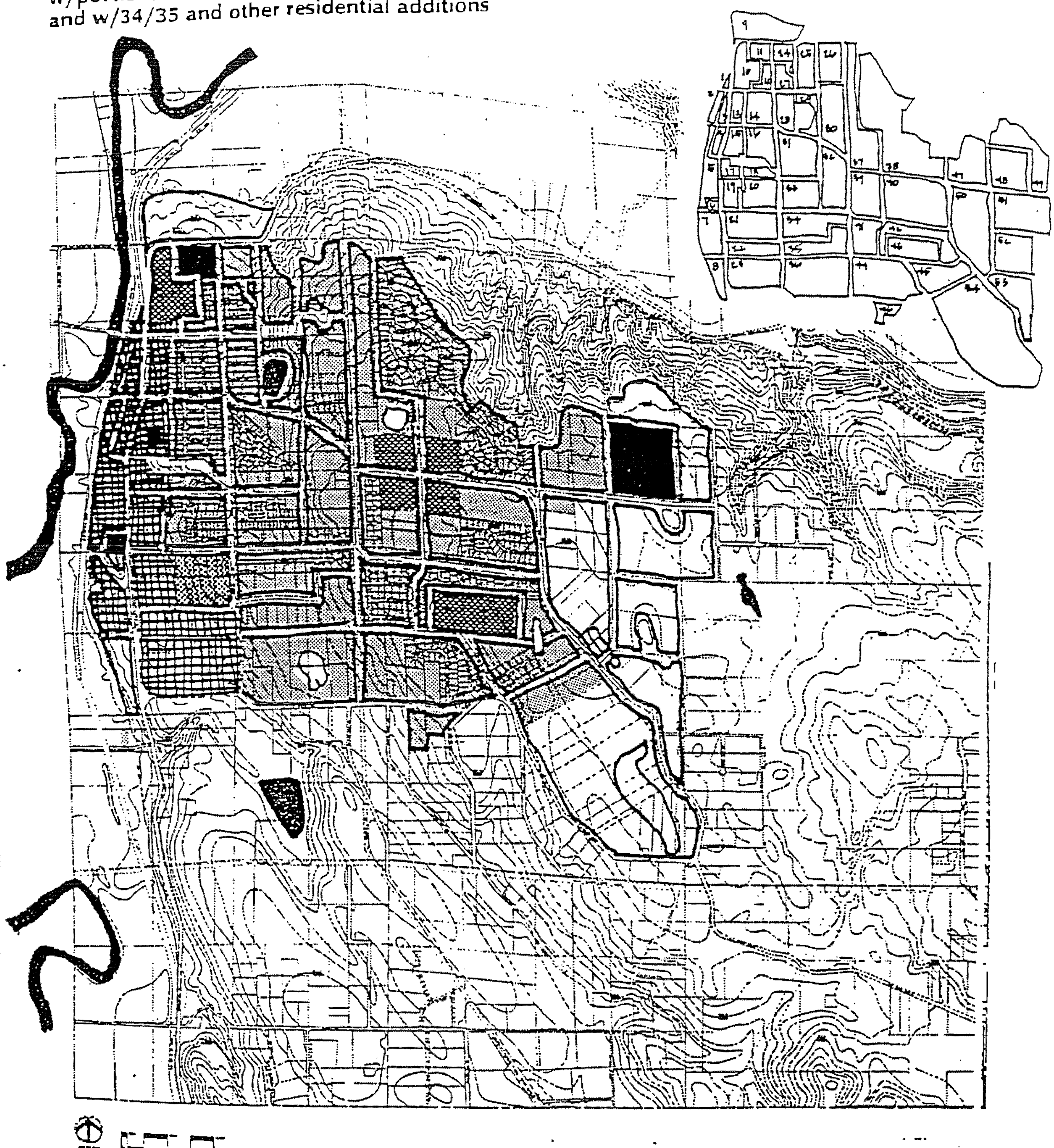
APPENDIX B

Proposed Zoning Densities

24 November 1992

Low Growth Scenario - option A

proposed new zoning densities - urban growth area
plus high economic options w/o plateau
w/portions of cells 17/19/21/22/23 as employment - Add cell 7.
and w/34/35 and other residential additions



public facility
commercial/business employment centers
urban housing densities
suburban housing densities
urban growth boundaries

24 November 1992

Duvall Comprehensive Plan Update – Residential holding capacities

Low growth scenario – proposed new zoning densities – proposed urban growth area

Plus high economic options w/o plateau

w/portions of cells 21/22/23 as employment and 34/35 and other residential additions

unit	useable acres	number platted lots	remaining undvpd acreage	percent buildable	buildable acreage	land use	dwelling units/buildable acreage	number dwelling units	platted lots plus potential du's	persons/dwelling unit	number of persons
1	0.9					community business mxd					0
2	4.3					community business/mxd mh park					0
3	5.0					community business mxd					0
4	4.6					community business mxd					0
5	12.0					industrial commercial					0
6	2.8					public fcty – wastewater tmnt plnt					0
7	19.1					community business mxd					0
10	24.5	8				residential – ur-12	12.0	0	8	2.5	20
			12.3	80%	9.8	residential – ur-12	12.0	118	118	2.5	295
	5.0					community business mxd					0
11	8.8					public fcty – school					0
12	8.7	34				residential – sf-5.8	5.8		34	2.5	85
13	7.3					community business mxd					0
	0.3					public fcty – fire stn					0
			1.1	80%	0.9	residential – ur-18	18.0	16	16	2.0	32
14	21.7	19				residential – ur-12	12.0		19	2.5	48
		57				residential – sf-5.8	5.8		57	2.5	143
15	12.6					community business mxd					0
			0.9	80%	0.7	residential – ur-18	18.0	13	13	2.0	26
16	25.8	23				residential – ur-8	8.0		23	3.0	69
		58				residential – sf-5.8	5.8		58	2.5	145
17	6.5					community business mxd					0
18	7.4		7.4	80%	5.9	residential – sf-4.5	4.5	27	27	2.5	67
19	12.6					community business mxd					0
20	20.2	71				residential – sf-4.5			71	2.5	178
	6.0		6.0	80%	4.8	residential – sf-4.5	4.5	22	22	2.5	54
21add	12.5					community business mxd					0
	25.1		25.1	80%	20.1	residential – ur-8	8.0	160	160	3.0	481
22add	10.1					community business mxd					0
	6.7					community business mxd					0
23add	30.3					community business mxd					0
	10.1					community business mxd					0
24	10.5		10.5	80%	8.4	residential – sf-3.1	3.1	26	26	3.1	81
25	4.0		4.0	80%	3.2	residential – sf-2.4	2.4	8	8	2.0	15
26	24.0		24.0	80%	19.2	residential – sf-2.4	2.4	46	46	3.2	149
27	12.0	49				residential – sf-5.8			49	2.5	123
28	17.2	60				residential – sf-5.8			60	2.5	150
29	3.0		3.0	80%	2.4	residential – sf-4.5	4.5	11	11	2.5	27
30	25.0		25.0	80%	20.0	residential – sf-3.1	3.1	62	62	3.1	193
	6.8	16				residential – sf-3.1			16	3.1	50
31	22.4		22.4	80%	17.9	residential – sf-4.5	4.5	81	81	2.5	202
	19.4	63				residential – sf-4.5			63	2.5	158
32	34.1		34.1	80%	27.3	residential – sf-3.1	3.1	85	85	3.1	263
	5.9	16				residential – sf-3.1			16	3.1	50

33	13.0		13.0	80%	10.4	residential – sf–4.5	4.5	47	47	2.5	117
	16.8	52				residential – sf–4.5			52	2.5	130
34	19.5	26				residential – sf–3.1			26	3.1	81
34add	13.8		13.8	80%	11.0	residential – sf–3.1	3.1	34	34	3.1	106
35	15.0		15.0	80%	12.0	residential – sf–3.1	3.1	37	37	3.1	116
35add	17.2		17.2	80%	13.8	residential – sf–3.1	3.1	43	43	3.1	133
36add	53.6		53.6	80%	42.9	residential – sf–3.1	3.1	133	133	3.1	414
37	43.2		43.2	80%	34.6	residential – sf–3.1	3.1	108	108	3.1	333
	9.3		9.3	80%	7.4	residential – ur–8	8.0	60	60	3.0	179
38	95.1	146				residential – sf–2.4			146	3.2	467
	9.3		9.3	80%	7.4	residential – sf–3.1	3.1	23	23	3.1	72
	9.3		9.3	80%	7.4	residential – ur–8	8.0	60	60	3.0	179
39	16.1	37				residential – sf–2.4	2.4		37	3.2	118
	10.4		10.4	80%	8.4	residential – sf–2.4	2.4	20	20	3.2	65
	9.7		9.7	80%	7.8	residential – ur–8	8.0	62	62	3.0	186
40	48.7	111				residential – sf–2.4			111	3.2	355
	8.6		8.6	80%	6.9	residential – sf–2.4	2.4	17	17	3.0	50
	9.3		9.3	80%	7.4	residential – ur–8	8.0	60	60	3.0	179
41	24.8	65				residential – sf–3.1			65	3.1	202
42	16.6	38				residential – sf–3.1			38	3.1	118
	7.4		7.4	80%	6.0	residential – sf–3.1	3.1	19	19	3.1	57
43	31.2		31.2	80%	25.0	mobile home – mp–5	5.0	125	125	2.0	250
44	25.3		25.3	80%	20.2	residential – sf–3.1	3.1	63	63	3.2	201
	32.7	71				residential – sf–2.4			71	3.2	227
44add	10.0		10.0	80%	8.0	residential – sf–3.1	3.1	25	25	3.2	79
45	36.1	25				residential – sf–3.1			25	3.1	78
	17.7		17.7	80%	14.2	residential – sf–3.1	3.1	44	44	3.2	141
46	10.5		10.5	80%	8.4	residential – sf–2.4	2.4	20	20	3.2	65
47	13.8		13.8	80%	11.0	residential – sf–3.1	3.1	34	34	3.2	110
	22.2		22.2	80%	17.8	residential – sf–3.1	3.1	55	55	3.2	176
48	38.5					public fcty – school					0
50	4.8		4.8	80%	3.8	residential – sf–2.4	2.4	9	9	3.2	30
54add	21.2		21.2	80%	17.0	residential – sf–3.1	3.1	53	53	3.2	168
Allotment for residential use in commercial business mixed use district											720
Totals	1,226.1	1,045	561.7		449.4			1,824	2,869		9,000

Average dwelling units/gross acre developed in planning area 3.2

Source: Beckwith Consulting Group w/Hough Beck & Baird

ur-8 Urban residential 8 units per acre
ur-12 Urban residential 12 units per acre
ur-18 Urban residential 18 units per acre
sf-2.4 Single family residential 2.4 units per acre
sf-3.1 Single family residential 3.1 units per acre
sf-4.5 Single family residential 4.5 units per acre
sf-5.8 Single family residential 5.8 units per acre

APPENDIX C

Daily Monitoring Reports (DMR)

199 ...thly R... - OC ... ER

PLANT INFLUENT

DATE	MGPD	P.H.	D.O.	TEMP	IMHOFF	BOD. MG\L	BOD. LBS.	TSS . MG\L	TSS.LBS.	VOL. SOL.	VOL. SOLIDS %
10/01/99	0.244090	7.76	4.23	19	18	293	596	172	350	158	92%
10/02/99	0.232500	Plant Check									
10/03/99	0.282090	Plant Check									
10/04/99	0.317860	7.66	3.88	20	12						
10/05/99	0.265670	7.70	4.84	19	13						
10/06/99	0.291830	7.52	3.99	19	15	281	684	157	382	145	92%
10/07/99	0.308700	8.07	3.20	19	22	319	821	155	399	134	86%
10/08/99	0.273670	7.35	3.52	19	21	320	730	189	431	1665	87%
10/09/99	0.336140	Plant Check									
10/10/99	0.331870	Plant Check									
10/11/99	0.355810	8.35	4.14	19	15						
10/12/99	0.303330	7.26	4.45	19	19						
10/13/99	0.282490	7.33	3.99	19	12	324	763	151	356	144	82%
10/14/99	0.307610	7.77	4.52	19	9	240	616	151	387	134	89%
10/15/99	0.301370	7.23	4.09	19	11	295	741	257	646	227	88%
10/16/99	0.261820	Plant Check									
10/17/99	0.316160	Plant Check									
10/18/99	0.361320	7.45	4.37	19	18						
10/19/99	0.291050	7.72	4.30	18	20						
10/20/99	0.278870	7.58	4.77	18	35	295	741	182	423	161	88%
10/21/99	0.270830	8.05	2.08	19	12	240	616	160	361	144	90%
10/22/99	0.274660	8.15	4.97	18	11	242	554	150	344	134	89%
10/23/99	0.240190	Plant Check									
10/24/99	0.312450	Plant Check									
10/25/99	0.348040	7.95	4.04	18	14						
10/26/99	0.287310	8.04	5.08	19	19						
10/27/99	0.273120	7.97	4.72	17	13	268	610	169	385	147	87%
10/28/99	0.295190	8.10	5.24	18	17	256	630	146	359	124	85%
10/29/99	0.298820	7.82	5.20	18	15	223	556	145	361	122	84%
10/30/99	0.270350	Plant Check									
10/31/99	0.373870	Plant Check									
TOTAL	9.189080	163	90	392	341	3596	8658	2184	5184	3439	1139%
MAX	0.373870	8	5	20	35	324	821	257	646	1665	92%
MIN	0.232500	7	2	17	9	223	554	145	344	122	82%
AVG	0.296422	8	4	19	16	277	666	168	399	264.538	88%
AVG.	AVG.	AVG.	AVG.	AVG.		AVG.	AVG.	AVG.	AVG.	AVG.	AVG.
PERMIT	0.9 MGD.						900 LB/D		1200 LB/D		
AVG.	AVG.	AVG.	AVG.	AVG.		AVG.	AVG.	AVG.	AVG.	AVG.	AVG.
LIMITS											

PLANT EFFLUENT / DISINFECTION

DATE	P.H	D.O	TEMP	IMHOFF	BOD MG/L	BOD.LBS.	% BOD REMOVAL	TSS MG/L	TSS. LBS.	% TSS REMOVAL	FECAL	LOG
10/01/99	6.34	6.78	16	TR	7	14	98%	9	18	95%	18	1.255
10/02/99	Plant Check											
10/03/99	Plant Check											
10/04/99	6.58	6.98	16	TR								
10/05/99	6.62	7.06	16	TR							2	0.301
10/06/99	6.48	7.34	17	TR	6	15	98%	12	29	92%	0	0.000
10/07/99	6.39	7.50	19	TR	5	13	98%	13	33	92%	2	0.301
10/08/99	6.66	6.87	17	TR	6	14	98%	14	32	93%		
10/09/99	Plant Check											
10/10/99	Plant Check											
10/11/99	6.45	7.10	16	TR								
10/12/99	6.58	7.25	16	TR							0	0.000
10/13/99	6.76	7.21	17	TR	6	14	98%	16	38	89%	6	0.778
10/14/99	6.30	7.04	16	TR	5	13	98%	13	33	91%	0	0.000
10/15/99	6.38	7.55	16	TR	8	20	97%	14	35	95%		
10/16/99	Plant Check							AVG.	AVG.			
10/17/99	Plant Check							14	35			
10/18/99	6.35	7.24	15	TR								
10/19/99	6.84	7.39	15	TR							2	0.301
10/20/99	6.63	7.33	15	TR	8	20	97%	8	19	97%	0	0.000
10/21/99	6.70	7.87	16	TR	5	13	98%	10	23	94%		
10/22/99	6.46	7.69	16	TR	6	14	98%	10	23	93%	0	0.000
10/23/99	Plant Check											
10/24/99	Plant Check											
10/25/99	6.01	6.80	15	TR								
10/26/99	6.64	6.83	15	TR								
10/27/99	6.57	7.41	15	TR	8	14	98%	8	18	95%	6	0.778
10/28/99	6.42	7.39	15	TR	7	17	97%	13	32	91%	34	1.532
10/29/99	6.47	7.23	15	TR	7	17	97%	12	30	92%	1	0.000
10/30/99	Plant Check				AVG.	AVG.						LOG
10/31/99	Plant Check				7	16						2.310
TOTAL	137	152	334	TR	91	214	1270%	166	398	1209%	71	7.556
MAX	7	8	19	TR	8	20	98%	16	38	97%	34	2.310
MIN	6	7	15	TR	5	13	97%	8	18	89%	0	0.000
AVG	7	7	16	TR	7	15	98%	12	28	93%	5	0.540
AVG.	MIN.				AVG.		AVG.	AVG.	AVG.	AVG.	GEM.	
PERMIT	6.00				30		75%	30	225	81%	200	
AVG.	MAX				AVW.			AVW.	AVW.		GM7	
LIMITS	9.00				45			45	338		400	

I CERTIFY THAT I AM FAMILIAR WITH THE INFORMATION CONTAINED IN THIS REPORT AND THAT TO THE BEST OF MY KNOWLEDGE THIS INFORMATION IS TRUE, COMPLETE AND ACCURATE

JOHN LIGHT GROUP2 SIGNATURE

Michael Marty Group 1

Dave Kinney Group 1

1999 Monthly Report - OCTOBER

EAST AERATOR											SLUDGE ULIZATION				CLARIFERS		WEATHER CONDITIONS			METALS		
DATE	P.H	D.O	TEMP	30 MIN	MLSS MG/L	SVI	LOADINDEX	MLVSS MG/L	% MLVSS	LBS. IN AERATOR	DATE	LOCATION	YRDS.	GALLONS	NORTH	SOUTH	WEATHER	TEMP	PRECIP	NH/3	PHOSP	METAL UG/L
10/01/99	5.93	1.92	16	170	2550	67		2120	83%	10049	10/01/99	Monroe	5.00				Fog	41	0.01	0.32		
10/02/99	**Plant Check**										10/02/99						Fog	48	0.00			
10/03/99	**Plant Check**										10/03/99						Fog	43	0.00			
10/04/99	6.20	1.88	17	190							10/04/99	Monroe	5.00				Fog	41	0.02			
10/05/99	6.41	1.73	17	180							10/05/99						Rain	51	0.01			
10/06/99	6.12	1.93	17	160	2710	59		2230	82%	10679	10/06/99	Monroe	5.00				Cldy	51	0.01	0.43		
10/07/99	5.96	1.93	19	160	2650	60	0.09	2220	84%	10443	10/07/99						Rain	55	0.05			
10/08/99	6.45	1.98	17	170	2805	61		2280	81%	11054	10/08/99						Rain	52	0.46			
10/09/99	**Plant Check**										10/09/99						Fog	47	1.02			
10/10/99	**Plant Check**										10/10/99						Fog	41	0.01			
10/11/99	6.27	2.11	16	160							10/11/99	Monroe	5.00				Cldy	47	0.00			
10/12/99	6.32	2.03	16	150							10/12/99	Monroe	5.00				Fog	49	0.80			
10/13/99	6.52	1.93	17	160	2875	56		2345	82%	11329	10/13/99						Rain	57	0.05			
10/14/99	6.35	2.13	16	140	2440	57	0.08	1900	82%	9615	10/14/99	Monroe	5.00				Rain	47	0.29			
10/15/99	6.23	2.04	15	140	2350	60		1950	83%	9261	10/15/99	Monroe	5.00				Fog	37	0.01	0.36		
10/16/99	**Plant Check**										10/16/99						Fog	35	0.00			
10/17/99	**Plant Check**										10/17/99						Fog	38	0.00			
10/18/99	5.97	1.78	15	170							10/18/99						Fog	39	0.01			
10/19/99	6.56	1.63	16	140							10/19/99	Monroe	5.00				Fog	41	0.01			
10/20/99	6.15	2.05	15	140	2415	58		1995	83%	9517	10/20/99	Monroe	5.00				Fog	39	0.00			
10/21/99	6.03	1.69	17	120	2340	51	0.08	1945	83%	9221	10/21/99						Fog	40	0.02			
10/22/99	6.06	1.87	16	130	2475	53		2050	83%	9753	10/22/99	Monroe	5.00				Fog	40	0.01	0.31		
10/23/99	**Plant Check**										10/23/99						Fog	43	0.01			
10/24/99	**Plant Check**										10/24/99						Fog	45	0.07			
10/25/99	5.89	1.42	16	140							10/25/99						Cldy	45	0.00			
10/26/99	6.53	2.23	16	150							10/26/99						Fog	45	0.14			
10/27/99	6.28	2.13	14	150	2890	52		2410	83%	11388	10/27/99						Fog	34	0.01			
10/28/99	6.29	2.03	15	140	2605	54	0.07	2180	84%	10265	10/28/99	Monroe	5.00				Rain	54	0.40			
10/29/99	6.29	2.06	15	130	2510	52		2085	83%	9891	10/29/99	Monroe	5.00				Cldy	48	0.19	0.40		
10/30/99	**Plant Check**										10/30/99						Cldy	50	0.11			
10/31/99	**Plant Check**										10/31/99						Cldy	47	0.89			
TOTAL	**131**	**41**	**338**	**3190**	**33615**	**740**	**0.32**	**27710**	**1076%**	**132465**	**TOTAL**		**60**	**0**	**0**	**0**		**1390**	**4.61**		**0.00**	
MAX	**7**	**2**	**19**	**190**	**2890**	**67**	**0.09**	**2410**	**84%**	**11388**	**MAX**		**5**	**0**	**0**	**0**		**57**	**1.02**		**0.00**	
MIN	**6**	**1**	**14**	**120**	**2340**	**51**	**0.07**	**1900**	**81%**	**9221**	**MIN**		**5**	**0**	**0**	**0**		**34**	**0.00**		**0.00**	
AVG	**6**	**2**	**16**	**151.905**	**2586**	**57**	**0.08**	**2132**	**83%**	**10190**	**AVG**		**5**	**#DIV/0!**	**#DIV/0!**	**#DIV/0!**		**45**	**0.15**		**#DIV/0!**	

COMMENTS

1999 Monthly Report - NOVEMBER

PLANT INFLUENT

DATE	MGPD	P.H.	D.O.	TEMP	IMHOFF	BOD. MG\L	BOD. LBS.	TSS . MG\L	TSS.LBS.	VOL. SOL.	VOL. SOLIDS %
11/01/99	0.450190	7.38	6.09	18	13						
11/02/99	0.365120	7.76	5.92	17	17						
11/03/99	0.328880	7.53	5.57	18	21	213	584	116	318	102	88%
11/04/99	0.332540	7.74	4.52	18	13	228	613	143	397	133	93%
11/05/99	0.320040	7.82	4.99	17	11	222	593	128	342	111	88%
11/06/99	0.324870	Plant Check									
11/07/99	0.420140	Plant Check									
11/08/99	0.424080	7.61	5.73	17	10						
11/09/99	0.387760	7.61	5.91	17	12						
11/10/99	0.636090	7.26	7.24	16	10	125	663	112	594	86	77%
11/11/99	0.581970	Plant Check				112	544				
11/12/99	0.739620	6.88	8.08	15	4	85	524	73	450	64	88%
11/13/99	1.023690	Plant Check									
11/14/99	0.734320	Plant Check									
11/15/99	0.534350	7.27	7.11	16	8						
11/16/99	0.471020	7.35	6.35	16	6						
11/17/99	0.441540	7.16	6.56	17	7	146	538	109	401	96	88%
11/18/99	0.531200	7.31	7.07	16	12	118	523	88	390	75	88%
11/19/99	0.455640	7.33	6.22	16	8	132	502	84	319	77	92%
11/20/99	0.463370	Plant Check									
11/21/99	0.652420	Plant Check									
11/22/99	0.723510	7.95	7.26	15	5						
11/23/99	0.541730	7.35	6.59	16	9						
11/24/99	0.425990	7.32	6.24	16	12	163	579	113	401	100	88%
11/25/99	0.600990	Plant Check				137	689				
11/26/99	0.860520	Plant Check				128	919				
11/27/99	0.599280	Plant Check									
11/28/99	0.573750	Plant Check									
11/29/99	0.565550	7.19	7.62	15	4						
11/30/99	0.546860	7.33	7.13	15	13						
TOTAL	**16.057030**	**141**	**122**	**311**	**195**	**1809**	**7271**	**966**	**3612**	**844**	**790%**
MAX	**1.023690**	**8**	**8**	**18**	**21**	**228**	**919**	**143**	**594**	**133**	**93%**
MIN	**0.320040**	**7**	**5**	**15**	**4**	**85**	**502**	**73**	**318**	**64**	**77%**
AVG	**0.535234**	**7**	**6**	**16**	**10**	**151**	**606**	**107**	**401**	**93.7778**	**88%**
AVG.	AVG.	AVG.	AVG.	AVG.		AVG.	AVG.	AVG.	AVG.	AVG.	AVG.
PERMIT	**0.9 MGD.**						**900 LB/D**		**1200 LB/D**		
AVG.	AVG.	AVG.	AVG.	AVG.		AVG.	AVG.	AVG.	AVG.	AVG.	AVG.
LIMITS											

PLANT EFFLUENT / **DISINFECTION**

DATE	P.H	D.O	TEMP	IMHOFF	BOD MG/L	BOD.LBS.	% BOD REMOVAL	TSS MG/L	TSS. LBS.	% TSS REMOVAL	FECAL	LOG
11/01/99	6.41	7.19	15	TR								
11/02/99	6.38	7.25	14	TR							68	1.833
11/03/99	6.79	7.35	13	TR	5	13	98%	8	22	93%	24	1.380
11/04/99	6.57	7.28	15	TR	6	16	97%	8	22	94%	50	1.699
11/05/99	6.34	7.12	13	TR	5	13	98%	8	21	94%		
11/06/99	Plant Check											
11/07/99	Plant Check											
11/08/99	6.00	6.89	15	TR								
11/09/99	6.55	7.65	16	TR							12	1.079
11/10/99	6.55	7.38	15	TR	6	32	95%	6	32	95%	62	1.792
11/11/99	Plant Check				9	44	92%				40	1.602
11/12/99	6.68	7.19	15	TR	8	49	91%	17	105	77%		
11/13/99	Plant Check											
11/14/99	Plant Check											
11/15/99	6.78	7.57	15	TR								
11/16/99	6.80	7.42	15	TR							0	0.000
11/17/99	6.68	7.42	15	TR	7	26	95%	11	41	90%	32	1.505
11/18/99	6.67	7.81	15	TR	6	27	95%	8	35	91%	132	2.121
11/19/99	6.65	7.57	14	TR	5	19	96%	5	19	94%		
11/20/99	Plant Check											
11/21/99	Plant Check											
11/22/99	6.65	7.63	12	TR								
11/23/99	6.75	7.93	13	TR							0	0.000
11/24/99	6.68	7.68	14	TR	5	18	97%	6	21	95%	2	0.301
11/25/99	Plant Check				6	30	96%				12	1.079
11/26/99	Plant Check				6	43	95%					
11/27/99	Plant Check											
11/28/99	Plant Check											
11/29/99	6.65	8.11	13	TR							4	0.602
11/30/99	6.77	7.76	14	TR								
TOTAL	**125**	**142**	**271**	**TR**	**74**	**330**	**1145%**	**77**	**318**	**823%**	**438**	**14.993**
MAX	**7**	**8**	**16**	**TR**	**9**	**49**	**98%**	**17**	**105**	**95%**	**132**	**2.121**
MIN	**6**	**7**	**12**	**TR**	**5**	**13**	**91%**	**5**	**19**	**77%**	**0**	**0.000**
AVG	**7**	**7**	**14**	**TR**	**6**	**28**	**95%**	**9**	**35**	**91%**	**34**	**1.153**
AVG.	MIN.				AVG.		AVG.	AVG.	AVG.	AVG.	GEM.	
PERMIT	**6.00**				**30**		**75%**	**30**	**225**	**81%**	**200**	
AVG.	MAX				AVW.			AVW.	AVW.		GM7	
LIMITS	**9.00**				**45**			**45**	**338**		**400**	

I CERTIFY THAT I AM FAMILIAR WITH THE INFORMATION CONTAINED IN THIS REPORT AND THAT TO THE BEST OF MY KNOWLEDGE THIS INFORMATION IS TRUE, COMPLETE AND ACCURATE

JOHN LIGHT GROUP2 SIGNATURE

Michael Marty Group 1

Dave Kinney Group 1

1999 Monthly Report - NOVEMBER

	EAST AERATOR										SLUDGE ULIZATION				CLARIFERS		WEATHER CONDITIONS			METALS		
DATE	P.H	D.O	TEMP	30 MIN	MLSS MG/L	SVI	LOADINDEX	MLVSS MG/L	% MLVSS	LBS. IN AERATOR	DATE	LOCATION	YRDS.	GALLONS	NORTH	SOUTH	WEATHER	TEMP	PRECIP	NH/3	PHOSP	METAL UG/L
11/01/99	6.28	2.57	15	130							11/01/99						F	32	0.00			
11/02/99	5.83	1.75	14	140							11/02/99	Monroe	5.00				F	31	0.00			
11/03/99	6.64	2.41	14	100	2045	49		1720	84%	8059	11/03/99						C	36	0.02			
11/04/99	6.41	2.01	15	120	2680	45	0.07	2225	83%	10561	11/04/99						C	41	0.19			
11/05/99	6.70	2.18	14	140	2535	55		2095	83%	9990	11/05/99	Monroe	5.00				C	33	0.00	0.31	4.20	
11/06/99	Plant Check										11/06/99						R	56	0.64			
11/07/99	Plant Check										11/07/99						C	50	0.00			
11/08/99	6.79	1.19	16	130							11/08/99	Monroe	5.00				C	48	0.05			
11/09/99	6.58	2.08	16	104							11/09/99						R	47	0.45			
11/10/99	6.11	1.78	15	120	2515	48		2050	82%	9911	11/10/99	Monroe	5.00				R	48	1.51			
11/11/99	Plant Check										11/11/99						R	48	0.41			
11/12/99	6.66	1.74	15	130	2810	46	0.06	2300	82%	11073	11/12/99						R	50	1.62	0.22		
11/13/99	Plant Check										11/13/99						R	48	1.23			
11/14/99	Plant Check										11/14/99						F	48	0.02			
11/15/99	6.65	2.35	15	150							11/15/99						F	47	0.00			
11/16/99	6.74	2.15	15	130							11/16/99	Monroe	10.00				C	48	0.12			
11/17/99	6.56	2.10	16	120	2200	55		1745	79%	8669	11/17/99	Monroe	5.00				C	46	0.75			
11/18/99	6.57	2.75	15	120	2255	53	0.07	1820	81%	8886	11/18/99	Monroe	5.00				F	37	0.00			
11/19/99	6.58	2.31	15	120	2405	50		1955	81%	9477	11/19/99						C	44	0.01	0.24		
11/20/99	Plant Check										11/20/99						C	47	0.37			
11/21/99	Plant Check										11/21/99						C	40	0.80			
11/22/99	6.68	2.40	14	120							11/22/99	Monroe	5.00				C	43	0.01			
11/23/99	6.61	2.30	14	130							11/23/99						C	42	0.11			
11/24/99	6.61	2.28	14	120	2160	56	0.08	1775	82%	8512	11/24/99	Monroe	5.00				C	46	0.03	0.29		
11/25/99	Plant Check										11/25/99						R	44	1.50			
11/26/99	Plant Check										11/26/99						C	44	0.61			
11/27/99	Plant Check										11/27/99						R	41	0.04			
11/28/99	Plant Check										11/28/99						C	45	0.32			
11/29/99	6.53	2.51	13	160							11/29/99	Monroe	5.00				C	39	0.00			
11/30/99	6.67	2.91	14	140							11/30/99	Monroe	5.00				R	46	0.49			
TOTAL	**124**	**42**	**279**	**2424**	**21605**	**457**	**0.28**	**17685**	**737%**	**85138**	**TOTAL**		**60**	**0**	**0**	**0**	**F=Fog**	**1315**	**11.30**		**4.20**	
MAX	**7**	**3**	**16**	**160**	**2810**	**56**	**0.08**	**2300**	**84%**	**11073**	**MAX**		**10**	**0**	**0**	**0**	**R=Rain**	**56**	**1.62**		**4.20**	
MIN	**6**	**1**	**13**	**100**	**2045**	**45**	**0.06**	**1720**	**79%**	**8059**	**MIN**		**5**	**0**	**0**	**0**	**S=Sun**	**31**	**0.00**		**4.20**	
AVG	**7**	**2**	**15**	**127.579**	**2401**	**51**	**0.07**	**1965**	**82%**	**9460**	**AVG**		**5**	**#DIV/0!**	**#DIV/0!**	**#DIV/0!**	**C=CLDY**	**44**	**0.38**		**4.20**	

COMMENTS

1999 Monthly Report - DECEMBER

PLANT INFLUENT

DATE	MGPD	P.H.	D.O.	TEMP	IMHOFF	BOD. MG\L	BOD. LBS.	TSS . MG\L	TSS.LBS.	VOL. SOL.	VOL. SOLIDS %
12/01/99	0.615550	7.49	6.61	15	8	269	1381	118	606	106	90%
12/02/99	0.583260	7.19	7.14	15	5	111	540	77	375	67	87%
12/03/99	0.627120	7.37	7.57	15	6	102	533	72	377	63	88%
12/04/99	0.507390	Plant Check									
12/05/99	0.487140	Plant Check									
12/06/99	0.525920	7.39	7.41	15	8						
12/07/99	0.768170	7.06	7.66	15	9						
12/08/99	0.590780	7.36	7.09	15	5	105	517	77	379	72	94%
12/09/99	0.513630	7.38	7.45	14	6	110	471	77	330	69	90%
12/10/99	0.593090	7.21	7.22	14	10	89	440	70	364	61	87%
12/11/99	0.516270	Plant Check									
12/12/99	0.619530	Plant Check									
12/13/99	0.717960	7.28	7.21	15	7						
12/14/99	0.563660	7.51	7.48	15	12						
12/15/99	0.503030	7.35	7.13	14	9	76	319	74	310	68	92%
12/16/99	0.633040	7.27	7.49	15	7	76	401	67	354	61	91%
12/17/99	0.570830	7.43	7.31	14	10	90	428	87	414	75	86%
12/18/99	0.659690	Plant Check									
12/19/99	0.618090	Plant Check									
12/20/99	0.582980	7.24	7.46	14	5						
12/21/99	0.481870	7.33	7.41	14	6						
12/22/99	0.430800	7.46	7.21	14	14	114	410	93	334	83	89%
12/23/99	0.399990	7.32	7.69	14	15	153	510	108	360	97	90%
12/24/99	0.450160	Plant Check				136	511				
12/25/99	0.573160	Plant Check									
12/26/99	0.396680	Plant Check									
12/27/99	0.324860	7.55	7.69	14	10						
12/28/99	0.404180	7.60	7.74	13	15	161	543	125	431	114	91%
12/29/99	0.394830	7.58	7.58	13	11	191	629	127	418	117	92%
12/30/99	0.381310	7.59	7.18	14	13	185	588	174	553	160	92%
12/31/99	0.454420	Plant Check									
TOTAL	16.489390	155	155	301	191	1968	8221	1346	5605	1213	1259%
MAX	0.768170	8	8	15	15	269	1381	174	606	160	94%
MIN	0.324860	7	7	13	5	76	319	67	310	61	86%
AVG	0.531916	7	7	14	9	131	548	96	400	87	90%
AVG.	AVG.	AVG.	AVG.	AVG.		AVG.	AVG.	AVG.	AVG.	AVG.	AVG.
PERMIT	0.9 MGD.						900 LB/D	1200 LB/D			
AVG.	AVG.	AVG.	AVG.	AVG.		AVG.	AVG.	AVG.	AVG.	AVG.	AVG.
LIMITS											

PLANT EFFLUENT / DISINFECTION

DATE	P.H	D.O	TEMP	IMHOFF	BOD MG/L	BOD.LBS.	% BOD REMOVAL	TSS MG/L	TSS. LBS.	% TSS REMOVAL	FECAL	LOG
12/01/99	6.66	7.20	14	TR	6	31	98%	11	56	91%		
12/02/99	6.64	7.29	14	TR	5	24	95%	10	49	87%	10	1.000
12/03/99	6.65	7.57	13	TR	6	31	94%	11	58	85%	16	1.204
12/04/99	Plant Check											
12/05/99	Plant Check											
12/06/99	6.58	7.15	13	TR								
12/07/99	6.70	7.65	13	TR								
12/08/99	6.53	7.26	13	TR	6	30	94%	11	54	86%	4	0.602
12/09/99	6.63	7.55	13	TR	6	26	95%	11	47	86%	0	0.000
12/10/99	6.63	7.45	13	TR	5	25	94%	14	69	80%	6	0.778
12/11/99	Plant Check					AVG.		AVG.	AVG.			
12/12/99	Plant Check					27		12	57			
12/13/99	6.67	7.32	13	TR								
12/14/99	6.70	7.05	13	TR							2	0.301
12/15/99	6.58	7.51	13	TR	2	8	97%	9	38	88%	36	1.556
12/16/99	6.62	7.51	14	TR	3	16	96%	8	42	88%	2	0.301
12/17/99	6.73	6.85	14	TR	4	19	96%	10	48	86%		
12/18/99	Plant Check											
12/19/99	Plant Check											
12/20/99	6.65	7.70	13	TR								
12/21/99	6.68	7.30	13	TR								
12/22/99	6.74	7.78	12	TR	5	18	96%	8	29	91%	48	1.681
12/23/99	6.58	7.28	12	TR	5	17	97%	7	23	94%	6	0.778
12/24/99	Plant Check				4	15	97%				14	1.146
12/25/99	Plant Check											
12/26/99	Plant Check				8							4.031
12/27/99	6.54	7.57	11	TR	AVG.							LOG
12/28/99	6.68	7.57	12	TR	9	30	94%	10	34	92%	28	1.447
12/29/99	6.53	7.24	11	TR	7	23	96%	10	33	92%	24	1.380
12/30/99	6.50	7.51	11	TR	8	25	96%	11	35	94%	16	1.204
12/31/99	Plant Check											
TOTAL	139	155	268	0	89	365	1435%	153	672	1240%	212	17.409
MAX	7	8	14	0	9	31	98%	14	69	94%	48	4.031
MIN	7	7	11	0	2	8	94%	7	23	80%	0	0.000
AVG	7	7	13	#DIV/0!	6	23	96%	10	45	89%	15	1.161
AVG.	MIN.				AVG.		AVG.	AVG.	AVG.	AVG.	GEM.	
PERMIT	6.00				30		75%	30	225	81%	200	
AVG.	MAX				AVW.			AVW.	AVW.		GM7	
LIMITS	9.00				45			45	338		400	

I CERTIFY THAT I AM FAMILIAR WITH THE INFORMATION CONTAINED IN THIS REPORT AND THAT TO THE BEST OF MY KNOWLEDGE THIS INFORMATION IS TRUE, COMPLETE AND ACCURATE

JOHN LIGHT GROUP2 SIGNATURE

Michael Marty Group 1

Dave Kinney Group 1

1999 Monthly Report - DECEMBER

EAST AERATOR											SLUDGE UTILIZATION				CLARIFIERS		WEATHER CONDITIONS			METALS		
DATE	P.H	D.O	TEMP	30 MIN	MLSS MG/L	SVI	LOADINDEX	MLVSS MG/L	% MLVSS	LBS. IN AERATOR	DATE	LOCATION	YARDS.	GALLONS	NORTH	SOUTH	WEATHER	TEMP	PRECIP	NH/3	PHOSP	METAL UG/L
12/01/99	6.56	2.17	14	140	2520	56		2080	83%	9,930	12/01/99	Monroe	5.00				Cldy	44	0.31			
12/02/99	6.55	2.81	14	140	2430	58	0.07	1995	82%	9,576	12/02/99						Rain	47	0.43			Copper
12/03/99	6.59	2.80	13	120	2245	53		1860	83%	8,847	12/03/99						Cldy	33	0.11	0.17	1.80	4.
12/04/99	Plant Check										12/04/99						Fog	29	0.01			ug/l
12/05/99	Plant Check										12/05/99						Cldy	46	0.26			
12/06/99	6.48	2.80	14	140							12/06/99						Rain	47	0.23			Mercury
12/07/99	6.54	2.85	13	150							12/07/99	Monroe	5.00				Rain	39	0.93			<0.2
12/08/99	6.43	2.23	13	150	2740	55		2280	83%	10,797	12/08/99						Rain	38	0.05			ug/l
12/09/99	6.53	2.46	13	150	2855	53	0.05	2370	83%	11,251	12/09/99	Monroe	5.00				Rain	41	0.58			
12/10/99	6.46	2.20	13	130	2460	53		2035	83%	9,694	12/10/99	Monroe	5.00				Cldy	44	0.03	0.20		Silver
12/11/99	Plant Check										12/11/99						Rain	44	0.54			0.1
12/12/99	Plant Check										12/12/99						Rain	48	0.35			ug/l
12/13/99	6.53	2.40	13	150							12/13/99						Cldy	40	0.13			
12/14/99	6.58	2.41	13	130							12/14/99	Monroe	5.00				Rain	42	0.13			Zinc
12/15/99	6.41	2.43	13	130	2560	51		2135	83%	10,088	12/15/99	Monroe	5.00				Rain	51	0.24			19.
12/16/99	6.43	2.60	14	130	2565	51	0.05	2135	83%	10,108	12/16/99						Rain	52	0.47			ug/l
12/17/99	6.57	2.12	14	120	2365	51		1965	83%	9,320	12/17/99						Cldy	40	0.06	0.19		
12/18/99	Plant Check										12/18/99						Cldy	49	0.33			
12/19/99	Plant Check										12/19/99						Cldy	42	0.27			
12/20/99	6.63	2.79	13	140							12/20/99	Monroe	5.00				Cldy	43	0.42			
12/21/99	6.62	2.89	13	120							12/21/99	Monroe	5.00				Cldy	42	0.00			
12/22/99	6.58	2.74	13	120	2115	57		1755	83%	8,334	12/22/99	Monroe	5.00				Fog	37	0.01			
12/23/99	6.55	3.07	12	130	2390	54	0.06	2025	85%	7,973	12/23/99						Fog	33	0.00	0.26		
12/24/99	Plant Check										12/24/99						Fog	31	0.01			
12/25/99	Plant Check										12/25/99						Fog	34	0.01			
12/26/99	Plant Check										12/26/99						Fog	30	0.00			
12/27/99	6.42	2.73	12	140							12/27/99						Fog	32	0.01			
12/28/99	6.57	2.73	11	150	2710	55		2265	84%	10,679	12/28/99						Fog	30	0.00			
12/29/99	6.46	2.24	12	160	2870	56	0.07	2450	85%	11,310	12/29/99	Monroe	5.00				Cldy	34	0.01			
12/30/99	6.45	2.05	12	140	2540	55		2145	84%	10,009	12/30/99						Cldy	37	0.01	0.24		
12/31/99	Plant Check										12/31/99						Rain	40	0.43			
TOTAL	**137**	**54**	**272**	**2880**	**35365**	**758**	**0.3**	**29495**	**1167%**	**137916**	**TOTAL**		**50**	**0**	**0**	**0**		**1239**	**6.37**	**1.06**	**1.80**	
MAX	**7**	**3**	**14**	**160**	**2870**	**58**	**0.07**	**2450**	**85%**	**11310**	**MAX**		**5**	**0**	**0**	**0**		**52**	**0.93**	**0.26**	**1.80**	
MIN	**6**	**2**	**11**	**120**	**2115**	**51**	**0.05**	**1755**	**82%**	**7973**	**MIN**		**5**	**0**	**0**	**0**		**29**	**0.00**	**0.17**	**1.80**	
AVG	**7**	**3**	**13**	**137.143**	**2526**	**54**	**0.06**	**2107**	**83%**	**9851**	**AVG**		**5**	**#DIV/0!**	**#DIV/0!**	**#DIV/0!**		**40**	**0.21**	**0.21**	**1.80**	

COMMENTS B.O.D. Lbs Infl.on 12/1/99 were high due to an grab sample . Sampler was down.

200[illegible] [illegible]thly [illegible] - JA[illegible]RY

PLANT INFLUENT

DATE	MGPD	P.H.	D.O.	TEMP	IMHOFF	BOD. MG\L	BOD. LBS.	TSS MG\L	TSS.LBS.	VOL. SOL.	VOL. SOLIDS %
01/01/00	0.514100	Plant Check									
01/02/00	0.537920	Plant Check									
01/03/00	0.503610	7.36	7.85	13	8						
01/04/00	0.560270	7.47	8.04	14	10						
01/05/00	0.619930	7.61	7.93	14	10	93	481	60	310	46	77%
01/06/00	0.532520	7.16	7.81	14	12	116	515	97	431	88	91%
01/07/00	0.471800	7.64	8.00	14	20	114	499	99	390	85	86%
01/08/00	0.460300	Plant Check									
01/09/00	0.600090	Plant Check									
01/10/00	0.720030	7.42	8.50	13	13						
01/11/00	0.574230	7.43	8.15	14	10						
01/12/00	0.534480	7.48	8.34	13	7	158	704	138	615	121	88%
01/13/00	0.496830	7.50	7.89	14	11	158	655	127	526	108	85%
01/14/00	0.489970	7.53	8.34	14	5	132	539	142	580	127	89%
01/15/00	0.507020	Plant Check									
01/16/00	0.517940	Plant Check									
01/17/00	0.667210	Plant Check									
01/18/00	0.524540	7.49	7.81	13	9						
01/19/00	0.429470	7.91	7.79	14	15	160	573	176	630	164	93%
01/20/00	0.422650	7.70	8.05	13	9	144	508	156	550	144	92%
01/21/00	0.439860	7.50	8.20	13	15	137	503	97	356	86	89%
01/22/00	0.474880	Plant Check									
01/23/00	0.479850	Plant Check									
01/24/00	0.507820	7.50	7.68	13	14						
01/25/00	0.439450	7.71	7.71	14	13						
01/26/00	0.415860	7.70	7.61	14	8	135	468	138	479	124	90%
01/27/00	0.400630	7.66	7.54	13	9	122	408	106	354	92	87%
01/28/00	0.394570	7.69	7.38	14	11	155	510	111	365	96	86%
01/29/00	0.368020	Plant Check									
01/30/00	0.409020	Plant Check									
01/31/00	0.428750	7.62	7.10	13	9						
TOTAL	15.443620	151	158	271	218	1624	6363	1447	5586	1281	1053%
MAX	0.720030	8	9	14	20	160	704	176	630	164	93%
MIN	0.368020	7	7	13	5	93	408	60	310	46	77%
AVG	0.498181	8	8	14	11	135	530	121	466	106.75	88%
AVG.	AVG.	AVG.	AVG.	AVG.		AVG.	AVG.	AVG.	AVG.	AVG.	AVG.
PERMIT	0.9 MGD.						900 LB/D		1200 LB/D		
AVG.	AVG.	AVG.	AVG.	AVG.		AVG.	AVG.	AVG.	AVG.	AVG.	AVG.
LIMITS											

PLANT EFFLUENT / DISINFECTION

DATE	P.H	D.O	TEMP	IMHOFF	BOD MG/L	BOD.LBS.	% BOD REMOVAL	TSS MG/L	TSS. LBS.	% TSS REMOVAL	FECAL	LOG
01/01/00	Plant Check											
01/02/00	Plant Check											
01/03/00	6.56	6.78	12	TR								
01/04/00	6.69	8.16	12	TR							24	1.380
01/05/00	6.63	7.92	12	TR	4	21	96%	9	47	85%	16	1.204
01/06/00	6.28	7.90	11	TR	5	22	96%	13	58	87%	12	1.079
01/07/00	6.31	7.59	12	TR	4	16	96%	10	39	90%		LOG
01/08/00	Plant Check											3.663
01/09/00	Plant Check											
01/10/00	6.65	7.75	12	TR								
01/11/00	6.65	7.37	12	TR							30	1.477
01/12/00	6.57	8.31	11	TR	5	22	97%	17	76	88%	12	1.079
01/13/00	6.47	8.20	12	TR	5	21	97%	18	75	86%	6	0.778
01/14/00	6.54	8.27	12	TR	5	20	96%	17	69	88%		
01/15/00	Plant Check				AVG.	AVG.		AVG.	AVG.			
01/16/00	Plant Check				5	21		17	73			
01/17/00	Plant Check											
01/18/00	6.52	6.14	11	TR								
01/19/00	6.58	8.39	11	TR	4	14	98%	14	50	92%	20	1.301
01/20/00	6.54	8.82	11	TR	5	18	97%	13	46	92%	10	1.000
01/21/00	6.51	8.47	12	TR	5	18	96%	12	44	88%	14	1.146
01/22/00	Plant Check											
01/23/00	Plant Check											
01/24/00	6.74	9.02	10	TR								
01/25/00	6.65	8.75	11	TR								
01/26/00	6.60	7.96	12	TR	5	17	96%	15	52	89%	0	0.000
01/27/00	6.67	8.85	11	TR	3	10	98%	10	33	91%	0	0.000
01/28/00	6.54	8.26	12	TR	3	10	98%	10	33	91%	0	0.000
01/29/00	Plant Check											
01/30/00	Plant Check											
01/31/00	6.81	8.23	11	TR								
TOTAL	132	161	230	TR	58	230	1161%	175	695	1067%	144	14.107
MAX	7	9	12	TR	5	22	98%	18	76	92%	30	3.663
MIN	6	6	10	TR	3	10	96%	9	33	85%	0	0.000
AVG	7	8	12	TR	4	18	97%	13	53	89%	12	1.085
AVG.	MIN.				AVG.		AVG.	AVG.	AVG.	AVG.	GEM.	
PERMIT	6.00				30		75%	30	225	81%	200	
AVG.	MAX				AVW.			AVW.	AVW.		GM7	
LIMITS	9.00				45			45	338		400	

I CERTIFY THAT I AM FAMILIAR WITH THE INFORMATION CONTAINED IN THIS REPORT AND THAT TO THE BEST OF MY KNOWLEDGE THIS INFORMATION IS TRUE, COMPLETE AND ACCURATE

JOHN LIGHT GROUP2 SIGNATURE

Michael Marty Group 1

Dave Kinney Group 1

2000 Monthly Report - JANUARY

EAST AERATOR												SLUDGE ULIZATION			CLARIFERS		WEATHER CONDITIONS			METALS		
DATE	P.H	D.O	TEMP	30 MIN	MLSS MG/L	SVI	LOADINDEX	MLVSS MG/L	% MLVSS	LBS. IN AERATOR	DATE	LOCATION	YRDS.	GALLONS	NORTH	SOUTH	WEATHER	TEMP	PRECIP	NH/3	PHOSP	METAL UG/L
01/01/00	Plant Check										01/01/00						Rain	41	0.26			
01/02/00	Plant Check										01/02/00						Cldy	39	0.09			Copper
01/03/00	6.53	3.29	12	180							01/03/00						Rain	34	0.04			9.
01/04/00	6.49	2.38	13	190							01/04/00						Cldy	47	0.61			ug/l
01/05/00	6.39	1.35	13	190	3360	57		2825	84%	13241	01/05/00						Cldy	38	0.14			
01/06/00	6.14	1.46	12	190	3025	63	0.05	2550	84%	11920	01/06/00	Monroe	5.00				Cldy	32	0.00		2.00	Mercury
01/07/00	6.23	3.43	12	180	3140	57		2655	85%	12374	01/07/00						Rain	40	0.13	0.17		0.20
01/08/00	Plant Check										01/08/00						Rain	44	0.26			ug/l
01/09/00	Plant Check										01/09/00						Rain	38	0.62			
01/10/00	6.58	2.65	12	200							01/10/00	Monroe	5.00				Rain	37	0.08			Silver
01/11/00	6.62	2.25	12	200							01/11/00						Cldy	37	0.26			0.10
01/12/00	6.51	3.50	12	200	3305	61		2790	84%	14732	01/12/00	Monroe	5.00				Cldy	35	0.13			ug/l
01/13/00	6.42	2.53	12	220	3415	64	0.06	2865	84%	13457	01/13/00	Monroe	5.00				Rain	35	0.11			
01/14/00	6.47	2.92	12	190	3175	60		2735	86%	12512	01/14/00	Monroe	5.00				Rain	41	0.08	0.26		Zinc
01/15/00	Plant Check										01/15/00						Sun	44	0.31			16.
01/16/00	Plant Check										01/16/00						Rain	40	0.18			ug/l
01/17/00	Plant Check										01/17/00						Sun	37	0.07			
01/18/00	6.59	1.07	12	200							01/18/00						Fog	28	0.00			
01/06/00	6.55	1.58	11	180	2920	62		2420	83%	11507	01/19/00	Monroe	5.00				Fog	27	0.01			
01/06/00	6.51	1.15	11	180	2910	62	0.05	2440	84%	11467	01/20/00						Rain	37	0.24			
01/21/00	6.50	1.18	12	140	2360	59		1975	84%	9300	01/21/00	Monroe	5.00				Rain	39	0.28	0.21		
01/22/00	Plant Check										01/22/00						Rain	39	0.09			
01/23/00	Plant Check										01/23/00						Fog	34	0.03			
01/24/00	6.72	3.19	11	200							01/24/00	Monroe	5.00				Fog	30	0.00			
01/25/00	6.66	2.09	12	180							01/25/00						Cldy	40	0.09			
01/26/00	6.50	1.72	12	190	3215	59		2700	84%	12669	01/26/00	Monroe	5.00				Cldy	41	0.08			
01/27/00	6.62	3.12	11	190	2940	65	0.04	2450	83%	11586	01/27/00						Cldy	35	0.00			
01/28/00	6.48	1.31	12	200	3260	61		2710	83%	12847	01/28/00	Monroe	5.00				Fog	28	0.00	0.20		
01/29/00	Plant Check										01/29/00						Sun	31	0.00			
01/30/00	Plant Check										01/30/00						Sun	27	0.00			
01/31/00	6.58	2.53	12	200							01/31/00						Cldy	39	0.12			
TOTAL	**130**	**45**	**238**	**3800**	**37025**	**730**	**0.2**	**31115**	**1008%**	**147612**	**TOTAL**		**50**	**0**	**0**	**0**		**1134**	**4.31**		**2.00**	
MAX	7	**4**	**13**	**220**	**3415**	**65**	**0.06**	**2865**	**86%**	**14732**	**MAX**		**5**	**0**	**0**	**0**		**47**	**0.62**		**2.00**	
MIN	**6**	**1**	**11**	**140**	**2360**	**57**	**0.04**	**1975**	**83%**	**9300**	**MIN**		**5**	**0**	**0**	**0**		**27**	**0.00**		**2.00**	
AVG	**7**	**2**	**12**	**190**	**3085**	**61**	**0.05**	**2593**	**84%**	**12301**	**AVG**		**5**	**#DIV/0!**	**#DIV/0!**	**#DIV/0!**		**37**	**0.14**		**2.00**	

COMMENTS

PLANT INFLUENT

DATE	MGPD	P.H.	D.O.	TEMP	IMHOFF	BOD. MG\L	BOD. LBS.	TSS . MG\L	TSS.LBS.	VOL. SOL.	VOL. SOLIDS %
02/01/00	0.428050	7.56	8.37	13	10						
02/02/00	0.594920	7.69	7.61	13	10	144	714	152	754	104	88%
02/03/00	0.517230	7.41	7.79	13	14	141	608	86	371	75	87%
02/04/00	0.433200	7.59	7.46	12	15	151	546	100	361	88	88%
02/05/00	0.374160	Plant Check									
02/06/00	0.407900	Plant Check									
02/07/00	0.441660	7.70	8.13	13	7						
02/08/00	0.408910	7.56	7.73	13	10						
02/09/00	0.535180	7.49	7.80	13	4	133	594	134	598	99	74%
02/10/00	0.478870	7.58	7.71	13	12	136	543	79	316	68	86%
02/11/00	0.437600	7.39	7.68	13	11	203	741	92	337	80	87%
02/12/00	0.401950	Plant Check									
02/13/00	0.434320	Plant Check									
02/14/00	0.455550	7.54	6.44	13	12						
02/15/00	0.458580	7.39	7.98	13	14						
02/16/00	0.556100	7.31	7.66	13	10	160	720	94	436	84	89%
02/17/00	0.584600	7.32	7.58	13	8	159	737	127	619	87	69%
02/18/00	0.565470	7.51	7.47	12	8	182	858	128	604	110	86%
02/19/00	0.639710	Plant Check									
02/20/00	0.608170	Plant Check									
02/21/00	0.572840	Plant Check									
02/22/00	0.573180	7.57	8.08	14	20						
02/23/00	0.598650	7.50	7.67	13	5	163	814	90	449	78	87%
02/24/00	0.566690	7.41	7.61	12	8	171	808	97	458	81	84%
02/25/00	0.530330	7.51	7.32	13	11	266	1177	207	916	184	89%
02/26/00	0.515170	Plant Check									
02/27/00	0.532810	Plant Check									
02/28/00	0.535950	7.58	7.36	14	10						
02/29/00	0.456200	7.45	7.39	13	20						
TOTAL	14.643950	150	153	259	219	2009	8860	1386	6219	1138	1014%
MAX	0.639710	8	8	14	20	266	1177	207	916	184	89%
MIN	0.374160	7	6	12	4	133	543	79	316	68	69%
AVG	0.504964	8	8	13	11	167	738	116	518	94.8333	85%
AVG.	AVG.	AVG.	AVG.	AVG.		AVG.	AVG.	AVG.	AVG.	AVG.	AVG.
PERMIT	0.9 MGD.						900 LB/D		1200 LB/D		
AVG.	AVG.	AVG.	AVG.	AVG.		AVG.	AVG.	AVG.	AVG.	AVG.	AVG.
LIMITS											

PLANT EFFLUENT / DISINFECTION

DATE	P.H	D.O	TEMP	IMHOFF	BOD MG/L	BOD.LBS.	% BOD REMOVAL	TSS MG/L	TSS. LBS.	% TSS REMOVAL	FECAL	LOG
02/01/00	6.70	8.49	12	TR							0	0.000
02/02/00	6.70	8.70	13	TR	6	30	96%	18	89	88%	0	0.000
02/03/00	6.73	8.81	12	TR	5	22	96%	16	69	81%	0	0.000
02/04/00	6.64	8.54	11	TR	5	18	97%	16	58	84%		
02/05/00	Plant Check				Avg.	Avg.		Avg.	Avg.			
02/06/00	Plant Check				5	23		17	72			
02/07/00	6.60	8.19	12	TR								
02/08/00	6.64	7.57	13	TR							4	0.602
02/09/00	6.76	7.69	13	TR	5	22	96%	14	62	90%	0	0.000
02/10/00	6.60	7.86	12	TR	5	20	96%	13	52	84%	2	0.301
02/11/00	6.60	8.24	12	TR	5	18	98%	13	47	86%		
02/12/00	Plant Check											
02/13/00	Plant Check											
02/14/00	6.58	7.62	11	TR								
02/15/00	6.62	7.74	11	TR							0	0.000
02/16/00	6.71	8.04	12	TR	5	23	97%	11	51	88%	0	0.000
02/17/00	6.63	7.68	11	TR	5	23	97%	10	49	92%	4	0.602
02/18/00	6.55	8.15	11	TR	5	24	97%	8	38	94%		
02/19/00	Plant Check											
02/20/00	Plant Check											
02/21/00	Plant Check											
02/22/00	6.56	7.88	12	TR							2	0.301
02/23/00	6.57	8.19	12	TR	4	20	98%	10	50	89%	10	1.000
02/24/00	6.36	7.35	11	TR	4	19	98%	6	28	94%	14	1.146
02/25/00	6.58	8.29	12	TR	5	22	98%	9	40	96%		LOG
02/26/00	Plant Check											2.447
02/27/00	Plant Check											
02/28/00	6.63	7.82	13	TR								
02/29/00	6.63	7.92	12	TR							6	0.778
TOTAL	132	161	238	TR	64	284	1164%	161	705	1066%	42	7.177
MAX	7	9	13	TR	6	30	98%	18	89	96%	14	2.447
MIN	6	7	11	TR	4	18	96%	6	28	81%	0	0.000
AVG	7	8	12	TR	5	22	97%	12	54	89%	3	0.513
AVG.	MIN.				AVG.		AVG.	AVG.	AVG.	AVG.	GEM.	
PERMIT	6.00				30		75%	30	225	81%	200	
AVG.	MAX				AVW.			AVW.	AVW.		GM7	
LIMITS	9.00				45			45	338		400	

I CERTIFY THAT I AM FAMILIAR WITH THE INFORMATION CONTAINED IN THIS REPORT AND THAT TO THE BEST OF MY KNOWLEDGE THIS INFORMATION IS TRUE, COMPLETE AND ACCURATE

JOHN LIGHT GROUP2 SIGNATURE

Michael Marty Group 1

Dave Kinney Group 1

2000 Monthly Report - FEBRUARY

					EAST AERATOR							SLUDGE ULIZATION			CLARIFERS		WEATHER CONDITIONS			METALS		
DATE	P.H	D.O	TEMP	30 MIN	MLSS MG/L	SVI	LOADINDEX	MLVSS MG/L	% MLVSS	LBS. IN AERATOR	DATE	LOCATION	YRDS.	GALLONS	NORTH	SOUTH	WEATHER	TEMP	PRECIP	NH/3	PHOSP	METAL UG/L
02/01/00	6.62	3.05	12	210							02/01/00	Monroe	5.00				Rain	50	0.67			
02/02/00	6.62	2.14	12	200	3275	61		2645	81%	12906	02/02/00	Monroe	5.00				Cldy	41	0.43			Copper
02/03/00	6.69	2.85	12	200	3515	57	0.05	2850	81%	13851	02/03/00						Fog	33	0.01			1.
02/04/00	6.56	2.30	11	190	3080	62		2515	82%	12137	02/04/00	Monroe	5.00				Cldy	33	0.00	0.21	2.00	ug/l
02/05/00	Plant Check										02/05/00						Cldy	34	0.00			
02/06/00	Plant Check										02/06/00						Cldy	46	0.11			Mercury
02/07/00	6.48	1.80	12	210							02/07/00						Cldy	41	0.00			0.20
02/08/00	6.56	1.65	13	190							02/08/00						Rain	46	0.55			ug/l
02/09/00	6.67	1.56	13	190	3410	56		2735	80%	13438	02/09/00	Monroe	5.00				Cldy	37	0.41			
02/10/00	6.55	1.42	11	200	3720	54	0.05	2940	79%	14659	02/10/00	Monroe	5.00				Fog	29	0.00			Silver
02/11/00	6.57	2.12	12	180	3190	56		2555	80%	12571	02/11/00						Cldy	34	0.01	0.19		0.10
02/12/00	Plant Check										02/12/00						Rain	43	0.02			ug/l
02/13/00	Plant Check										02/13/00						Fog	38	0.02			
02/14/00	6.50	2.03	12	200							02/14/00						Rain	38	0.01			Zinc
02/15/00	6.56	2.14	12	170							02/15/00	Monroe	5.00				Cldy	38	0.64			24.
02/16/00	6.62	1.48	12	170	2985	57		2485	83%	11763	02/16/00						Cldy	32	0.01			ug/l
02/17/00	6.52	1.54	12	150	2850	53	0.08	2290	80%	11231	02/17/00	Monroe	10.00				Fog	29	0.01			
02/18/00	6.57	1.77	11	150	2870	52		2330	81%	11329	02/18/00	Monroe	5.00				Cldy	27	0.00	0.19		
02/19/00	Plant Check										02/19/00						Fog	33	0.01			
02/20/00	Plant Check										02/20/00						Sun	36	0.00			
02/21/00	Plant Check										02/21/00						Rain	44	0.18			
02/22/00	6.65	1.83	13	160							02/22/00						Rain	47	0.22			
02/23/00	6.57	1.54	12	160	2840	56		2295	81%	11191	02/23/00	Monroe	5.00				Fog	37	0.36			
02/24/00	6.50	1.93	11	160	2970	54	0.09	2390	80%	11704	02/24/00						Cldy	37	0.00			
02/25/00	6.65	2.50	12	160	2785	57		2305	83%	10975	02/25/00	Monroe	5.00				Sun	28	0.04	0.23		
02/26/00	Plant Check										02/26/00						Cldy	47	0.17			
02/27/00	Plant Check										02/27/00						Cldy	43	0.31			
02/28/00	6.45	1.82	13	170							02/28/00	Monroe	5.00				Cldy	43	0.08			
02/29/00	6.58	1.77	12	190							02/29/00						Rain	42	0.18			
TOTAL	**131**	**39**	**240**	**3610**	**37490**	**675**	**0.27**	**30335**	**971%**	**147755**	**TOTAL**		**60**	**0**	**0**	**0**		**1106**	**4.45**	**0.82**	**2.00**	
MAX	**7**	**3**	**13**	**210**	**3720**	**62**	**0.09**	**2940**	**83%**	**14659**	**MAX**		**10**	**0**	**0**	**0**		**50**	**0.67**	**0.23**	**2.00**	
MIN	**6**	**1**	**11**	**150**	**2785**	**52**	**0.05**	**2290**	**79%**	**10975**	**MIN**		**5**	**0**	**0**	**0**		**27**	**0.00**	**0.19**	**2.00**	
AVG	**7**	**2**	**12**	**180.5**	**3124**	**56**	**0.07**	**2528**	**81%**	**12313**	**AVG**		**5**	**#DIV/0!**	**#DIV/0!**	**#DIV/0!**		**38**	**0.15**	**0.21**	**2.00**	

COMMENTS B.O.D. Inf. Lbs. On 2/25/00 over limit due to sampler being down and a very dirty grab sample taken.

	PLANT INFLUENT											PLANT EFFLUENT											DISINFECTION	
	MGPD	P.H.	D.O.	TEMP	IMHOFF	BOD. MG\L	BOD. LBS.	TSS . MG\L	TSS.LBS.	VOL. SOL	L. SOLIDS	DATE	P.H	D.O	TEMP	IMHOFF	BOD MG/L	BOD.LBS.	BOD REMOV	TSS MG/L	TSS. LBS.	TSS REMO	FECAL	LOG
03/01/00	0.481990	7.22	8.19	12	13	136	547	109	438	87	80%	03/01/00	6.55	8.02	12	TR	6	24	96%	12	48	89%	12	1.079
03/02/00	0.474590	7.47	7.62	13	10	199	788	119	471	105	88%	03/02/00	6.55	8.22	13	TR	5	20	97%	11	44	91%	6	0.778
03/03/00	0.493300	7.27	7.08	13	11	115	473	96	395	86	90%	03/03/00	6.59	8.00	12	TR	5	21	96%	11	45	89%		
03/04/00	0.508730	Plant Check										03/04/00	Plant Check				AVG.	AVG.						
03/05/00	0.628640	Plant Check										03/05/00	Plant Check				5	22						
03/06/00	0.577740	7.33	7.75	13	13							03/06/00	6.75	7.93	12	TR								
03/07/00	0.486170	7.41	7.44	12	8							03/07/00	6.88	7.71	11	TR							6	0.778
03/08/00	0.437900	7.34	7.28	13	10	97	354	195	712	179	92%	03/08/00	6.74	7.96	12	TR	3	11	97%	9	33	95%	2	0.301
03/09/00	0.438450	7.38	7.97	14	12	79	289	93	340	80	86%	03/09/00	6.68	7.77	12	TR	3	11	96%	9	33	90%	10	1.000
03/10/00	0.402190	7.48	7.75	13	14	105	352	127	426	112	88%	03/10/00	6.63	8.21	13	TR	4	13	96%	7	23	94%		Log
03/11/00	0.384810	Plant Check										03/11/00	Plant Check											2.079
03/12/00	0.393840	Plant Check										03/12/00	Plant Check											
03/13/00	0.428040	7.45	7.14	13	11							03/13/00	6.55	8.15	13	TR								
03/14/00	0.422980	7.43	7.76	14	12							03/14/00	6.46	7.89	13	TR							0	0.000
03/15/00	0.379590	7.38	7.73	13	15	112	355	150	475	135	90%	03/15/00	6.71	7.82	12	TR	5	16	96%	11	35	92%	20	1.301
03/16/00	0.385270	7.36	7.94	14	15	151	485	106	341	93	88%	03/16/00	6.63	8.34	12	TR	5	16	97%	10	32	91%	16	1.204
03/17/00	0.463520	7.16	8.19	13	12	105	406	110	517	96	84%	03/17/00	6.67	8.71	12	TR	5	19	95%	9	42	92%		
03/18/00	0.510540	Plant Check										03/18/00	Plant Check											
03/19/00	0.580800	Plant Check										03/19/00	Plant Check											
03/20/00	0.542890	7.28	8.01	14	8							03/20/00	6.55	8.28	12	TR								
03/21/00	0.475250	7.25	7.64	13	10							03/21/00	6.51	7.91	12	TR							12	1.079
03/22/00	0.410290	8.29	8.60	14	16	92	315	105	359	92	88%	03/22/00	6.50	8.36	13	TR	3	10	97%	7	24	93%	2	0.301
03/23/00	0.453330	7.28	7.85	13	12	96	363	137	518	121	88%	03/23/00	6.44	7.48	12	TR	3	11	97%	8	30	94%	0	0.000
03/24/00	0.469550	7.26	7.45	13	12	86	337	90	352	79	88%	03/24/00	6.51	8.04	12	TR	3	12	97%	8	31	91%		
03/25/00	0.438990	Plant Check										03/25/00	Plant Check											
03/26/00	0.435150	Plant Check										03/26/00	Plant Check											
03/27/00	0.453270	7.46	7.91	14	13							03/27/00	6.53	8.51	13	TR				13	47			
03/28/00	0.439980	7.38	7.98	14	12							03/28/00	6.51	8.56	13	TR				AVG.	AVG.		2	0.301
03/29/00	0.447450	7.31	8.14	14	9	108	403	141	526	128	91%	03/29/00	6.56	8.26	12	TR	4	15	96%	11	41	92%	0	0.000
03/30/00	0.428190	7.43	7.68	14	11	81	289	97	346	86	89%	03/30/00	6.53	8.24	12	TR	5	18	94%	16	57	84%	4	0.602
03/31/00	0.419420	7.31	8.14	14	13	100	350	110	385	95	86%	03/31/00	6.53	7.92	12	TR	4	14	96%	12	42	89%		
TOTAL	14.292850	170	179	307	272	1662	6106	1785	6601	1574	1316%	TOTAL	152	186	282	TR	68	253	1443%	164	607	1366%	92	10.803
MAX	0.628640	8	9	14	16	199	788	195	712	179	92%	MAX	7	9	13	TR	6	24	97%	16	57	95%	20	2.079
MIN	0.379590	7	7	12	8	79	289	90	340	79	80%	MIN	6	7	11	TR	3	10	94%	7	23	84%	0	0.000
AVG	0.461060	7	8	13	12	111	407	119	440	104.933	88%	AVG	7	8	12	TR	4	16	96%	10	38	91%	7	0.720
AVG.	AVG.	AVG.	AVG.	AVG.		AVG.	AVG.	AVG.	AVG.	AVG.	AVG.	AVG.	MIN.				AVG.		AVG.	AVG.	AVG.	AVG.	GEM.	
PERMIT	0.9 MGD.						900 LB/D		1200 LB/D			PERMIT	6.00				30		75%	30	225	81%	200	
AVG.	AVG.	AVG.	AVG.	AVG.		AVG.	AVG.	AVG.	AVG.	AVG.	AVG.	AVG.	MAX				AVW.			AVW.	AVW.		GM7	
LIMITS												LIMITS	9.00				45			45	338		400	

I CERTIFY THAT I AM FAMILIAR WITH THE INFORMATION CONTAINED IN THIS REPORT AND THAT TO THE BEST OF MY KNOWLEDGE THIS INFORMATION IS TRUE, COMPLETE AND ACCURATE

JOHN LIGHT GROUP2 SIGNATURE

Michael Marty Group 1

Dave Kinney Group 1

2000 Monthly Report - MARCH

	EAST AERATOR									
DATE	P.H	D.O	TEMP	30 MIN	MLSS MG/L	SVI	LOADINDEX	MLVSS MG/L	% MLVSS	S. IN AERAT
03/01/00	6.48	1.87	12	170	3160	54		2520	80%	12452
03/02/00	6.50	1.40	12	160	2775	58	0.09	2220	80%	10935
03/03/00	6.51	1.78	13	140	2745	51		2195	80%	10817
03/04/00	Plant Check									
03/05/00	Plant Check									
03/06/00	6.69	1.65	12	150						
03/07/00	6.81	1.67	11	140						
03/08/00	6.67	1.73	13	130	2130	61		1695	80%	8394
03/09/00	6.61	1.53	13	140	2450	57	0.04	1975	81%	9655
03/10/00	6.55	1.98	12	120	1840	65		1505	82%	7251
03/11/00	Plant Check									
03/12/00	Plant Check									
03/13/00	6.48	1.83	13	160						
03/14/00	6.42	2.46	13	160						
03/15/00	6.50	1.99	12	140	1995	70		1640	82%	7862
03/16/00	6.50	2.25	13	150	2530	59	0.06	2080	82%	9970
03/17/00	6.51	2.38	13	130	1950	67		1605	82%	7684
03/18/00	Plant Check									
03/19/00	Plant Check									
03/20/00	6.46	2.56	12	170						
03/21/00	6.46	2.31	12	150						
03/22/00	6.45	2.21	13	160	2490	64		2055	83%	9812
03/23/00	6.40	2.15	12	140	2175	64	0.05	1815	83%	8571
03/24/00	6.45	2.16	12	150	2180	69		1795	82%	8591
03/25/00	Plant Check									
03/26/00	Plant Check									
03/27/00	6.44	2.56	14	150						
03/28/00	6.45	2.65	13	130						
03/29/00	6.41	2.85	13	140	2210	63		1875	85%	8709
03/30/00	6.43	2.74	13	130	1975	66	0.04	1650	84%	7783
03/31/00	6.47	2.68	13	130	2015	65		1680	83%	7940
TOTAL	**150**	**49**	**289**	**3340**	**34620**	**933**	**0.28**	**28305**	**1229%**	**136426**
MAX	**7**	**3**	**14**	**170**	**3160**	**70**	**0.09**	**2520**	**85%**	**12452**
MIN	**6**	**1**	**11**	**120**	**1840**	**51**	**0.04**	**1505**	**80%**	**7251**
AVG	**7**	**2**	**13**	**145.217**	**2308**	**62**	**0.06**	**1887**	**82%**	**9095**

	SLUDGE ULIZATION			CLARIFERS		WEATHER CONDITIONS			METALS		
DATE	LOCATION	YRDS.	GALLONS	NORTH	SOUTH	WEATHER	TEMP	PRECIP	NH/3	PHOSP	METAL UG/L
03/01/00	Monroe	5.00				Cldy	40	0.29		1.60	
03/02/00	Monroe	10.00				Rain	43	0.12			Copper
03/03/00	Monroe	5.00				Cldy	44	0.06	0.18		9.
03/04/00						Rain	43	0.75			ug/l
03/05/00						Cldy	41	0.06			
03/06/00	Monroe	5.00				Fog	34	0.00			Mercury
03/07/00	Monroe	5.00				Cldy	30	0.00			0.20
03/08/00						Cldy	41	0.00			ug/l
03/09/00	Monroe	5.00				Fog	43	0.02			
03/10/00	Monroe	5.00				Fog	32	0.00	0.37		Silver
03/11/00						Rain	43	0.08			0.20
03/12/00						Cldy	50	0.07			ug/l
03/13/00						Cldy	41	0.01			
03/14/00						Cldy	46	0.29			Zinc
03/15/00	Monroe	5.00				Fog	32	0.20			
03/16/00						Cldy	48	0.19			ug/l
03/17/00	Monroe	5.00				Cldy	43	0.39	0.29		31.
03/18/00						Rain	44	0.44			
03/19/00						Cldy	43	0.12			
03/20/00	Monroe	5.00				Fog	32	0.01			
03/21/00						Rain	44	0.01			
03/22/00						Rain	48	0.34			
03/23/00	Monroe	5.00				Cldy	43	0.12			
03/24/00						Fog	36	0.01	0.21		
03/25/00						Cldy	42	0.01			
03/26/00						Sun	50	0.00			
03/27/00	Monroe	5.00				Cldy	47	0.00			
03/28/00	Monroe	5.00				Cldy	43	0.37			
03/29/00	Monroe	5.00				Cldy	38	0.32			
03/30/00	Monroe	5.00				Fog	34	0.00			
03/31/00						Cldy	40	0.01	0.26		
TOTAL		**80**	**0**	**0**	**0**		**1278**	**4.29**	**1.31**	**1.60**	
MAX		**10**	**0**	**0**	**0**		**50**	**0.75**	**0.37**	**1.60**	
MIN		**5**	**0**	**0**	**0**		**30**	**0.00**	**0.18**	**1.60**	
AVG		**5**	**#DIV/0!**	**#DIV/0!**	**#DIV/0!**		**41**	**0.14**	**0.26**	**1.60**	

COMMENTS

PLANT INFLUENT

DATE	MGPD	P.H.	D.O.	TEMP	IMHOFF	CBOD. MG/L	CBOD. LBS.	BOD. MG\L	BOD. LBS.	TSS . MG\L	TSS. LBS.	VOL. SOL.	VOL. SOL.%
04/01/00	0.387370	Plant Check											
04/02/00	0.409260	Plant Check											
04/03/00	0.452120	7.35	7.64	14	12								
04/04/00	0.389650	7.38	8.22	15	9								
04/05/00	0.405000	7.37	7.05	15	8	116	392	124	419	122	412	105	86%
04/06/00	0.420040	7.58	8.00	15	10	148	518			119	417	111	93%
04/07/00	0.495020	7.41	8.07	13	5								
04/08/00	0.450300	Plant Check											
04/09/00	0.440600	Plant Check											
04/10/00	0.442760	7.58	8.15	14	13					190	702	172	91%
04/11/00	0.379880	7.57	7.27	14	18								
04/12/00	0.319830	7.53	7.43	14	16	163	435	196	523	125	333	110	88%
04/13/00	0.327550	7.67	7.39	15	10	164	448						
04/14/00	0.383570	7.61	7.98	14	13								
04/15/00	0.405790	Plant Check											
04/16/00	0.477010	Plant Check											
04/17/00	0.504890	7.83	7.59	14	14					122	514	105	86%
04/18/00	0.425210	7.68	7.39	15	15								
04/19/00	0.381100	7.82	6.40	15	12	179	569	198	629	152	483	136	89%
04/20/00	0.369830	7.69	6.77	15	11	170	524						
04/21/00	0.369100	7.86	6.77	15	14								
04/22/00	0.350910	Plant Check											
04/23/00	0.378950	Plant Check											
04/24/00	0.402720	7.79	6.66	15	19					171	574	151	88%
04/25/00	0.360310	7.69	6.71	15	12								
04/26/00	0.335310	7.81	6.72	15	14	216	604	237	663	187	523	166	89%
04/27/00	0.322820	7.71	6.43	15	11	211	568						
04/28/00	0.319720	7.96	6.34	15	15								
04/29/00	0.297140	Plant Check											
04/30/00	0.321520	Plant Check											
TOTAL	11.725280												
MAX	0.504890	8	8	15	19	216	604	237	663	190	702	172	93%
MIN	0.297140	7	6	13	5	116	392	124	419	119	333	105	86%
AVG	0.390843	8	7	15	13	171	507	189	559	149	495	132	89%

Permit Limits	MGPD	BOD. LBS.	TSS. LBS.
AVG.	0.9 MGD.	900 LB/D	1200 LB/D

PLANT EFFLUENT / Coliform

DATE	P.H	D.O	TEMP	IMHOFF	CBOD MG/L	CBOD LBS.	% CBOD REMOVAL	TSS MG/L	TSS. LBS.	% TSS REMOVAL	FECAL	LOG
04/01/00	6.57	Plant Check										
04/02/00	6.55	Plant Check										
04/03/00	6.55	8.15	14	TR								
04/04/00	6.44	8.35	14	TR								
04/05/00	6.28	7.76	14	TR	3	10	97%	10	34	92%		
04/06/00	6.32	8.11	13	TR	3	11	98%	9	36	92%	18	1.255
04/07/00	6.51	8.42	12	TR							20	1.301
04/08/00	6.41	Plant Check										
04/09/00	6.49	Plant Check										
04/10/00	6.56	8.60	14	TR				11	41	94%		
04/11/00	6.57	8.10	14	TR								
04/12/00	6.64	7.94	14	TR	6	16	96%	15	40	88%	6	0.778
04/13/00	6.40	8.07	15	TR	5	14	97%	AVW			6	0.778
04/14/00	6.58	8.27	14	TR	AVW	AVW		13				
04/15/00	6.49	Plant Check			6	15						
04/16/00	6.72	Plant Check										
04/17/00	6.83	7.68	14	TR				13	55	89%		
04/18/00	6.75	7.63	14	TR								
04/19/00	6.54	7.20	14	TR	5	16	97%	10	32	93%	38	1.580
04/20/00	6.51	6.96	14	TR	4	12	98%		AVW		20	1.301
04/21/00	6.37	6.98	14	TR					44			Log
04/22/00	6.23	Plant Check										2.881
04/23/00	6.31	Plant Check										
04/24/00	6.43	8.18	14	TR				12	40	93%		
04/25/00	6.56	7.79	14	TR								
04/26/00	6.55	7.13	14	TR	5	14	98%	11	31	94%	18	1.255
04/27/00	6.34	8.00	14	TR	4	11	98%				28	1.447
04/28/00	6.29	8.05	14	TR								
04/29/00	6.45	Plant Check										
04/30/00	6.19	Plant Check										
TOTAL												12.576
MAX	7	9	15	TR	6	16	98%	15	55	94%	38	2.881
MIN	6	7	12	TR	3	10	96%	9	31	88%	6	0.778
AVG	6	8	14	TR	5	13	97%	12	39	92%	19	1.397

Permit Limits	P.H	CBOD MG/L	CBOD LBS.	% CBOD REMOVAL	TSS MG/L	TSS. LBS.	% TSS REMOVAL	FECAL
	MAX. 9.00	AVG. 25	AVG. 188	AVG. 75%	AVG. 30	AVG. 225	AVG. 81%	GEM. 200
	MIN. 6.00	AVW. 40	AVW. 300		AVW. 45	AVW. 338		GM7 400

I CERTIFY THAT I AM FAMILIAR WITH THE INFORMATION CONTAINED IN THIS REPORT AND THAT TO THE BEST OF MY KNOWLEDGE THIS INFORMATION IS TRUE, COMPLETE AND ACCURATE

JOHN LIGHT GROUP2 — Michael Marty Group 1 — Dave Kinney Group 1

2000 Monthly Report - APRIL

EAST AERATOR										
DATE	P.H	D.O	TEMP	30 MIN	MLSS MG/L	SVI	LOAD INDEX	MLVSS MG/L	MLVSS %	LBS. IN AERATOR
04/01/00	Plant Check									
04/02/00	Plant Check									
04/03/00	6.48	2.16	14	140						
04/04/00	6.38	2.98	14	150						
04/05/00	6.20	2.12	14	140	2155	65		1810	84%	8,492
04/06/00	6.40	2.43	13	140	2505	56	0.06	2140	85%	9,871
04/07/00	6.63	3.63	12	150						
04/08/00	Plant Check									
04/09/00	Plant Check									
04/10/00	6.80	3.48	14	150	2565	58		2180	85%	10,108
04/11/00	6.68	2.60	14	160						
04/12/00	6.57	2.46	14	140	2495	56	0.05	2130	85%	9,832
04/13/00	6.46	2.46	15	150						
04/14/00	6.51	2.55	14	140						
04/15/00	Plant Check									
04/16/00	Plant Check									
04/17/00	6.72	1.76	14	130	2165	60		1860	86%	8,532
04/18/00	6.74	1.86	14	140						
04/19/00	6.47	1.48	14	140	2390	59	0.07	1985	83%	9,418
04/20/00	6.55	2.07	14	140						
04/21/00	6.38	1.34	14	150	2470	61				
04/22/00	Plant Check									
04/23/00	Plant Check									
04/24/00	6.60	1.56	14	160	2910	55		2390	82%	11,467
04/25/00	6.54	1.98	14	170						
04/26/00	6.46	1.76	14	150	2490	60	0.07	2080	84%	9,812
04/27/00	6.35	1.82	15	160						
04/28/00	6.28	1.04	14	160						
04/29/00	Plant Check									
04/30/00	Plant Check									
TOTAL										
MAX	7	4	15	170	2910	65	0.07	2390	86%	11467
MIN	6	1	12	130	2155	55	0.05	1810	82%	8492
AVG	7	2	14	148	2461	59	0.06	2072	84%	9692

	SLUDGE UTLIZ.		WEATHER CONDITIONS			NH/3 & METALS									
DATE	LOCATION	YRDS.	WEATHER	TEMP	PRECIP	NH/3	NH/3 LBS	COPPER	COPPER LBS.	MERC.	MERC. LBS.	SILVER	SILVER LBS.	ZINC	ZINC LBS.
04/01/00			Cldy	58	0.00										
04/02/00			Fog	45	0.00										
04/03/00			Fog	42	0.01										
04/04/00	Monroe	5.00	Cldy	47	0.00										
04/05/00			Rain	39	0.56			19.	0.06	0.00	0.0000	0.00	0.0000	25.	0.084
04/06/00			Rain	38	0.39	0.28	0.98								
04/07/00	Monroe	5.00	Fog	35	0.10										
04/08/00			Sun	58	0.01										
04/09/00			Cldy	46	0.00										
04/10/00			Cldy	43	0.00			12.	0.04	0.00	0.0000	0.40	0.0014	29.	0.107
04/11/00			Fog	41	0.00										
04/12/00	Monroe	5.00	Cldy	46	0.00										
04/13/00			Cldy	51	0.00	0.31	0.85								
04/14/00			Cldy	51	0.61										
04/15/00			Cldy	49	0.23										
04/16/00			Cldy	45	0.00										
04/17/00	Monroe	5.00	Fog	42	0.01			16.	0.07	0.00	0.0000	0.00	0.0000	35.	0.147
04/18/00	Monroe	5.00	Fog	42	0.00										
04/19/00			Cldy	46	0.00										
04/20/00			Cldy	48	0.00	0.18	0.60								
04/21/00	Monroe	5.00	Cldy	46	0.00										
04/22/00			Cldy	50	0.11										
04/23/00			Cldy	49	0.01										
04/24/00			Fog	35	0.17			19.	0.06	0.00	0.0000	0.00	0.0000	42.	0.141
04/25/00			Rain	46	0.05										
04/26/00	Monroe	5.00	Fog	41	0.10										
04/27/00			Cldy	49	0.00	0.25	0.67								
04/28/00	Monroe	5.00	Cldy	42	0.19										
04/29/00			Cldy	49	0.05										
04/30/00			Cldy	46	0.00										
TOTAL		40			2.60	mg/l	lbs.	ug/l	lbs.	ug/l	lbs.	ug/l	lbs.	ug/l	lbs.
MAX		5	MAX	58	0.61	0.31	0.98	19.		0.00		0.40		42.	
MIN		5	MIN	35	0.00	0.18		12.		0.00		0.00		25.	
AVG		5	AVG	46	0.09	0.26	0.78	17.	0.06	0.00	0.0000	0.10	0.0004	33.	0.120

COMMENTS

PLANT INFLUENT

DATE	MGPD	P.H.	D.O.	TEMP	IMHOFF	CBOD. MG/L	CBOD. LBS.	BOD. MG\L	BOD. LBS.	TSS . MG\L	TSS. LBS.	VOL. SOL.	VOL. SOL.%
05/01/00	0.367730	7.81	5.97	16	10					171	524	152	89%
05/02/00	0.317460	7.90	6.27	17	18								
05/03/00	0.317440	7.84	6.32	16	10	199	527	248	657	150	397	134	89%
05/04/00	0.345140	7.81	5.62	16	20	209	602						
05/05/00	0.324790	7.77	6.25	16	15								
05/06/00	0.322380	Plant Check											
05/07/00	0.331950	Plant Check											
05/08/00	0.374320	7.87	5.88	17	11					173	540	151	87%
05/09/00	0.314700	7.81	5.74	16	9								
05/10/00	0.402400	7.83	6.59	15	12	174	584	202	678	125	420	110	88%
05/11/00	0.412370	7.63	6.54	16	12	170	585						
05/12/00	0.441930	7.63	6.51	16	13								
05/13/00	0.473140	Plant Check											
05/14/00	0.422660	Plant Check											
05/15/00	0.417180	7.68	5.58	17	13					153	532	134	88%
05/16/00	0.368120	7.69	5.88	17	13								
05/17/00	0.330510	8.07	5.63	17	12	165	455	231	637	134	369	116	87%
05/18/00	0.315340	7.78	5.14	17	8	157	413						
05/19/00	0.342480	7.72	5.47	17	10								
05/20/00	0.346560	Plant Check											
05/21/00	0.394420	Plant Check											
05/22/00	0.460230	7.88	6.13	17	16					101	388	90	89%
05/23/00	0.363610	7.83	6.22	17	20								
05/24/00	0.361410	7.72	5.74	16	21	155	467	168	506	92	277	82	89%
05/25/00	0.355480	7.86	5.89	16	14	150	445						
05/26/00	0.344880	7.76	6.05	16	12								
05/27/00	0.358330	Plant Check											
05/28/00	0.378360	Plant Check											
05/29/00	0.361560	Plant Check											
05/30/00	0.429890	7.85	5.97	17	14								
05/31/00	0.390860	7.75	5.58	16	18	174	567	205	668				
TOTAL	11.487630												
MAX	**0.473140**	8	7	17	21	209	602	248	678	173	540	152	89%
MIN	0.314700	8	5	15	8	150	413	168	506	92	277	82	87%
AVG	**0.370569**	8	6	16	14	173	516	211	**629**	137	**431**	121	88%
Permit Limits	AVG. 0.9 MGD.								AVG. 900 LB/D		AVG. 1200 LB/D		

PLANT EFFLUENT / Coliform

DATE	P.H	D.O	TEMP	IMHOFF	CBOD MG/L	CBOD LBS.	% CBOD REMOVAL	TSS MG/L	TSS. LBS.	% TSS REMOVAL	FECAL	LOG
05/01/00	6.18	7.69	15	TR				13	40	92%		
05/02/00	6.26	7.43	16	TR							18	1.255
05/03/00	6.40	7.43	15	TR	3	8	98%	9	24	94%		
05/04/00	6.17	7.42	15	TR	3	9	99%					
05/05/00	6.06	7.48	14	TR							40	1.602
05/06/00	6.10	Plant Check										
05/07/00	6.02	Plant Check										
05/08/00	6.24	7.45	15	TR				6	19	97%		
05/09/00	6.61	7.57	14	TR							130	2.114
05/10/00	6.95	7.53	15	TR	3	10	98%	6	20	95%	8	0.903
05/11/00	6.75	8.24	15	TR	3	10	98%					
05/12/00	6.52	7.63	14	TR								
05/13/00	6.56	Plant Check										
05/14/00	6.75	Plant Check										
05/15/00	6.54	6.95	17	TR				9	31	94%		
05/16/00	6.34	7.15	16	TR								
05/17/00	6.34	7.66	15	TR	5	14	97%	12	33	91%		
05/18/00	6.20	7.55	15	TR	4	11	97%				24	1.380
05/19/00	6.07	7.98	17	TR	AVW						126	2.100
05/20/00	6.08	Plant Check			5							LOG
05/21/00	6.10	Plant Check										3.480
05/22/00	6.32	8.16	16	TR				12	46	88%		
05/23/00	6.40	7.44	17	TR								
05/24/00	6.10	7.16	16	TR	5	15	98%	10	30	89%		
05/25/00	6.40	7.80	16	TR	4	12	97%	AVW	AVW			
05/26/00	6.46	6.64	16	TR		AVW		11	38		0	0.000
05/27/00	6.30	Plant Check				14					0	0.000
05/28/00	6.34	Plant Check										
05/29/00	6.64	Plant Check										
05/30/00	6.51	7.35	16	TR				8	29	95%		
05/31/00	6.44	7.76	16	TR	4	13	98%					
TOTAL												12.834
MAX	7	8	17	TR	5	15	99%	13	46	97%	130	3.480
MIN	6	7	14	TR	3	8	97%	6	19	88%	0	0.000
AVG	6	8	16	TR	**4**	**12**	**98%**	**10**	**31**	**93%**	43	1.426
Permit Limits	MAX. 9.00				AVG. 25	AVG. 188	AVG. 75%	AVG. 30	AVG. 225	AVG. 81%	GEM. 200	
	MIN. 6.00				AVW. 40	AVW. 300		AVW. 45	AVW. 338		GM7 400	

I CERTIFY THAT I AM FAMILIAR WITH THE INFORMATION CONTAINED IN THIS REPORT AND THAT TO THE BEST OF MY KNOWLEDGE THIS INFORMATION IS TRUE, COMPLETE AND ACCURATE

JOHN LIGHT GROUP2 — Michael Marty Group 1 — Dave Kinney Group 1

2000 Monthly Report - MAY

EAST AERATOR											SLUDGE UTLIZ.			WEATHER CONDITIONS			NH/3 & METALS									
DATE	P.H	D.O	TEMP	30 MIN	MLSS MG/L	SVI	LOAD INDEX	MLVSS MG/L	MLVSS %	LBS. IN AERATOR	DATE	LOCATION	YRDS.	WEATHER	TEMP	PRECIP	NH/3	NH/3 LBS	COPPER	COPPER LBS.	MERC.	MERC. LBS.	SILVER	SILVER LBS.	ZINC	ZINC LBS.
05/01/00	6.45	1.90	16	160	2720	59		2270	83%	10719	05/01/00			Cldy	52	0.01			18.	0.055	0.00	0.0000	0.70	0.002	40.	0.123
05/02/00	6.40	1.43	16	150							05/02/00	Monroe	5.00	Cldy	53	0.10										
05/03/00	6.27	1.98	15	160	2745	58	0.07	2300	84%	10817	05/03/00	Monroe	5.00	Rain	50	0.10										
05/04/00	6.13	2.14	15	140							05/04/00	Monroe	5.00	Cldy	48	0.33	0.29	0.83								
05/05/00	6.04	1.28	15	170	2945	58					05/05/00			Cldy	47	0.09										
05/06/00	**Plant Check**										05/06/00			Cldy	41	0.00										
05/07/00	**Plant Check**										05/07/00			Sun	58	0.00										
05/08/00	6.46	1.58	15	150	2815	53		2370	84%	11093	05/08/00			Cldy	48	0.00			14.	0.044	0.00	0.0000	0.40	0.001	42.	0.131
05/09/00	6.76	2.33	15	140							05/09/00	Monroe	5.00	Rain	46	0.21										
05/10/00	6.75	2.28	15	130	2305	56	0.09	1930	84%	9083	05/10/00			Rain	45	0.72										
05/11/00	6.65	2.74	15	130							05/11/00	Monroe	5.00	Cldy	48	0.02	0.26	0.89								
05/12/00	6.51	1.82	15	140							05/12/00			Sun	44	0.48										
05/13/00	**Plant Check**										05/13/00			Sun	48	0.00										
05/14/00	**Plant Check**										05/14/00			Sun	50	0.01										
05/15/00	6.55	1.53	17	140	2980	54		2455	82%	11743	05/15/00			Sun	57	0.00			9.	0.031	0.00	0.0000	0.30	0.001	39.	0.136
05/16/00	6.46	1.46	17	140							05/16/00			Fog	50	0.00										
05/17/00	6.55	1.44	16	160	3055	52	0.07	2480	81%	12039	05/17/00	Monroe	5.00	Cldy	52	0.00										
05/18/00	6.05	1.86	16	160							05/18/00			Fog	51	0.00	0.21	0.55								
05/19/00	5.95	2.38	16	130	2480	52				9773	05/19/00	Monroe	5.00	Cldy	57	0.47										
05/20/00	**Plant Check**										05/20/00			Cldy	58	0.02										
05/21/00	**Plant Check**										05/21/00			Cldy	70	0.00										
05/22/00	6.24	1.76	17	140	2660	53		2245	84%	10482	05/22/00	Monroe	5.00	Cldy	58	0.33			15.	0.058	0.00	0.0000	0.00	0.000	47.	0.180
05/23/00	6.10	1.31	17	210							05/23/00			Cldy	57	0.01										
05/24/00	6.30	2.24	15	150	1960	77	0.08	1620	83%	7724	05/24/00	Monroe	5.00	Fog	46	0.00										
05/25/00	6.66	1.97	15	150	2575	58				10147	05/25/00			Cldy	56	0.00	0.31	0.92								
05/26/00	6.78	2.00	16	160							05/26/00			Rain	49	0.08										
05/27/00	**Plant Check**										05/27/00			Rain	55	0.29										
05/28/00	**Plant Check**										05/28/00			Cldy	61	0.04										
05/29/00	**Plant Check**										05/29/00			Cldy	53	0.19										
05/30/00	6.53	1.33	17	160	2970	54		2475	83%	11704	05/30/00	Monroe	5.00	Cldy	50	0.02										
05/31/00	6.51	1.71	15	170							05/31/00			Rain	52	0.09										
TOTAL											**TOTAL**		50			3.61	mg/l	lbs.	ug/l	lbs.	ug/l	lbs.	ug/l	lbs.	ug/l	lbs.
MAX	7	3	17	210	3055	77	0.09	2480	84%	12039	**MAX**		5	**MAX**	70	0.72	0.31	0.92	18.		0.00		0.70		47.	
MIN	6	1	15	130	1960	52	0.07	1620	81%	7724	**MIN**		5	**MIN**	41	0.00	0.21		9.		0.00		0.00		39.	
AVG	6	2	16	152	2684	57	0.08	2238	83%	10484	**AVG**		5	**AVG**	52	0.12	0.27	0.80	14.	0.047	0.00	0.0000	0.35	0.001	42.	0.143

COMMENTS

PLANT INFLUENT

DATE	MGPD	P.H.	D.O.	TEMP	IMHOFF	CBOD. MG/L	CBOD. LBS.	BOD. MG\L	BOD. LBS.	TSS. MG\L	TSS. LBS.	VOL. SOL.	VOL. SOL.%
06/01/00	0.373500	7.79	5.64	17	19	185	576			169	526	145	86%
06/02/00	0.373470	7.92	4.77	17	11								
06/03/00	0.342790	Plant Check											
06/04/00	0.364230	Plant Check											
06/05/00	0.403050	7.70	4.40	18	15								
06/06/00	0.360750	7.78	5.32	17	20								
06/07/00	0.336750	7.73	5.06	17	19	194	545	225	632	188	528	153	81%
06/08/00	0.337070	7.69	5.43	17	16	209	588			151	424	136	90%
06/09/00	0.342680	8.10	4.01	17	15								
06/10/00	0.335540	Plant Check											
06/11/00	0.372060	Plant Check											
06/12/00	0.450370	7.51	5.75	18	16								
06/13/00	0.408940	7.68	5.41	18	18								
06/14/00	0.363070	7.68	5.57	18	13	196	593	217	657	156	472	145	93%
06/15/00	0.390440	7.62	5.05	18	16	175	570			131	427	113	86%
06/16/00	0.404250	7.40	4.80	17	14								
06/17/00	0.366540	Plant Check											
06/18/00	0.372090	Plant Check											
06/19/00	0.409300	7.60	5.81	17	16					181	618	191	89%
06/20/00	0.374880	7.55	5.60	17	15								
06/21/00	0.350870	7.52	5.09	18	14	182	533	227	664	98	287	88	90%
06/22/00	0.346980	7.54	5.38	17	27	201	582						
06/23/00	0.355130	7.50	5.27	17	12								
06/24/00	0.335680	Plant Check											
06/25/00	0.345130	Plant Check											
06/26/00	0.360360	7.40	5.69	17	11					182	547	160	88%
06/27/00	0.344030	7.52	5.24	18	12								
06/28/00	0.318440	7.60	4.75	18	22	220	584	277	736	186	494	157	84%
06/29/00	0.311590	7.47	5.22	18	14	266	691						
06/30/00	0.301800	7.56	5.89	18	13								
TOTAL	10.851780												
MAX	0.450370	8	6	18	27	266	691	277	736	188	618	191	93%
MIN	0.301800	7	4	17	11	175	533	217	632	98	287	88	81%
AVG	0.361726	8	5	17	16	203	585	237	672	160	480	143	87%
	AVG.								AVG.		AVG.		
Permit Limits	0.9 MGD.								900 LB/D		1200 LB/D		

PLANT EFFLUENT

DATE	P.H	D.O	TEMP	IMHOFF	CBOD MG/L	CBOD LBS.	% CBOD REMOVAL	TSS MG/L	TSS. LBS.	% TSS REMOVAL	Coliform FECAL	Coliform LOG
06/01/00	6.47	7.77	16	TR	4	12	98%	10	31	94%	0	0.000
06/02/00	6.25	7.40	16	TR							0	0.000
06/03/00	6.69	Plant Check										
06/04/00	6.62	Plant Check										
06/05/00	6.39	6.35	18	TR								
06/06/00	6.64	6.08	17	TR								
06/07/00	6.81	6.75	17	TR	3	8	98%	5	14	97%	0	0.000
06/08/00	6.74	6.08	17	TR	3	8	99%	6	17	96%	0	0.000
06/09/00	6.59	7.82	17	TR								
06/10/00	6.31	Plant Check										
06/11/00	6.35	Plant Check										
06/12/00	6.41	7.25	17	TR								
06/13/00	6.63	6.72	17	TR							4	0.602
06/14/00	6.79	7.18	18	TR	4	12	98%	5	15	97%	0	0.000
06/15/00	6.31	7.06	17	TR	3	10	98%	6	20	95%		Log
06/16/00	6.28	7.37	16	TR	Avg.	Avg.						0.602
06/17/00	6.21	Plant Check			4	11						
06/18/00	6.33	Plant Check										
06/19/00	6.65	7.03	17	TR				10	34	94%		
06/20/00	6.66	7.32	17	TR							0	0.000
06/21/00	6.48	7.66	18	TR	4	12	98%	15	44	85%	0	0.000
06/22/00	6.67	7.48	17	TR	3	9	99%	Avg.	Avg.			
06/23/00	6.92	7.35	17	TR				13	39			
06/24/00	6.30	Plant Check										
06/25/00	6.26	Plant Check										
06/26/00	6.50	6.47	18	TR				6	18	97%		
06/27/00	6.68	6.58	18	TR							4	0.602
06/28/00	6.71	7.05	19	TR	2	5	99%	7	19	96%	0	0.000
06/29/00	6.58	7.00	19	TR	2	5	99%					
06/30/00	6.82	7.07	19	TR								
TOTAL												1.806
MAX	7	8	19	TR	4	12	99%	15	44	97%	4	0.602
MIN	6	6	16	TR	2	5	98%	5	14	85%	0	0.000
AVG	7	7	17	TR	3	9	98%	8	25	95%	1	0.164
	MAX.				AVG.	AVG.	AVG.	AVG.	AVG.	AVG.	GEM.	
Permit Limits	9.00				25	188	75%	30	225	81%	200	
	MIN.				AVW.	AVW.		AVW.	AVW.		GM7	
	6.00				40	300		45	338		400	

I CERTIFY THAT I AM FAMILIAR WITH THE INFORMATION CONTAINED IN THIS REPORT AND THAT TO THE BEST OF MY KNOWLEDGE THIS INFORMATION IS TRUE, COMPLETE AND ACCURATE

JOHN LIGHT GROUP2 | Michael Marty Group 1 | Dave Kinney Group 1

2000 Monthly Report - JUNE

EAST AERATOR											SLUDGE UTLIZ.			WEATHER CONDITIONS			NH/3 & METALS									
DATE	P.H	D.O	TEMP	30 MIN	MLSS MG/L	SVI	LOAD INDEX	MLVSS MG/L	MLVSS %	LBS. IN AERATOR	DATE	LOCATION	YRDS.	WEATHER	TEMP	PRECIP	NH/3	NH/3 LBS	COPPER	COPPER LBS.	MERC.	MERC. LBS.	SILVER	SILVER LBS.	ZINC	ZINC LBS.
06/01/00	6.44	1.97	16	160	3010	53	0.06	2390	79%	11861	06/01/00			Cldy	52	0.03	0.43	1.34	*10.	0.036	*0.00	0.0000	*0.00	0.000	*38.	0.136
06/02/00	6.18	1.85	17	160							06/02/00	Monroe	5.00	Cldy	51	0.00										
06/03/00	Plant Check										06/03/00			Sun	48	0.00										
06/04/00	Plant Check										06/04/00			Sun	60	0.00			14.	0.043	0.00	0.0000	0.20	0.001	38.	0.115
06/05/00	6.53	1.45	18	160							06/05/00			Cldy	59	0.00										
06/06/00	6.71	1.85	17	160							06/06/00	Monroe	5.00	Cldy	53	0.00										
06/07/00	6.61	2.65	17	170	2935	58	0.06	2400	82%	11566	06/07/00	Monroe	5.00	Rain	53	0.03										
06/08/00	6.58	2.00	17	150	2710	55		2285	84%	10679	06/08/00	Monroe	5.00	Cldy	55	0.05	0.51	1.43								
06/09/00	6.53	2.44	16	150							06/09/00	Monroe	5.00	Cldy	51	0.03										
06/10/00	Plant Check										06/10/00			Rain	554	0.05										
06/11/00	Plant Check										06/11/00			Rain	56	0.19										
06/12/00	6.58	2.59	17	180							06/12/00			Rain	57	0.76			12.	0.045	0.00	0.0000	0.30	0.001	61.	0.229
06/13/00	6.68	1.75	17	190							06/13/00	Monroe	5.00	Cldy	56	0.04										
06/14/00	6.70	2.35	18	160	2475	65	0.07	2175	88%	9753	06/14/00	Monroe	5.00	Cldy	61	0.00										
06/15/00	6.10	2.18	17	170	2620	65		2260	86%	10325	06/15/00			Cldy	52	0.16	0.45	1.47								
06/16/00	6.15	2.46	16	160							06/16/00	Monroe	5.00	Fog	48	0.01										
06/17/00	Plant Check										06/17/00			Cldy	54	0.00										
06/18/00	Plant Check										06/18/00			Cldy	58	0.00										
06/19/00	6.53	2.18	17	180	2890	62		2435	84%	11388	06/19/00			Cldy	54	0.16			12.	0.041	0.00	0.0000	0.30	0.001	43.	0.147
06/20/00	6.35	2.00	17	170							06/20/00	Monroe	5.00	Fog	52	0.00										
06/21/00	6.24	2.50	17	190	2715	70	0.07	2225	82%	10699	06/21/00	Monroe	5.00	Cldy	58	0.00										
06/22/00	6.56	2.51	17	180							06/22/00	Monroe	5.00	Sun	63	0.00	0.38	1.10								
06/23/00	6.69	2.48	17	180							06/23/00			Sun	50	0.00										
06/24/00	Plant Check										06/24/00			Cldy	61	0.00										
06/25/00	Plant Check										06/25/00			Sun	55	0.00										
06/26/00	6.34	2.45	18	180	2565	70		2160	84%	10108	06/26/00	Monroe	5.00	Sun	64	0.00			1.	0.003	0.00	0.0000	0.40	0.001	1.	0.003
06/27/00	6.67	2.40	18	190							06/27/00	Monroe	5.00	Sun	61	0.00										
06/28/00	6.30	2.67	19	170	2525	67	0.07	2110	84%	9950	06/28/00	Monroe	5.00	Sun	64	0.00										
06/29/00	6.63	2.79	19	160							06/29/00	Monroe	5.00	Cldy	57	0.00	0.27	0.70								
06/30/00	6.49	2.43	18	150							06/30/00			Cldy	56	0.00										
TOTAL											TOTAL		75			1.51	mg/l	lbs.	ug/l	lbs.	ug/l	lbs.	ug/l	lbs.	ug/l	lbs.
MAX	7	3	19	190	3010	70	0.09	2435	88%	11861	MAX		5	MAX	554	0.76	0.51	1.47	14.		0.00		0.40		61.	
MIN	6	1	16	150	2475	53	0.07	2110	79%	9753	MIN		5	MIN	48	0.00	0.27		1.		0.00		0.20		1.	
AVG	6	2	17	169	2716	63	0.08	2271	84%	10703	AVG		5	AVG	72	0.05	0.41	1.21	10.	0.034	0.00	0.0000	0.30	0.001	36.	0.126

COMMENTS * Test was sampled on 5-30-00

2000 Monthly Report - JULY

PLANT INFLUENT

DATE	MGPD	P.H.	D.O.	TEMP	IMHOFF	CBOD. MG/L	CBOD. LBS.	BOD. MG\L	BOD. LBS.	TSS . MG\L	TSS. LBS.	VOL. SOL.	VOL. SOL.%
07/01/00	0.287800	Plant Check											
07/02/00	0.309340	Plant Check											
07/03/00	0.306870	7.45	4.81	18	19					163	417	142	87%
07/04/00	0.306610	Plant Check											
07/05/00	0.340260	7.48	5.20	18	22	183	519	235	471	186	528	162	87%
07/06/00	0.311160	7.70	4.01	18	16	199	516						
07/07/00	0.324220	7.84	3.91	18	24								
07/08/00	0.281960	Plant Check											
07/09/00	0.308320	Plant Check											
07/10/00	0.346420	7.84	5.25	18	11					190	549	162	85%
07/11/00	0.312050	7.84	4.99	19	19								
07/12/00	0.308720	7.81	5.64	19	18	230	592	266	685	181	466	167	92%
07/13/00	0.332290	7.86	4.44	19	20	220	610						
07/14/00	0.317350	7.58	4.17	19	20								
07/15/00	0.292950	Plant Check											
07/16/00	0.286560	Plant Check											
07/17/00	0.320640	7.72	3.29	18	18					193	571	163	84%
07/18/00	0.334380	7.77	4.66	19	15								
07/19/00	0.298830	7.33	3.90	20	15	193	481	237	591	147	366	136	93%
07/20/00	0.302360	7.50	3.48	19	15	193	487						
07/21/00	0.335260	7.46	3.53	19	17								
07/22/00	0.326220	Plant Check											
07/23/00	0.329310	Plant Check											
07/24/00	0.354840	7.64	2.92	19	20					193	571	163	84%
07/25/00	0.312380	7.90	3.86	20	13								
07/26/00	0.307730	7.53	2.98	20	17	275	706	315	808	175	449	147	84%
07/27/00	0.306970	7.70	2.81	19	31	Inc.	Inc.						
07/28/00	0.301840	7.60	3.76	20	17								
07/29/00	0.290930	Plant Check											
07/30/00	0.308590	Plant Check											
07/31/00	0.314910	7.77	3.93	20	16					188	494	174	93%
TOTAL	9.718070												
MAX	0.354840	8	6	20	31	275	706	315	808	193	571	174	93%
MIN	0.281960	7	3	18	11	183	481	235	471	147	366	136	84%
AVG	0.313486	8	4	19	18	213	559	263	639	180	490	157	88%

	MGPD	BOD. LBS.	TSS. LBS.
	AVG.	AVG.	AVG.
Permit Limits	0.9 MGD.	900 LB/D	1200 LB/D

PLANT EFFLUENT

DATE	P.H	D.O	TEMP	IMHOFF	CBOD MG/L	CBOD LBS.	% CBOD REMOVAL	TSS MG/L	TSS. LBS.	% TSS REMOVAL	Coliform FECAL	Coliform LOG
07/01/00	6.65	Plant Check										
07/02/00	6.31	Plant Check										
07/03/00	6.38	7.68	17	TR				4	10	98%		
07/04/00	6.30	Plant Check									6	0.778
07/05/00	6.55	7.75	17	TR	3	9	98%	5	14	97%	4	0.602
07/06/00	6.23	8.66	17	TR	3	8	98%					
07/07/00	6.80	7.65	18	TR	Avg.	Avg.						
07/08/00	6.49	Plant Check			3	9						
07/09/00	6.36	Plant Check										
07/10/00	6.49	7.02	18	TR				5	14	97%		
07/11/00	6.35	7.14	18	TR								
07/12/00	6.47	7.43	18	TR	3	8	99%	3	8	98%		
07/13/00	6.85	7.23	18	TR	2	6	99%				0	0.000
07/14/00	6.68	6.75	18	TR							6	0.778
07/15/00	6.31	Plant Check										
07/16/00	6.10	Plant Check										
07/17/00	6.24	6.02	18	TR				6	16	97%		
07/18/00	6.03	6.91	19	TR								
07/19/00	6.44	6.58	19	TR	3	7	98%	5	12	97%	0	0.000
07/20/00	6.30	6.91	19	TR	3	8	98%				4	0.602
07/21/00	6.49	6.55	19	TR								
07/22/00	6.32	Plant Check										
07/23/00	6.15	Plant Check										
07/24/00	6.01	6.98	19	TR				8	24	96%		
07/25/00	6.76	7.03	19	TR								
07/26/00	6.48	6.84	19	TR	4	10	99%	16	41	91%	14	1.146
07/27/00	6.10	7.34	20	TR	Inc.	Inc.	Inc.	Avg.	Avg.		10	1.000
07/28/00	6.00	6.78	20	TR				12	33			LOG
07/29/00	6.30	Plant Check										2.146
07/30/00	6.53	Plant Check										
07/31/00	6.39	6.74	20	TR				12	32	94%		
TOTAL												7.052
MAX	7	9	20	TR	4	10	99%	16	41	98%	14	2.146
MIN	6	6	17	TR	2	6	98%	3	8	91%	0	0.000
AVG	6	7	19	TR	3	8	98%	8	20	96%	6	0.784

	P.H	CBOD MG/L	CBOD LBS.	% CBOD REMOVAL	TSS MG/L	TSS. LBS.	% TSS REMOVAL	FECAL
	MAX.	AVG.	AVG.	AVG.	AVG.	AVG.	AVG.	GEM.
Permit Limits	9.00	25	188	75%	30	225	81%	200
	MIN.	AVW.	AVW.		AVW.	AVW.		GM7
	6.00	40	300		45	338		400

I CERTIFY THAT I AM FAMILIAR WITH THE INFORMATION CONTAINED IN THIS REPORT AND THAT TO THE BEST OF MY KNOWLEDGE THIS INFORMATION IS TRUE, COMPLETE AND ACCURATE

JOHN LIGHT GROUP2 | Michael Marty Group 2 | Dave Kinney Group 1

EAST AERATOR										
DATE	P.H	D.O	TEMP	30 MIN	MLSS MG/L	SVI	LOAD INDEX	MLVSS MG/L	MLVSS %	LBS. IN AERATOR
07/01/00	Plant Check									
07/02/00	Plant Check									
07/03/00	6.31	2.46	17	190	2635	72		2195	83%	10,384
07/04/00	Plant Check									
07/05/00	6.23	2.19	17	180	2475	73	0.06	2045	83%	9,753
07/06/00	6.15	1.46	17	190						
07/07/00	6.76	1.91	17	170						
07/08/00	Plant Check									
07/09/00	Plant Check									
07/10/00	6.21	2.19	18	180	2540	71		2100	83%	10,009
07/11/00	6.24	2.14	18	190						
07/12/00	6.51	2.28	18	160	2340	68	0.08	1925	82%	9,221
07/13/00	6.70	1.62	18	170						
07/14/00	6.52	2.32	18	150						
07/15/00	Plant Check									
07/16/00	Plant Check									
07/17/00	6.07	1.02	18	150	2920	51		2280	78%	11,507
07/18/00	6.06	1.65	18	150						
07/19/00	6.20	1.44	19	160	2940	54	0.05	2285	78%	11,586
07/20/00	6.09	1.88	18	140						
07/21/00	6.46	1.41	19	140	2540	55				10,009
07/22/00	Plant Check									
07/23/00	Plant Check									
07/24/00	5.94	1.38	19	140	2685	52		2075	77%	10,581
07/25/00	6.59	1.41	19	140						
07/26/00	6.24	1.40	19	150	2710	55	0.09	2075	77%	10,679
07/27/00	6.04	1.86	19	140						
07/28/00	6.10	1.40	20	150	2640	57				10,403
07/29/00	Plant Check									
07/30/00	Plant Check									
07/31/00	6.16	1.86	20	160	2885	55		2330	81%	11,369
TOTAL										
MAX	7	2	20	190	2940	73	0.09	2330	83%	11,586
MIN	6	1	17	140	2340	51	0.05	1925	77%	9,221
AVG	6	2	18	160	2665	60	0.07	2146	80%	10,500

	SLUDGE UTLIZ.		WEATHER CONDITIONS			NH/3 & METALS									
DATE	LOCATION	YRDS.	WEATHER	TEMP	PRECIP	NH/3	NH/3 LBS	COPPER	COPPER LBS.	MERC.	MERC. LBS.	SILVER	SILVER LBS.	ZINC	ZINC LBS.
07/01/00			Cldy	58	0.00										
07/02/00			Cldy	57	0.07										
07/03/00	Monroe	5.00	Cldy	53	0.00			15.	0.038	0.00	0.0000	0.00	0.000	48.	0.123
07/04/00			Cldy	59	0.07										
07/05/00			Fog	48	0.00										
07/06/00			Sun	55	0.00	0.29	0.75								
07/07/00			Fog	52	0.01										
07/08/00			Cldy	59	0.00										
07/09/00			Cldy	60	0.00										
07/10/00			Cldy	55	0.00			17.	0.049	0.00	0.0000	0.00	0.000	41.	0.118
07/11/00	Monroe	15.00	Cldy	57	0.00										
07/12/00			Cldy	60	0.00										
07/13/00	Monroe	5.00	Sun	57	0.00										
07/14/00			Cldy	58	0.00	0.46	1.22								
07/15/00			Sun	60	0.00										
07/16/00			Sun	54	0.00										
07/17/00	Monroe	5.00	Fog	58	0.00			20.	0.053	0.00	0.0000	0.30	0.001	55.	0.147
07/18/00			Cldy	60	0.00										
07/19/00	Monroe	5.00	Cldy	58	0.00										
07/20/00			Cldy	64	0.00	0.32	0.81								
07/21/00	Monroe	5.00	Fog	63	0.00										
07/22/00			Cldy	62	0.01										
07/23/00			Cldy	65	0.42										
07/24/00	Monroe	5.00	Fog	54	0.04			20.	0.059	0.00	0.0000	0.40	0.001	66.	0.195
07/25/00			Cldy	66	0.00										
07/26/00			Cldy	63	0.00										
07/27/00			Cldy	60	0.01	0.36	0.92								
07/28/00	Monroe	5.00	Cldy	67	0.00										
07/29/00			Fog	62	0.00										
07/30/00			Fog	60	0.00										
07/31/00			Sun	59	0.00										
TOTAL		50			0.63	mg/l	lbs.	ug/l	lbs.	ug/l	lbs.	ug/l	lbs.	ug/l	lbs.
MAX		15	MAX	67	0.42	0.46	1.22	20.		0.00		0.40		66.	
MIN		5	MIN	48	0.00	0.29		15.		0.00		0.00		41.	
AVG		6	AVG	59	0.02	0.36	0.93	18.	0.050	0.00	0.0000	0.18	0.000	53.	0.146

COMMENTS **B.O.D test for 7/27/00 Inc. due to contaminated dillution water.**

PLANT INFLUENT														PLANT EFFLUENT											Coliform	
DATE	MGPD	P.H.	D.O.	TEMP	IMHOFF	CBOD. MG/L	CBOD. LBS.	BOD. MG\L	BOD. LBS.	TSS . MG\L	TSS. LBS.	VOL. SOL.	VOL. SOL.%	DATE	P.H	D.O	TEMP	IMHOFF	CBOD MG/L	CBOD LBS.	% CBOD REMOVAL	TSS MG/L	TSS. LBS.	% TSS REMOVAL	FECAL	LOG
08/01/00	0.298320	7.58	2.94	20	25									08/01/00	6.24	6.61	20	TR								
08/02/00	0.280260	7.78	4.71	19	16	231	540	271	633	233	545	208	89%	08/02/00	6.17	6.98	19	TR	3	7	99%	7	16	97%	22	1.342
08/03/00	0.274980	7.67	4.77	20	15	211	493							08/03/00	6.71	6.37	19	TR	3	7	99%				36	1.556
08/04/00	0.277600	7.75	3.67	20	12									08/04/00	6.73	7.67	20	TR	AVG.	AVG.						Log
08/05/00	0.265410	Plant Check												08/05/00	6.23	Plant Check			3	7						2.898
08/06/00	0.292360	Plant Check												08/06/00	6.00	Plant Check										
08/07/00	0.332330	7.61	3.68	20	22					204	565	186	91%	08/07/00	6.06	6.96	20	TR				11	30	95%		
08/08/00	0.301370	7.62	1.70	19	13									08/08/00	6.65	6.15	19	TR								
08/09/00	0.337610	7.77	2.36	20	15	227	639	264	743	207	583	175	86%	08/09/00	6.88	6.58	19	TR	3	8	99%	12	34	94%		
08/10/00	0.287530	7.85	3.87	20	10	241	578							08/10/00	6.81	6.60	20	TR	2	5	99%	AVG.	AVG.		0	0.000
08/11/00	0.295040	7.65	4.69	20	15									08/11/00	6.30	5.86	19	TR				12	32		2	0.301
08/12/00	0.279270	Plant Check												08/12/00	6.17	Plant Check										
08/13/00	0.304930	Plant Check												08/13/00	6.05	Plant Check										
08/14/00	0.327320	7.84	4.54	20	32					237	647	207	87%	08/14/00	6.79	6.40	18	TR				11	30	95%		
08/15/00	0.315340	7.92	3.87	20	24									08/15/00	6.47	6.72	18	TR								
08/16/00	0.286790	7.70	3.37	19	12	244	584	299	715	221	529	197	89%	08/16/00	6.36	7.73	18	TR	2	5	99%	8	19	96%	6	0.778
08/17/00	0.291480	8.07	3.86	20	12	231	562							08/17/00	6.65	6.77	18	TR	2	5	99%				12	1.079
08/18/00	0.301440	7.86	3.57	19	10									08/18/00	6.84	7.55	18	TR								
08/19/00	0.282990	Plant Check												08/19/00	6.44	Plant Check										
08/20/00	0.331790	Plant Check												08/20/00	6.01	Plant Check										
08/21/00	0.335370	7.68	3.76	19	13					208	582	182	88%	08/21/00	6.76	7.63	18	TR				7	20	97%	0	0.000
08/22/00	0.301510	7.86	4.52	20	15									08/22/00	6.40	8.20	18	TR								
08/23/00	0.300830	7.48	2.60	20	13	201	504	239	600	202	507	180	89%	08/23/00	6.47	8.06	19	TR	2	5	99%	2	5	99%	0	0.000
08/24/00	0.287260	7.69	4.62	20	17	189	453							08/24/00	6.24	7.53	19	TR	2	5	99%					
08/25/00	0.289790	7.69	5.08	20	14									08/25/00	6.57	7.80	20	TR								
08/26/00	0.293660	Plant Check												08/26/00	6.42	Plant Check										
08/27/00	0.295910	Plant Check												08/27/00	6.63	Plant Check										
08/28/00	0.335260	7.62	4.84	18	14					227	635	191	84%	08/28/00	6.50	7.39	18	TR				6	17	97%		
08/29/00	0.311700	7.73	4.15	20	25									08/29/00	6.60	7.47	18	TR								
08/30/00	0.294810	7.56	4.03	20	14	227	590	258	671	278	684	250	90%	08/30/00	6.46	6.76	18	TR	3	8	99%	5	12	99%	0	0.000
08/31/00	0.296060	7.87	4.70	20	18	286	706							08/31/00	6.74	7.92	19	TR	2	5	99%				4	0.602
TOTAL	9.306320													TOTAL												8.556
MAX	0.337610	8	5	20	32	286	706	299	743	278	684	250	91%	MAX	7	8	20	TR	3	8	99%	12	34	99%	36	2.898
MIN	0.265410	7	2	18	10	189	453	239	600	202	507	175	84%	MIN	6	6	18	TR	2	5	99%	2	5	94%	0	0.000
AVG	0.300204	8	4	20	16	229	565	266	672	224	586	197	88%	AVG	6	7	19	TR	2	6	99%	8	22	97%	8	0.778

Permit Limits (Influent):

	MGPD	BOD. LBS.	TSS. LBS.
	AVG.	AVG.	AVG.
Permit Limits	0.75 MGD.	900 LB/D	1200 LB/D

Permit Limits (Effluent):

	P.H	CBOD MG/L	CBOD LBS.	% CBOD REMOVAL	TSS MG/L	TSS. LBS.	% TSS REMOVAL	FECAL
	MAX.	AVG.	AVG.	AVG.	AVG.	AVG.	AVG.	GEM.
Permit Limits	9.00	18.3	114	75%	30	188	81%	200
	MIN.	AVW.	AVW.		AVW.	AVW.		GM7
	6.00	27.5	172		45	281		400

I CERTIFY THAT I AM FAMILIAR WITH THE INFORMATION CONTAINED IN THIS REPORT AND THAT TO THE BEST OF MY KNOWLEDGE THIS INFORMATION IS TRUE, COMPLETE AND ACCURATE

JOHN LIGHT GROUP2 Michael Marty Group 2 Dave Kinney Group 1

2000 Monthly Report - AUGUST

EAST AERATOR											SLUDGE UTLIZ.			WEATHER CONDITIONS			NH/3 & METALS									
DATE	P.H	D.O	TEMP	30 MIN	MLSS MG/L	SVI	LOAD INDEX	MLVSS MG/L	MLVSS %	LBS. IN AERATOR	DATE	LOCATION	YRDS.	WEATHER	TEMP	PRECIP	NH/3	NH/3 LBS	COPPER	COPPER LBS.	MERC.	MERC. LBS.	SILVER	SILVER LBS.	ZINC	ZINC LBS.
08/01/00	5.99	1.55	20	150							08/01/00			Cldy	61	0.00			*14	0.036	0.00	0.0000	0.50	0.001	45.	0.118
08/02/00	6.05	1.72	19	170	2945	58	0.07	2345	80%	11605	08/02/00	Monroe	5.00	Fog	52	0.00										
08/03/00	6.59	2.06	19	140							08/03/00			Sun	55	0.00	0.31	0.71								
08/04/00	6.29	1.33	20	180	2950	61				11625	08/04/00			Sun	59	0.00										
08/05/00	Plant Check										08/05/00			Sun	74	0.00										
08/06/00	Plant Check										08/06/00			Cldy	60	0.00										
08/07/00	5.89	1.56	19	180	3095	58		2560	83%	12196	08/07/00			Fog	63	0.00			16.	0.044	0.00	0.0000	0.40	0.001	64.	0.177
08/08/00	6.56	1.68	19	210							08/08/00			Fog	60	0.01										
08/09/00	6.72	2.84	19	200	3090	65	0.08	2440	79%	12177	08/09/00	Monroe	5.00	Fog	54	0.00										
08/10/00	6.54	2.02	19	190							08/10/00	Monroe	5.00	Cldy	59	0.00	0.34	0.82								
08/11/00	6.26	2.02	19	190	2655	72				10462	08/11/00			Cldy	57	0.00										
08/12/00	Plant Check										08/12/00			Sun	50	0.00										
08/13/00	Plant Check										08/13/00			Fog	46	0.00										
08/14/00	6.57	1.55	18	220	3075	72		2520	82%	12117	08/14/00			Fog	48	0.00			20.	0.055	0.00	0.0000	0.70	0.002	69.	0.188
08/15/00	6.42	2.12	18	220							08/15/00			Cldy	50	0.00										
08/16/00	6.16	1.89	18	230	3410	67	0.07	2785	82%	13438	08/16/00			Sun	43	0.00										
08/17/00	6.53	1.94	18	220							08/17/00			Sun	47	0.00	0.38	0.92								
08/18/00	6.43	1.18	18	210							08/18/00			Rain	56	0.02										
08/19/00	Plant Check										08/19/00			Cldy	57	0.11										
08/20/00	Plant Check										08/20/00			Cldy	59	0.08										
08/21/00	6.55	1.29	18	210	3715	57		3015	81%	14640	08/21/00			Fog	50	0.07			14.	0.039	0.00	0.0000	0.50	0.001	51.	0.143
08/22/00	6.24	1.05	18	250							08/22/00	Monroe	5.00	Fog	51	0.03										
08/23/00	6.29	2.03	19	220	3255	68	0.06	2620	80%	12827	08/23/00	Monroe	5.00	Fog	53	0.00										
08/24/00	6.03	2.10	19	210							08/24/00	Monroe	5.00	Cldy	53	0.00	0.26	0.62								
08/25/00	6.54	2.58	20	210	3115	67				12275	08/25/00	Monroe	5.00	Cldy	60	0.01										
08/26/00	Plant Check										08/26/00			Cldy	60	0.06										
08/27/00	Plant Check										08/27/00			Cldy	56	0.01										
08/28/00	6.68	1.82	17	200	3290	61		2580	78%	12965	08/28/00			Fog	47	0.00			10.	0.028	0.00	0.0000	0.40	0.001	50.	0.140
08/29/00	6.65	2.45	18	220							08/29/00	Monroe	5.00	Cldy	51	0.00										
08/30/00	6.43	1.75	19	220	3240	68	0.07	2595	80%	12768	08/30/00	Monroe	5.00	Fog	58	0.10										
08/31/00	6.62	2.44	18	200							08/31/00	Monroe	5.00	Cldy	57	0.04	0.33	0.81								
TOTAL											TOTAL		50			0.54	mg/l	lbs.	ug/l	lbs.	ug/l	lbs.	ug/l	lbs.	ug/l	lbs.
MAX	7	3	20	250	3715	72	0.09	3015	83%	14640	MAX		5	MAX	74	0.11	0.38	0.92	20.		0.00		0.70		69.	
MIN	6	1	17	140	2655	57	0.07	2345	78%	10462	MIN		5	MIN	43	0.00	0.26		10.		0.00		0.40		45.	
AVG	6	2	19	202	3153	65	0.08	2607	81%	12425	AVG		5	AVG	55	0.02	0.32	0.78	15.	0.040	0.00	0.0000	0.50	0.001	56.	0.153

COMMENTS *** Test sampled on 07/31/00**

2000 Monthly Report - SEPTEMBER

PLANT INFLUENT

DATE	MGPD	P.H.	D.O.	TEMP	IMHOFF	CBOD. MG/L	CBOD. LBS.	BOD. MG\L	BOD. LBS.	TSS. MG\L	TSS. LBS.	VOL. SOL.	VOL. SOL.%
09/01/00	0.287940	7.78	5.23	19	16								
09/02/00	0.277550	Plant Check											
09/03/00	0.297380	Plant Check											
09/04/00	0.303120	Plant Check											
09/05/00	0.371020	7.77	4.25	20	14					244	755	216	89%
09/06/00	0.295460	7.76	3.86	20	17	247	609	315	776	181	466	169	93%
09/07/00	0.290670	7.67	4.40	20	19	172	417						
09/08/00	0.296500	7.95	4.15	20	25								
09/09/00	0.311810	Plant Check											
09/10/00	0.361340	Plant Check											
09/11/00	0.404710	7.42	1.67	20	22					208	702	185	89%
09/12/00	0.315290	8.12	4.43	20	28								
09/13/00	0.310840	7.41	3.43	20	10	180	467	222	576	185	185	149	81%
09/14/00	0.307280	7.43	2.65	20	16	249	638						
09/15/00	0.327350	7.70	3.09	20	17								
09/16/00	0.278860	Plant Check											
09/17/00	0.323090	Plant Check											
09/18/00	0.342040	7.45	4.08	21	13					187	533	166	89%
09/19/00	0.335620	7.37	2.41	20	15								
09/20/00	0.316790	7.82	3.07	20	15	218	576	250	661	146	386	131	90%
09/21/00	0.318380	7.54	3.95	20	13	242	643						
09/22/00	0.310790	7.50	3.66	20	13								
09/23/00	0.281220	Plant Check											
09/24/00	0.346540	Plant Check											
09/25/00	0.381610	7.58	2.66	20	23					183	582	163	89%
09/26/00	0.308540	7.77	4.19	19	15								
09/27/00	0.295280	7.59	3.14	19	20	234	576	302	744	148	364	131	89%
09/28/00	0.294660	7.45	2.96	19	21	288	708						
09/29/00	0.286740	7.62	3.94	20	17								
09/30/00	0.318560	Plant Check											
TOTAL	9.496980												
MAX	0.404710	8	5	21	28	288	708	315	776	244	755	216	93%
MIN	0.277550	7	2	19	10	172	417	222	576	146	185	131	81%
AVG	0.316566	8	4	20	17	229	579	272	689	185	497	164	89%
	AVG.								AVG.		AVG.		
Permit Limits	0.75 MGD.								900 LB/D		1200 LB/D		

PLANT EFFLUENT / **Coliform**

DATE	P.H	D.O	TEMP	IMHOFF	CBOD MG/L	CBOD LBS.	% CBOD REMOVAL	TSS MG/L	TSS. LBS.	% TSS REMOVAL	FECAL	LOG
09/01/00	6.56	7.65	18	TR								
09/02/00	6.40	Plant Check										
09/03/00	6.37	Plant Check										
09/04/00	6.31	Plant Check										
09/05/00	6.67	7.42	18	TR				7	22	97%	24	1.380
09/06/00	6.48	7.80	18	TR	3	7	99%	7	17	96%		
09/07/00	6.56	8.52	18	TR	3	7	98%				2	0.301
09/08/00	6.37	8.78	18	TR								
09/09/00	5.93	Plant Check										
09/10/00	6.78	Plant Check										
09/11/00	6.42	7.41	19	TR				5	17	98%		
09/12/00	6.64	7.70	18	TR								
09/13/00	6.42	7.29	18	TR	3	8	98%	5	13	97%	14	1.146
09/14/00	6.48	7.17	18	TR	3	8	99%				6	0.778
09/15/00	6.57	7.08	19	TR								Log
09/16/00	6.24	Plant Check										1.924
09/17/00	6.08	Plant Check										
09/18/00	6.00	5.75	20	TR				6	17	97%		
09/19/00	6.37	6.38	20	TR								
09/20/00	6.51	6.08	19	TR	3	8	99%	4	11	97%	32	1.505
09/21/00	6.62	7.63	19	TR	2	5	99%				0	0.000
09/22/00	6.43	7.60	18	TR								
09/23/00	6.53	Plant Check										
09/24/00	6.45	Plant Check										
09/25/00	6.42	8.02	16	TR				15	48			
09/26/00	6.62	7.99	16	TR						92%	0	0.000
09/27/00	6.64	7.82	16	TR	4	10	98%	13	32	91%	4	0.602
09/28/00	6.47	7.78	16	TR	3	7	99%	Avg.	Avg.			
09/29/00	6.27	7.64	17	TR	Avg.	Avg.		14	40			
09/30/00	6.01	Plant Check			4	9						
TOTAL												7.636
MAX	7	9	20	TR	4	10	99%	15	48	98%	32	1.924
MIN	6	6	16	TR	2	5	98%	4	11	91%	0	0.000
AVG	6	7	18	TR	3	8	99%	8	24	96%	10	0.848
	MAX.				AVG.	AVG.	AVG.	AVG.	AVG.	AVG.	GEM.	
Permit Limits	9.00				18.3	114	75%	30	188	81%	200	
	MIN.				AVW.	AVW.		AVW.	AVW.		GM7	
	6.00				27.5	172		45	281		400	

I CERTIFY THAT I AM FAMILIAR WITH THE INFORMATION CONTAINED IN THIS REPORT AND THAT TO THE BEST OF MY KNOWLEDGE THIS INFORMATION IS TRUE, COMPLETE AND ACCURATE

JOHN LIGHT GROUP2   Michael Marty Group 1   Dave Kinney Group 1

2000 Monthly Report - SEPTEMBER

EAST AERATOR											SLUDGE UTLIZ.			WEATHER CONDITIONS			NH/3 & METALS									
DATE	P.H	D.O	TEMP	30 MIN	MLSS MG/L	SVI	LOAD INDEX	MLVSS MG/L	MLVSS %	LBS. IN AERATOR	DATE	LOCATION	YRDS.	WEATHER	TEMP	PRECIP	NH/3	NH/3 LBS	COPPER	COPPER LBS.	MERC.	MERC. LBS.	SILVER	SILVER LBS.	ZINC	ZINC LBS.
09/01/00	6.32	2.63	18	190							09/01/00			Cldy	52	0.00										
09/02/00	Plant Check										09/02/00			Fog	52	0.00										
09/03/00	Plant Check										09/03/00			Fog	48	0.00										
09/04/00	Plant Check										09/04/00			Fog	55	0.04										
09/05/00	6.47	1.35	18	220	3475	63		2845	82%	13694	09/05/00	Monroe	5.00	Fog	45	0.01			12.	0.037	0.00	0.0000	0.00	0.000	63.	0.195
09/06/00	7.04	1.63	18	250	3490	72		2885	83%	13753	09/06/00			Rain	56	0.03										
09/07/00	6.26	1.67	18	220							09/07/00	Monroe	5.00	Fog	47	0.02	0.39	0.95								
09/08/00	5.93	1.80	18	210							09/08/00	Monroe	5.00	Cldy	55	0.09										
09/09/00	Plant Check										09/09/00			Cldy	52	0.87										
09/10/00	Plant Check										09/10/00			Rain	56	0.44										
09/11/00	6.12	1.87	19	210	3540	59		2810	79%	13950	09/11/00			Fog	51	0.08			12.	0.041	0.00	0.0000	0.00	0.000	44.	0.149
09/12/00	6.35	1.94	19	220							09/12/00	Monroe	5.00	Fog	50	0.02										
09/13/00	6.09	1.29	19	210	3520	60		2800	80%	13870	09/13/00	Monroe	5.00	Fog	50	0.00										
09/14/00	6.23	1.62	18	210							09/14/00			Cldy	53	0.00	0.44	1.13								
09/15/00	6.23	0.98	19	200							09/15/00	Monroe	5.00	Cldy	59	0.00										
09/16/00	Plant Check										09/16/00			Sun	60	0.00										
09/17/00	Plant Check										09/17/00			Cldy	60	0.00										
09/18/00	5.78	1.31	20	230	3665	63		2945	80%	14442	09/18/00	Monroe	5.00	Cldy	61	0.00										
09/19/00	6.14	1.47	20	210							09/19/00	Monroe	5.00	Cldy	61	0.14			14.	0.039	0.00	0.0000	0.00	0.000	48.	0.134
09/20/00	6.43	0.93	19	220	3605	61		2875	80%	14206	09/20/00			Cldy	57	0.01										
09/21/00	6.43	1.78	19	210							09/21/00	Monroe	5.00	Cldy	57	0.03	0.43	1.14								
09/22/00	6.17	1.11	18	220							09/22/00			Fog	43	0.02										
09/23/00	Plant Check										09/23/00			Sun	32	0.00										
09/24/00	Plant Check										09/24/00			Sun	34	0.00										
09/25/00	6.13	1.48	17	220	3365	65		3655	79%	13260	09/25/00	Monroe	5.00	Sun	35	0.00			13.	0.041	0.00	0.0000	0.40	0.001	48.	0.153
09/26/00	6.45	1.67	16	220							09/26/00	Monroe	5.00	Fog	35	0.00										
09/27/00	6.47	1.69	16	190	3075	62		2480	81%	12117	09/27/00	Monroe	5.00	Fog	39	0.00										
09/28/00	6.21	1.91	17	190							09/28/00	Monroe	5.00	Fog	45	0.00	0.45	1.11								
09/29/00	5.93	1.83	18	190	2870	66				11310	09/29/00	Monroe	5.00	Cldy	57	0.04										
09/30/00	Plant Check										09/30/00			Rain	63	0.98										
TOTAL											TOTAL		70			2.82	mg/l	lbs.	ug/l	lbs.	ug/l	lbs.	ug/l	lbs.	ug/l	lbs.
MAX	7	3	20	250	3665	72	0.09	3655	83%	14442	MAX		5	MAX	63	0.98	0.45	1.14	14.		0.00		0.40		63.	
MIN	6	1	16	190	2870	59	0.07	2480	79%	11310	MIN		5	MIN	32	0.00	0.39		12.		0.00		0.00		44.	
AVG	6	2	18	212	3401	63	0.08	2912	81%	13400	AVG		5	AVG	51	0.09	0.43	1.08	13.	0.040	0.00	0.0000	0.10	0.000	51.	0.158

COMMENTS

APPENDIX D

Collection System Summarizations

City of Duvall

Average temperature and precipitation

Data taken from the City of Duvall's WWTP DMRs

	Temperature				Precitiation			
Month	**1997**	**1998**	**1999**	**Average**	**1997**	**1998**	**1999**	**Average**
jan	39.0	41.0	41.0	40.3	10.80	9.65	7.40	9.28
feb	39.0	42.0	42.0	41.0	5.00	5.00	7.48	5.83
mar	45.0	43.0	41.0	43.0	12.60	7.05	4.41	8.02
apr	45.0	47.0	42.0	44.7	7.25	3.00	1.87	4.04
may	55.0	55.0	48.0	40.3	5.90	4.90	2.36	4.39
jun	60.0	58.0	55.0	57.7	5.20	2.10	2.63	3.31
jul	61.0	62.0	57.0	60.0	2.65	0.65	2.21	1.84
aug	60.0	59.0	59.0	59.3	2.10	0.35	1.06	1.17
sep	57.0	54.0	49.0	53.3	4.55	1.35	1.36	2.42
oct	49.0	46.0	45.0	46.7	6.80	5.65	4.61	5.69
nov	42.0	45.0	44.0	43.7	5.85	10.45	11.30	9.20
dec	38.0	38.0	40.0	38.7	5.40	17.01	6.37	9.59
Total					74.10	67.16	53.06	64.77

City of Duvall
Landuse Wastewater Flow Estimates

Zoning	Units/ac	Capita/unit	Flow/capita	Flow (gpad)
Rmh	5	2.0	70	700
R3	3	3.3	70	682.5
R4.5	4.5	3.0	70	945
R6	6	3.1	70	1302
R8	8	3.1	70	1736
R12	12	2.5	70	2100
Mxd12	12	2.0	70	1680
Mxd16	16	2.0	70	2240
MU16	17.8	2.0	70	2492
Co				0
Pf				0
Eo				0

Determination of Existing Peak Day Flow and Maximum Month Flow

Peak Day Flow			30-Day Maximum Wet Weather (mgd)		30-day Minimum Dry Weather (mgd)	
Year	Date	Flow (mgd)				
1997			**1997**		**1997**	
	1/1/97	1.06	March	0.536	August	0.249
1998			**1998**		**1998**	
	11/26/98	1.209	December	0.571	August	0.274
	12/14/98	1.034				
1999			**1999**		**1999**	
	11/13/99	1.024	February	0.636	September	0.286

Peak Day Flow Calculations (mgd)

Very Conservative	**Conservative**	**Moderate**
1.209 - 0.249 = 0.960	1.209 - 0.274 = 0.935	1.024 - 0.274 = 0.75

System I/I Calculation @ 750 acres (gpad)

Very Conservative	**Conservative**	**Moderate**
0.96 / 750 = 1280	0.935 / 750 = 1247	0.75 / 750 = 1000

Max. Month Flow (mgd)

1997	**1998**	**1999**
0.563 - 0.249 = 0.314	0.571 - 0.274 = 0.297	0.636 - 0.286 = 0.350

System I/I for Wet Weather @ 750 acres (gpad)

1997	**1998**	**1999**
314000 / 750 = 419	297000 / 750 = 396	350000 / 750 = 467

APPENDIX E

Phase 1 – Cost Estimates

Cost Estimate

12/20/00

Project: **Legacy Ridge Pump Station Remodel**

Cole Elliott

Number	Description	Quantity		Total	Extension
		Measure	Units		
1	Mobilization	1	LS	$1,736.00	$2,000.00
2	Traffic Control	1	LS	$1,000.00	$1,000.00
3	Shoring	1	LS	$1,000.00	$1,000.00
4	Replacement of Valves and Piping	1	LS	$1,500.00	$1,700.00
5	Electrical System Repair	1	LS	$2,000.00	$2,000.00
6	Replacement of Pumps and Motors	2	EA	$7,000.00	$14,000.00
7	Restoration	1	LS	$1,000.00	$1,000.00
8	Trimming and Cleanup	1	LS	$1,000.00	$1,000.00
		Subtotal			$23,700.00
		Contingencies (20%)			$4,740.00
		TOTAL			$28,440.00
		Sales Tax @ 8.6%			$2,445.84
	Engineering and Inspection (20%)				$5,688.00
	City Administration (5%)				$1,422.00
	Total Estimated Project Cost				$38,000.00

Cost Estimate

12/20/00

Project: **Cherry Brooke Pump Station Remodel**

Cole Elliott

Number	Description	Quantity		Total	Extension
		Measure	Units		
1	Mobilization	1	LS	$1,936.00	$2,000.00
2	Traffic Control	1	LS	$1,000.00	$1,000.00
3	Shoring	1	LS	$1,000.00	$1,000.00
4	Replacement of Valves and Piping	1	LS	$2,000.00	$2,000.00
5	Electrical System Repair	1	LS	$2,200.00	$2,200.00
6	Replacement of Pumps and Motors	2	EA	$8,000.00	$16,000.00
7	Restoration	1	LS	$1,000.00	$1,000.00
8	Trimming and Cleanup	1	LS	$1,000.00	$1,000.00
		Subtotal			$26,200.00
		Contingencies (20%)			$5,240.00
		TOTAL			$31,440.00
		Sales Tax @ 8.6%			$2,703.84
	Engineering and Inspection (20%)				$6,288.00
	City Administration (5%)				$1,572.00
	Total Estimated Project Cost				$42,000.00

Parametrix Inc.

Cost Estimate

Date: 12/20/00

Project: **Depot Village Pump Station Rehabilitation**

Cole Elliott

Number	Description	Quantity		Total	Extension
		Measure	Units		
1	Mobilization	1	LS	$2,240.00	$2,000.00
2	Traffic Control	1	LS	$1,000.00	$1,000.00
3	Shoring	1	LS	$1,000.00	$1,000.00
4	Replacement of Valves and Piping	1	LS	$2,000.00	$2,000.00
5	Electrical System Repair	1	LS	$3,000.00	$3,000.00
6	Replacement of Pumps and Motors	2	EA	$9,000.00	$18,000.00
7	Restoration	1	LS	$2,000.00	$2,000.00
8	Trimming and Cleanup	1	LS	$1,000.00	$1,000.00
		Subtotal			$30,000.00
		Contingencies (20%)			$6,000.00
		TOTAL			$36,000.00
		Sales Tax @ 8.6%			$3,096.00
	Engineering and Inspection (20%)				$7,200.00
	City Administration (5%)				$1,800.00
	Total Estimated Project Cost				$48,100.00

Parametrix Inc.
Cost Estimate

Date: 12/20/00

Project: Cherry Brooke Pump Station Remodel

Cole Elliott

Number	Description	Quantity		Total	Extension
		Measure	Units		
1	Mobilization	1	LS	$1,840.00	$2,000.00
2	Traffic Control	1	LS	$1,000.00	$1,000.00
3	Shoring	1	LS	$1,000.00	$1,000.00
4	Replacement of Valves and Piping	1	LS	$2,000.00	$2,000.00
5	Electrical System Repair	1	LS	$2,000.00	$2,000.00
6	Replacement of Pumps and Motors	2	EA	$7,500.00	$15,000.00
7	Restoration	1	LS	$1,000.00	$1,000.00
8	Trimming and Cleanup	1	LS	$1,000.00	$1,000.00
		Subtotal			$25,000.00
		ontingencies (20%			$5,000.00
		TOTAL			$30,000.00
		Sales Tax @ 8.6%			$2,580.00
	Engineering and Inspection (20%)				$6,000.00
	City Administration (5%)				$1,500.00
	Total Estimated Project Cost				$40,100.00

Parametrix Inc.

Cost Estimate

Date: 12/20/00

Project: **Legacy Ridge Electrical Repair**

Cole Elliott

Number	Description	Quantity		Total	Extension
		Measure	Units		
1	Mobilization	1	LS	$300.00	$300.00
2	Electrical Repair	1	LS	$3,000.00	$3,000.00
		Subtotal			$3,300.00
		Contingencies (20%)			$660.00
		TOTAL			$3,960.00
		Sales Tax @ 8.6%			$340.56
	Engineering and Inspection (20%)				$792.00
	City Administration (5%)				$198.00
	Total Estimated Project Cost				$5,000.00

Parametrix Inc.

Cost Estimate

Date: 1/2/01

Project: **System Telemetry Installation**

Cole Elliott

Number	Description	Quantity		Total	Extension
		Measure	Units		
1	Mobilization	1	LS	$3,000.00	$3,000.00
2	Telemetry equipment	1	LS	$12,000.00	$12,000.00
3	WWTP Receiving equipment	1	LS	$25,000.00	$25,000.00
		Subtotal			$40,000.00
		Contingencies (20%)			$8,000.00
		TOTAL			$48,000.00
		Sales Tax @ 8.6%			$4,128.00
	Engineering and Inspection (20%)				$9,600.00
	City Administration (5%)				$2,400.00
	Total Estimated Project Cost				$64,100.00

APPENDIX F

Engineering Report for the Wastewater Treatment Plant Outfall – April 2002

Engineering Report

Wastewater Treatment Plant Outfall Improvements

City of Duvall, Washington

Parametrix, Inc.

April 2000

216-3240-001

STATE OF WASHINGTON

DEPARTMENT OF ECOLOGY

Northwest Regional Office, 3190 - 160th Ave S.E. • Bellevue, Washington 98008-5452 • (425) 649-7000

June 12, 2000

Ms. Elizabeth Goode, P.E.
Director of Public Works
City of Duvall
PO Box 1300
Duvall, Washington 98019

Dear Ms. Goode:

Re: City of Duvall
Wastewater Treatmnet Plant Outfall Improvements-Engineering Report
Parametrix, Inc April 2000
Wastewater Treatment Plant Capacity Analysis
Gray and Osborne, Inc. September 1999

In accordance with RCW 90.48.110 and WAC 173-240-010 through 180 of the Department of Ecology, the aforementioned documents have been reviewed and are hereby approved.

Nothing in this approval shall be construed as satisfying other applicable federal, state or local statutes, ordinances or regulations.

For additional information, please contact Mr. David E. Wright, Senior Water Quality Engineer, at the address above or telephone (425) 649-7059.

Sincerely,

John H. Glynn
Water Quality Manager
Northwest Regional Office

JHG:DEW:ms

cc: John Wilson, Gray and Osborne, Inc.
David Mcbride, Parametrix, Inc.
NWRO Central files NPDES 4.1

Engineering Report On

The City of Duvall Wastewater Treatment Plant Outfall Improvements

Prepared for

City of Duvall
P.O. Box 1300
Duvall, Washington 98019

Prepared by

Parametrix, Inc.
5808 Lake Washington Blvd. NE, Suite 200
Kirkland, Washington 98033-7350
www.parametrix.com

April 2000
Project No. 216-3240-001

CERTIFICATE OF ENGINEER

The technical material and data contained in this document were prepared under the supervision and direction of the undersigned, whose seal, as a professional engineer licensed to practice as such, is affixed below.

DAVID JOSEPH McBRIDE
STATE OF WASHINGTON
33220
REGISTERED
PROFESSIONAL ENGINEER

4/25/00

EXPIRES: 1/05/01

David J. McBride

Prepared by David McBride, P.E.

Checked by Mike Ollivant, P.E.

Approved by Dwight Miller, P.E.

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EXECUTIVE SUMMARY

This *Engineering Report on the City of Duvall Wastewater Treatment Plant Outfall Improvements* fulfills the requirements of WAC 173-240-060, which requires approval by the Washington State Department of Ecology (Ecology) prior to the initiation of new wastewater facilities construction.

The report contains the following findings:

1. The City of Duvall is required under the 1992 National Pollutant Discharge Elimination System (NPDES) permit to build a new wastewater treatment plant (WWTP) outfall.

2. Ecology has issued water-quality based effluent limits for the City of Duvall based upon the City's existing bankside outfall. The requirements contained within the NPDES discharge permit issued on April 1, 2000, may be difficult, if not impossible, for the City to meet without a new outfall configuration.

3. A new river survey shows that the river depths and velocities in the outfall vicinity are controlled at low flow by a large gravel bar downstream of the existing outfall. A deep pool exists offshore of the existing outfall where a new outfall is technically feasible.

4. The new outfall plan will result in the abandonment of the existing side-bank outfall discharge and provide a new two-port discharge near the river thalweg (deepest point).

5. Selected outfall construction techniques will minimally impact aquatic habitat.

6. Analysis of the mixing process for the effluent and river waters shows that with the new outfall plan water quality standards will be met for conventional pollutants (e.g. fecal coliform, pH, and temperature) and for toxic pollutants, with the possible exception of dissolved copper.

7. Dissolved metals such as copper and silver are present in small concentrations in most municipal wastewater treatment plant effluents. There are several possible sources, including metal leached from household copper piping, and wastewater discharge from dentistry practices.

8. A program is recommended requiring improved ("clean") sampling and accurate analytical reporting of laboratory results. The program is intended to eliminate potential sample contamination that may have resulted in "spikes" in the results of previous effluent sample analyses.

9. A metal's source identification and pretreatment control program will be developed and submitted to Ecology if the "clean" sampling monitoring indicates a continued potential to exceed water quality standards at the mixing zone boundaries.

10. The potential effluent limitations for the proposed outfall based on the most restrictive of all known, available, and reasonable methods of treatment (AKART); total maximum daily load (TMDL); or water quality (mixing zone) based criteria; and the Year 2020 upgraded wastewater treatment plant are summarized in the report (Table 8-5).

11. Seasonal permit limits are recommended in lieu of annual permit limits to better reflect seasonal river flow, water quality, and effluent characteristics and conditions.

12. The maximum daily carbonaceous biochemical deoxygenation (CBOD) and ammonia permit limitations should be based on an allowable equivalent CBOD loading (lbs/day) in accordance with the Snoqualmie River TMDL Study (Joy, J. 1994). CBOD AKART limits and ammonia water quality based limits will also apply.

13. The City of Duvall NPDES Waste Discharge Permit was revised and reissued on April 1, 2000. The revised permit reflects plant discharge requirements based upon the City's current side-bank outfall discharge. These requirements are restrictive and may result in the City's wastewater treatment plant violating the permit conditions. It is recommended that the City install the new outfall and upon completion of construction request modification to those permit limits. The new permit limits would be reflective of the recommendations contained within this report.

14. The City of Duvall received an extension until July 31, 2004, for the date of completion of construction of the new outfall. However, due to the difficulties in meeting the requirements of the April 1, 2000, NPDES permit based upon a side-bank discharge with the existing plant configuration, it is recommended that the City proceed as soon as possible with the construction of the two port outfall.

ACRONYMS

Ag	silver
AKART	All Known, Available and Reasonable Methods of Treatment
BOD	biochemical oxygen demand
CBOD	carbonaceous biochemical deoxygenation
CFR	Code of Federal Register
Cu	copper
df	dissolved fractions
DMRs	daily monitoring reports
DO	dissolved oxygen
Ecology	Washington State Department of Ecology
EPA	Environmental Protection Agency
HCW-L	Hammond, Collier, & Wade – Livingston
IDOD	immediate dissolved oxygen demand
LAs	load allocations
mgd	million gallons per day
NPDES	National Pollutant Discharge Elimination System
NPS	nonpoint source
PCHB	Pollution Control Hearings Board
SRP	soluble reactive phosphorus
TMDL	total maximum daily load
TSS	total suspended solids
UGA	Urban Growth Area
USGS	U.S. Geological Survey
VSW	very shallow water
WER	water effects ratio
WLAs	waste load allocations
WWTP	wastewater treatment plant
Zn	zinc

1. INTRODUCTION

1.1 BACKGROUND

The City of Duvall owns and operates a wastewater system, which includes a gravity sanitary sewer collection system, a wastewater treatment plant (WWTP), and a side bank outfall for discharge of treated effluent into the Snoqualmie River. Figure 1-1 is a vicinity map showing the City and surrounding features. The initial wastewater system was put into service in 1976 to correct failing septic tanks and to eliminate unauthorized sewage discharges into the Snoqualmie River. The 1976 wastewater facility was initially designed for a population equivalent of 2,000 individuals. The facilities were intended to be expanded through phased construction (Hammond, Collier, & Wade – Livingstone [HCW-L] 1990).

In 1990, an Engineering Report was prepared by HCW-L for the purpose of expanding the 1976 wastewater treatment plant from a design population equivalent of 2,000 to 6,000 individuals. In 1992, the City of Duvall constructed the treatment plant expansion based on the recommended improvements outlined in the 1990 engineering report, with the exception of the recommended outfall improvements.

The improvements recommended in the 1990 Engineering Report included extending the existing side bank outfall to a "... single center of river outfall" that provides reasonable protection to the river (HCW-L 1990). The City did not implement the outfall improvements recommended and continues to use the side bank outfall that was constructed in 1976 for discharge of treated effluent into the Snoqualmie River. It is reported that the outfall improvements proposed in 1990 were not implemented at the time of plant improvements because permits could not be secured from regulatory agencies.

The City of Duvall received its previous National Pollutant Discharge Elimination System (NPDES) Waste Discharge Permit for the expanded treatment facility on October 9, 1992. Within the "Fact Sheet" portion of this permit, the City of Duvall was required to construct a new outfall. A NPDES permit, "Stipulation and Order of Dismissal" (Pollution Control Hearings Board [PCHB] No 91-67) also required the City of Duvall to construct a new center of the river outfall no later than October 1, 1994. The City of Duvall recently requested extension of the October 1, 1994, deadline. The City received the following response from the Department of Ecology on March 10, 2000, attached in Appendix F:

- "...approval is hereby granted extending the date for submission of the plans and specifications for construction of the new outfall to December 31, 2002.
- "...approval is hereby granted extending the date for completion of construction of the new river outfall to July 31, 2004.

The City of Duvall was issued its latest revision to the NPDES permit on April 1, 2000, attached in Appendix F. The current NPDES permit limits established permit limits based upon the City's current side-bank outfall that was constructed during the initial plant installation in 1976. With the current outfall configuration, the discharge requirements for parameters that are subject to aquatic-life based water quality standards are very restrictive. These parameters, which include ammonia and certain metals, have discharge concentrations that are quite low and may be difficult to achieve with the existing wastewater treatment plant and outfall configuration. The potential for the City to violate the new NPDES permit for these parameters is quite high.

1.2 REPORT OBJECTIVES

The City is preparing this outfall improvements engineering report as the first step to meet the NPDES regulatory requirements and to facilitate a future expansion of the WWTP.

To address improvements to the outfall and to address the capacity of the wastewater system, the following approach has been taken:

- Preparation of this Engineering Report to reflect improvements to only the outfall component of the wastewater system. The outfall improvements discussed in this Engineering Report also acknowledge future wastewater treatment plant improvements anticipated to provide service to the UGA and UGA Reserve Area. The Outfall Engineering Report is being prepared as a separate document from the WWTP engineering report to expedite regulatory approval and to achieve nearer compliance with the NPDES permit conditions (as currently drafted in July 1999 by Ecology).

- A separate Engineering Report will be prepared in accordance with WAC 173-240-060 that addresses improvements to the wastewater treatment plant sufficient to serve the UGA and UGA Reserve Area. It is anticipated that preparation of the Engineering Report to address the treatment plant will commence immediately following the outfall report and will contain the information included in the Outfall Engineering Report by reference.

1.3 PREVIOUS REPORTS

The City wants to ensure that any outfall improvements installed to satisfy the NPDES permit and the PCHB are designed and constructed to provide adequate service to those customers that may exist within the existing Urban Growth Area (UGA) and UGA Reserve Area. The City also wants to ensure that capacity at the wastewater treatment plant is managed correctly and that this and other planning documents acknowledge the existing plant capacity. Elements that affect the design and construction of the outfall and management of the existing plant capacity include:

- The City of Duvall Comprehensive Land Use Plan prepared in 1994 that defined a new UGA and a UGA reserve area for the Duvall City limits. The Comprehensive Land Use Plan defined the limits of the UGA and UGA Reserve and established the density of development that would exist within the City's jurisdiction. As a result of that plan the City of Duvall adopted a low growth approach within the UGA and limited the density of development within the City. Based upon information in the Land Use Plan it is projected that the UGA will have a population base of 9,000 people. This estimate is not a population equivalent as it does not include a commercial population equivalent and also does not include most of the UGA Reserve Area.

- The existing wastewater treatment plant has insufficient capacity to provide service to the existing UGA. The existing plant has a design population equivalent of 6,000 compared to a potential UGA population of 9,000 people based upon the Office of Financial Management (OFM) population estimates, platted property, and property in the preliminary plat approval process.

- Since upgrade of the treatment plant in 1992, the City has experienced a high rate of land development including subdivision of land, and residential and commercial constructions consistent with the City's land use planning.

- The City of Duvall completed a population forecast within the UGA. It is estimated that Duvall could have a minimum population base of 6,600 people without considering additional subdivision of land, build-out of vacant land within older plats, or a population equivalents for existing or future commercial and institutional building. This population estimate would exceed the capacity of the existing treatment plant.

- The City has taken steps to manage the wastewater system's capacity to assure that continued development with the UGA does not exceed the treatment plant's capacity.

1.3.1 TMDL

The Snoqualmie River is located within 15 miles (24 km) of the Seattle-Bellevue metropolitan area. The Snoqualmie River Valley is undergoing rapid changes in land use with additional river waste load discharges projected. Since 1989, the Washington State Department of Ecology has conducted several water quality investigations on 44.5 miles (71.6 km) of the lower river basin to define present and potential water quality problems during the summer low flow season. These investigations and water quality simulations, using the Model QUAL2E, have resulted in estimating load capacities for biochemical oxygen demand (BOD), ammonia, and fecal coliform during the critical low flow months of August through October. Additional monitoring was also recommended to develop soluble reactive phosphorus (SRP) loading capacities in the future. The TMDL loading capacities will require waste load allocations (WLAs) of BOD and ammonia when the three existing municipal WWTPs expand (Snoqualmie, Duvall, and North Bend). Implementation of a nonpoint source (NPS) management plan for the mainstem and some tributaries will be necessary immediately to meet Class A fecal coliform criteria, and to meet BOD and ammonia load allocations (LAs). A phased total maximum daily load (TMDL) was recommended to make adjustments to the WLAs/LAs as nonpoint source controls are implemented, and as additional water quality and growth pattern data become available (Joy 1994).

1.3.2 Wastewater Treatment Plant Capacity Analysis

In 1998, Ecology notified the City that the acute and chronic dilution factors must be assessed for the existing side-bank outfall in the river. The City was required to demonstrate the ability of the WWTP/outfall to meet aquatic life criteria for ammonia, copper, mercury, silver, and zinc to continue using the side-bank discharge. A mixing zone analysis was prepared as part of a 1999 Capacity Analysis (Cosmopolitan Engineering Group [Cosmopolitan] 1999 as included in Appendix F of Gray & Osborne 1999). The mixing zone analysis concluded that a new channel outfall configuration would more likely provide adequate dilution to achieve compliance with dissolved metals water quality criteria. The report noted that the existing side-bank outfall was adequate for the Year 2010 design flows estimated in the 1996 general sewer plan to comply with ammonia criteria, but was inadequate to comply with the dissolved metals criteria.

1.3.3 National Pollutant Discharge Elimination System (NPDES) Permit

In 1999, Ecology provided the City a draft NPDES permit using Cosmopolitans modeled dilutions obtained with the existing outfall. In its response to the draft NPDES permit, the City commented that metal limits cannot be reliably met for the effluent discharge unless a new in-channel outfall is constructed.

1.4 BASIS FOR EFFLUENT LIMITATIONS

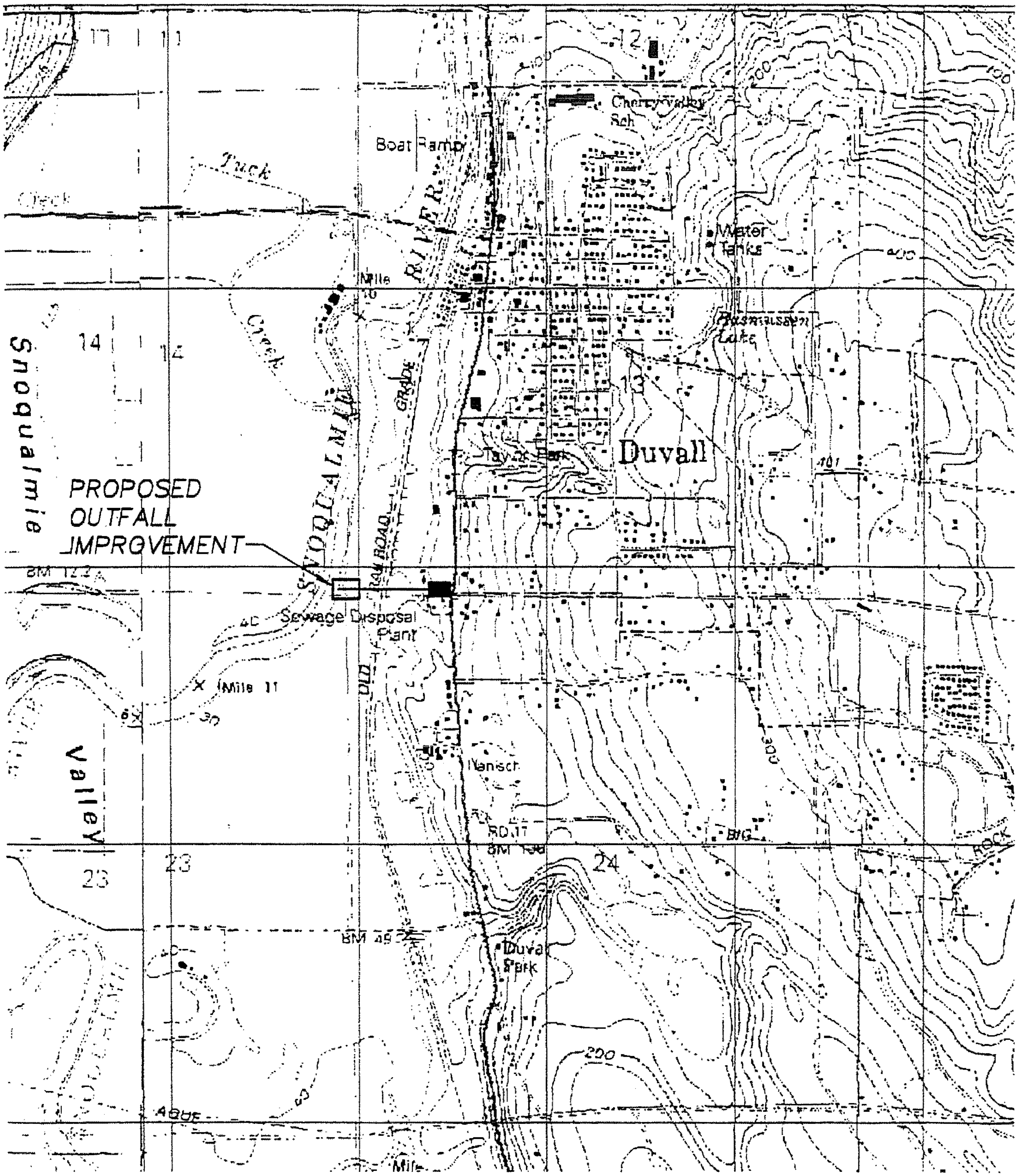
The Washington State Department of Ecology promulgates treatment requirements and water quality standards for point source discharges to waters of the state. Discharge limitations are set forth in NPDES Permits. In setting discharge limits for the Duvall WWTP, Ecology will look at three bases:

- Technology-Based Effluent Limits (also known as AKART – All Known, Available and Reasonable Methods of Treatment) for municipal WWTPs as promulgated in federal (40 CFR [Code of Federal Register] 133) and state (WAC 173-221) code,
- Water Quality (Mixing Zone) Based Effluent Limits as promulgated in WAC 173-201(A), and
- TMDL Based Effluent Limits as set forth by *the Snoqualmie River Total Maximum Daily Load Study* (Joy 1994), as promulgated in Section 303(d) of the Clean Water Act.

Effluent constituents regulated in the City's current NPDES Permit No. WA-002951-3 and their applicable bases are shown in Table 1-1. Where more than one basis applies, the most stringent limits govern treatment requirements. In this report, effluent constituents and their bases are reevaluated in light of the plant expansion and outfall improvements, Table 1-1.

Table 1-1. Basis for Effluent Limitations

Constituent	Technology-Based	TMDL-Based	Water Quality-Based
BOD_5	•		
$CBOD_5$		•	
Suspended Solids	•		
Total Ammonia		•	•
Metals (i.e., Copper)			•
pH	•		•
Fecal Coliforms	•		•
Temperature			•



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SCALE IN FEET

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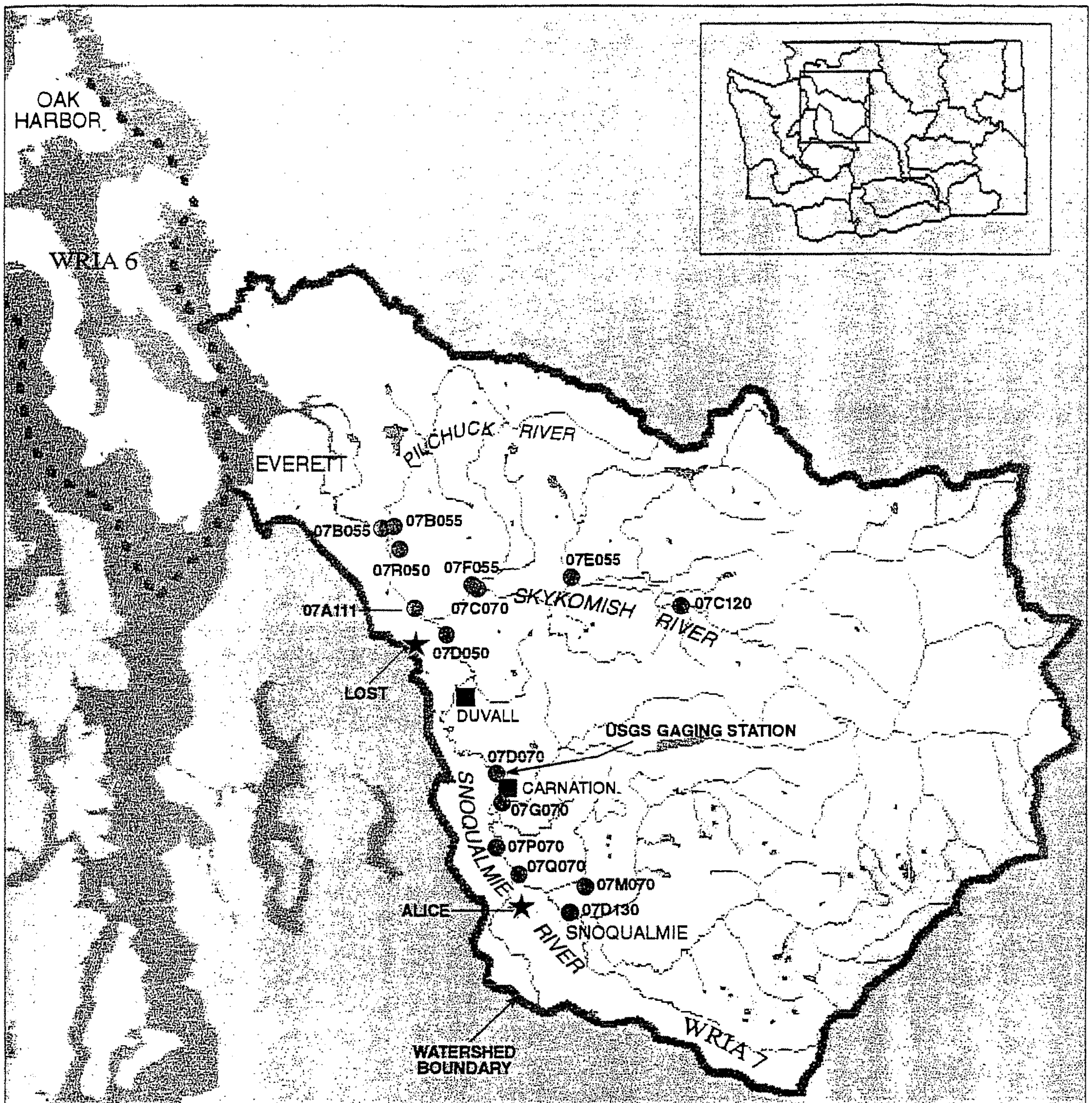
Figure 1-1
Vicinity Map
City of Duvall

2. EXISTING OUTFALL DESCRIPTION

The existing outfall is located on the right bank (looking downstream) of the Snoqualmie River. It is situated at river mile 10.4 approximately 4,600 feet upstream from the Woodinville-Duvall Road Bridge, as shown on Figure 1-1 (geographical coordinates are 47° 43' 20" N and 121o 59' 37" W).

Figure 2-1 shows the location of the Duvall WWTP outfall within the Snohomish River watershed. Duvall is located approximately ten miles upstream of the confluence of the Snoqualmie and Skykomish Rivers. Figure 2-1 also shows Ecology's water quality monitoring stations within the watershed. The nearest upstream U.S. Geological Survey river gauging station is located at Carnation (river water quality sampling Station 07D070, USGS Gauge Number 12149000).

The outfall consists of a 15-inch-diameter pipe terminating in a slotted manhole on the bank of the river. Effluent passes through the openings and the surrounding armor stone into the river. To estimate dilution factors, the outfall can be modeled as a side-bank discharge.



Source: http//www.wa.gov.ecology/eils/fw_riv/isl_snoh.html

Parametrix, Inc. Duvall/216-3240-001(03) 2/00 (K)

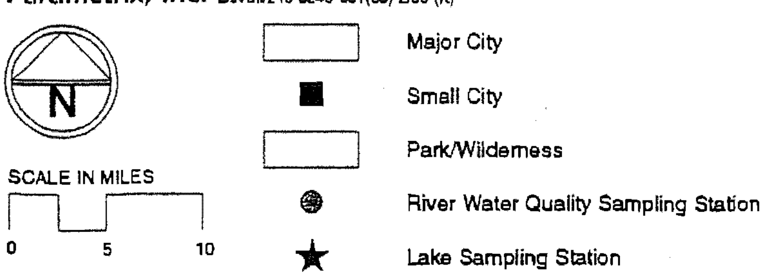


Figure 2-1
Snoqualmie River Monitoring Stations

3. RECEIVING WATER CHARACTERISTICS

3.1 SNOQUALMIE RIVER FLOW

The Snoqualmie River system is highly valued for recreation, aquatic habitat, and domestic water supply, particularly because of its proximity to metropolitan Seattle. The river and its tributaries are designated Class A waters from the mouth to the west border of Twin Falls State Park (river mile [RM] 9.1 on the South Fork). This reach includes the stretch within which the Duvall WWTP is located (at RM 10.4 on the main stem).

Class A freshwater quality standards as provided in WAC 173-201A. The water quality parameters of importance to this report include fecal coliform, dissolved oxygen (DO) (concentration and percent saturation), temperature, pH, turbidity, toxic materials, and aesthetics. Class A freshwater quality standards are as follows:

- Fecal Coliform – Shall not exceed a geometric mean value of 100 organisms/100 ml.
- DO – Shall exceed 8.0 mg/ℓ and not more than 110% saturation.
- Temperature – Shall not exceed 18.0°C due to human activities or cause more than a 0.3°C increase above ambient when ambient is greater than 18.0°C.
- pH – Shall be in the range of 6.5 to 8.5 with man-made variation of less than 0.5 standard units (SU).
- Turbidity – Shall not exceed 5 nephelometric turbidity units (NTU) above ambient when background turbidity is 50 NTU or less.
- Toxics – Shall be below concentrations that have the potential singularly or cumulatively to adversely effect characteristic uses or cause acute or chronic conditions to the most sensitive aquatic life.
- Aesthetics – Shall not be impaired by the presence of effects that offend the senses.

The U.S. Geological Survey (USGS) has maintained a continuous river gauging station (12149000) on the Snoqualmie River near Carnation since 1929. Ecology also maintains an ambient river water quality monitoring station (07D070) at this location. USGS and Ecology's water quality monitoring station is at river mile 23.0, 12.6 miles upstream of the outfall. Water quality data are available from this station from 1970 through 1996.

The critical dry season period flow value adopted here for the Snoqualmie River is that developed by Ecology for the TMDL study for the Snoqualmie River (Joy 1994). This dry season value is a 7Q20 (i.e., seven-day minimum average flow) from a stratified annual series that has an average recurrence interval of once in twenty years. The dry season 7Q20 flow value is 456 cfs. The 7Q20 flow value for the wet season was adopted based on the value of 684 cfs reported by Cosmopolitan (1999). The annual series 7Q10 value (Joy 1994) at the outfall is 443 cfs. The small (9 cfs) difference between dry season 7Q20 and 7Q10 annual flows was neglected for QUAL2E modeling purposes discussed in Section 8.

A sensitivity analysis was made to consider the effect of a different definition of river flow seasons. Ecology guidance (1996) allows seasonal effluent limitations in situations where meeting annual water quality based limitations has high operational costs and there is a considerable difference of magnitude between seasonal and annual limits. Ecology established the dry season months of August, September, and October because this period contains the lowest flows in the Snoqualmie River (Joy 1994). Seasonal limits are usually set on a semiannual or quarterly basis (Ecology 1996).

In lieu of a quarterly basis for the dry season, a six month interval between May 1 and October 31 was considered. Daily flows on the Snoqualmie River for a 63-year period were selected for the USGS gauging station (12149000) near Carnation. Seven-day moving averages were computed and the seasonal minimums fit to a lognormal probability distribution.

In comparison to the Ecology seasonal stratification (August through October), the six-month dry season 7Q20 is nearly identical. This is because the lowest flow values for either seasonal period occur in August through October.

An August through October dry season is adopted here because:

- Ecology chose this dry season as the most critical condition in the TMDL Study (Joy 1994).
- The TMDL study has set the precedent for seasonal permit limit determination in the Snoqualmie River valley.
- The April 1, 2000, NPDES permit is based on an August through October dry season and November through July wet season.

3.2 AMBIENT RIVER WATER QUALITY

Conventional and toxic pollutants in the ambient receiving water are characterized in this analysis based on calculating the 90th percentile value from a lognormal probability distribution. The ambient DO concentration is based on the 10th percentile from a lognormal probability distribution.

Conventional parameter data for receiving water were obtained from Ecology's monitoring station for November 1970 through September 1996. The pH, temperature, DO, hardness, ammonia, and fecal coliform count were analyzed. Critical values are shown in Table 3-1. Nondetected measurements are recorded as half the reported value. All other results were included at the reported value regardless of their assigned qualifiers. Ammonia results prior to 1978 were not included because the sampling and preservation methods were different and there was no quality control assurance provided for these results. Additionally, non-detected results were reported as zero for many samples prior to 1978, as well as for two samples after 1978. Two ammonia results (11/5/79 and 2/12/80) were removed prior to analysis. Using Splus 4.0, each variable was fit to a lognormal distribution, then percentiles for the fitted distribution were calculated. The distribution fit and percentiles were verified using BestFit 2.0d.

Ambient hardness data indicate that the river water is very soft; however, the hardness data set was collected in 1971 and may not represent current conditions. A hardness value of 25 mg/L as $CaCO_3$ was adopted to estimate the metals water quality criteria (related to hardness) that are used to determine the reasonable potential to exceed water quality standards. In determining water quality based metal standards, toxicological testing of metal parameters was limited to water with greater than 25-mg/ℓ hardness (Wright, D. Personal Communication, January 2000).

No monitoring data were available in Ecology's database for Station 07D070 on ambient dissolved metal concentrations. Background dissolved metals concentrations are assumed to be negligible.

Table 3-1. Summary of Data Used for Reasonable Potential Analysis

	Wet Season[a]	Annual	Dry Season[b]	Statistic	Estimation	Statistic Application
Plant Effluent Quantity						
Flows – Max Month						
(MGD)	1.75	1.75	1.05		Wet Season – Forecast for planning period (2020) Dry Season – Forecast for planning period (2020)	Aquatic Life Based Chronic WQ criteria Reasonable potential; also used in AKART calculations
(cfs)	(2.71)	(2.71)	(1.62)			
Flows – Max Day						
(MGD)	5.25	5.25	1.37		Wet Season – Maximum month wet season x 3 Dry Season – Maximum month dry season x 1.3	Aquatic Life Based Acute WQ criteria reasonable potential; also used in AKART calculations
(cfs)	(8.12)	(8.12)	(2.12)			
Plant Effluent Quality						
Conventional Pollutants						
pH, S.U.	6.86	6.87	6.88	95%	From log normal distribution in sets of 590, 783, and 193 data values based on 1/97 – 12/99 DMRs	Aquatic life based Chronic WQ criteria reasonable potential
DO, mg/ℓ	6.66	6.57	6.36	10%	From log normal distribution in sets of 590, 783, and 193 data values based on 1/97 – 12/99 DMRs	Aquatic life based Chronic WQ criteria reasonable potential
Temp. °C	18.66	20.41	20.85	95%	From log normal distribution in sets of 490, 783, and 193 data values based on 1/97 – 12/99 DMRs	Aquatic life based Chronic WQ criteria reasonable potential
FC, Weekly Geomean (#/100 mℓ)	6.8	6.6	6.0	95%	From log normal distribution in sets of 115, 153, and 38 data values based on 1/97 – 12/99 DMRs	Aquatic life based Chronic WQ criteria reasonable potential

Table 3-1. Summary of Data Used for Reasonable Potential Analysis

	Wet Season[a]	Annual	Dry Season[b]	Statistic	Estimation	Statistic Application
Toxic Pollutants for Aquatic Life						
NH_3, mg/ℓ	0.74	0.36	0.97	95%	From log normal distribution in sets of 21 data values based on 4/98 – 12/99 DMRs for annual series; for seasonal values based on geometric mean (of 13 or 8 seasonal samples) multiplied by factor from Table 3.2 of EPA (1991a)	
Hg, µg/ℓ	0.127	0.132	0.160	95%	From log normal distribution in sets of 82 data values based on 1/93 – 12/99 Ecology data for annual series; for seasonal values based on sets of 54 west seasonable data and 28 dry season data	Aquatic life based Chronic & Acute WQ criteria reasonable potential
Cu, µg/ℓ	72	73	61	95%	From log normal distribution in sets of 82 data values based on 1/93 – 12/99 Ecology data for annual series; for seasonal values based on sets of 54 wet season data and 28 dry season data	Aquatic life based Chronic & Acute WQ criteria reasonable potential
Ag, µg/ℓ	1.80	1.60	1.28	95%	From log normal distribution in sets of 82 data values based on 1/93 – 12/99 Ecology data for annual series; for seasonal values based on sets of 54 wet season data and 28 dry season data	Aquatic life based Chronic & Acute WQ criteria reasonable potential
Zn, µg/ℓ	133	172	269	95%	From log normal distribution in sets of 82 data values based on 1/93 – 12/99 Ecology data for annual series; for seasonal values based on sets of 54 wet season data and 28 dry season data	Aquatic life based Chronic & Acute WQ criteria reasonable potential

Table 3-1. Summary of Data Used for Reasonable Potential Analysis

	Wet Season[a]	Annual	Dry Season[b]	Statistic	Estimation	Statistic Application
Receiving Water Quantity						
Flows – 7Q20 or 7Q10 for Annual Series, cfs (mgd)	684 (442)	443 (286)	456 (295)		Dry and Wet season critical periods from Ecology Snoqualmie River TMDL Study (Joy 1994)	Aquatic life based Chronic & Acute WQ criteria reasonable potential
Receiving Water Depth/Velocity						
7D20, feet	11.1	9.9	10.0		Depth calculated using HEC-RAS and survey data obtained 1/00 for Q~4,000 cfs at WWTP outfall	Dilution Model
7V20, fps	0.8	0.5	0.5		Depth calculated using HEC-RAS and survey data obtained 1/00 for Q~4,000 cfs at WWTP outfall	Dilution Model
Receiving Water Quality						
Conventional Pollutants						
pH, S.U.	7.55	7.58	7.59	90%	From log normal distribution of 197, 262, and 65 data based on Ecology ambient monitoring Station 07DO70 (1971-1996)	Aquatic Life based chronic and Acute WQ criteria reasonable potential
Hardness, mg/ℓ	25	25	25		Based on minimum value for hardness associated with water quality criteria for dissolved metals	Aquatic Life based chronic and Acute WQ criteria reasonable potential
DO, Mg/ℓ	10.35	9.93	9.38	10%	From log normal distribution of 201, 267, and 66 data based on Ecology ambient monitoring Station 07DO70(1971-1996)	Aquatic Life based chronic WQ criteria reasonable potential
temp, °C	14.26	16.7	18.44	90%	From log normal distribution of 201, 267, and 66 data based on Ecology ambient monitoring Station 07DO70 (1971-1996)	Aquatic Life based chronic WQ criteria reasonable potential

Table 3-1. Summary of Data Used for Reasonable Potential Analysis

	Wet Season[a]	Annual	Dry Season[b]	Statistic	Estimation	Statistic Application
FC, #/100ml	76	85	102	90%	From log normal distribution of 182, 241, and 59 data based on Ecology ambient monitoring Station 07DO70 (1971-1996)	Aquatic Life based chronic WQ criteria reasonable potential
Toxic Pollutants						
NH^3, mg/ℓ	0.038	0.037	0.033	90%	From log normal distribution of 134, 176, and 42 data based on Ecology ambient monitoring Station 07DO70 (1971-1996)	Aquatic Life based chronic and Acute WQ criteria reasonable potential
All Dissolved Metals	0.0	0.0	0.0	–	Assumed (no data available in Ecology's database for ambient monitoring station)	Aquatic Life based chronic and Acute WQ criteria reasonable potential

(1) Wet Season – November through June

(2) Dry Season – July through October

4. EFFLUENT CHARACTERISTICS

4.1 EFFLUENT DISCHARGE QUANTITY

Maximum monthly effluent discharge and maximum daily discharge rates have been forecast for both wet and dry seasons for the end of the planning period (2020). Maximum month and day flow rates are 1.75-million gallons per day (mgd) and 5.25 mgd, respectively, for the wet season, and 1.05 mgd and 1.37 mgd, respectively, for the dry season. Derivation of these flows is provided in Appendix E. 1997 through 1999 daily monitoring reports (DMRs) indicate that the maximum monthly discharge rate has occurred within a wet season period from December through March. The reasonable potential analysis to exceed water quality standards in Section 8 is based on the maximum design WWTP flows for the selected data series. If an annual series is selected, the maximum design effluent flows may not coincide with the critical low 7Q10 river flow period. However, the collection of seven-day average minimums from each year of record included in the river flow probability analysis could include dry periods in the winter months. Table 3-1 shows effluent flows used in the reasonable potential permit limit analysis.

4.2 EFFLUENT QUALITY

The reasonable potential/permit limit analysis for conventional and toxic pollutants is based on calculating the 95th percentile value of the pollutant from a lognormal probability distribution when more than 20 data points are available. When less than 20 data points are available, the methods in the Technical Support Document (U.S. Environmental Protection Agency [EPA] 1991a) are used. To determine the immediate DO deficit, the 10th percentile DO concentration was selected to characterize the effluent quality. Results from the statistical analyses of the effluent quality data are summarized in Table 3-1.

Conventional effluent data quality were obtained from the daily monitoring reports spanning 1997 through 1999. The pH, temperature, DO, and fecal coliform count were analyzed. Monthly and weekly geometric means were analyzed for fecal coliform. Data were analyzed on an annual basis as well as stratified by river flow season. The statistical term "stratification" refers to the process of dividing the total set of data into non-overlapping sub-populations. Together, these sub-populations comprised the whole series of record. November through July were considered the wet season while August through October the dry season. Each parameter for each stratification scheme was fit to a lognormal distribution using Splus 4.0. Percentiles for the fitted distribution were then calculated. The distribution fit and percentiles were verified using BestFit 2.0d.

Toxic metal sample results for Duvall's effluent were obtained from Ecology's database. The effluent metal concentrations are reported (by the analytical laboratory) as total recoverable concentrations; however, water quality standards are based upon the dissolved metal concentration. The results shown in Table 3-1 are for total recoverable metal concentrations. The data for each metal parameter were fit to a lognormal distribution. Data were analyzed on an annual basis as well as stratified by river flow season. Non-detected metals were included at half the reported method detection value.

5. RIVER SURVEY

In January 2000, a bathymetric survey of the reach of the Snoqualmie River at the existing outfall location was performed in a reach approximately 250 feet upriver to approximately 200 feet downriver of the existing outfall. The survey revealed a large depression adjacent to the existing outfall. The thalweg of the river is approximately 42 feet lower than the outfall structure's manhole lid elevation. The bank from the outfall into the river slopes at approximately 1.5 H to 1 V at this location.

The recent survey also revealed a submerged gravel bar that begins to encroach into the channel approximately 150 feet downstream of the existing outfall. The channel thalweg over this bar is relatively shallow. The riverbed elevation increases approximately 15 feet from the thalweg near the existing outfall to the thalweg at the gravel bar. It is very likely that this shallow portion of the river acts as the principal hydraulic control for some distance upstream above the outfall.

The location of these riverbed features, the existing side-bank outfall, and the proposed outfall are shown on Figure 5-1. Note the elevation contours shown in this figure are 1-foot increments based on a mean sea level datum. A subsequent section discusses the proposed outfall configuration.

The extent to which the present river bathymetry and hydraulic control has been considered in previous outfall analyses and mixing zone calculations is unknown. Therefore, a water surface profile model was constructed to analyze flow conditions based on the recent river survey.

HEC-RAS hydraulic river model was calibrated to simulate water surface elevations near the existing outfall. A channel roughness factor of 0.05 (Manning's *n*) was assumed for water surface profile calculations. This value was selected from a standard open channel flow reference (Chow 1959) based on a natural stream that is clean and winding with some pools, shoals, and stones (see Appendix D). The HEC-RAS model was calibrated to river flow during the January 2000 survey, estimated to be approximately 4,000 cfs based on the USGS real time flow data for Station 12149000, the Snoqualmie River at Carnation gauge.

Of the four transects created from the survey data, two were downstream, one was located at the existing (and proposed outfall) and one was upstream. The distance-elevation data for these transects were used with the HEC-RAS (Hydrologic Engineering Center 1998) water surface profile model to calculate the depth of flow at the outfall for different river flow rates. The velocity distribution for vertical slices of each transect were calculated using the model. The slice above the outfall was used to estimate ambient flow velocity.

Based on the flow of 4,000 cfs, the water surface at Station 3 was estimated to be 24.50 feet, equal to the survey. The water surface profile calculation requires an assumed value for the energy slope at Station 1, near the gravel bar. This section was assumed to be the hydraulic control section for this reach. The energy slope that provided closest correlation of the calculated and measured water surface at Station 3 was 0.000258. This energy slope was applied to the other river flow water surface profiles to start the calculation. This procedure for starting the calculations assumes the energy slope is constant in the hydraulic control section over the flow range of interest.

HEC-RAS input and results are provided in Appendix D and summarized in Table 5-1.

Table 5-1. Water Depth and Velocity at Station 3

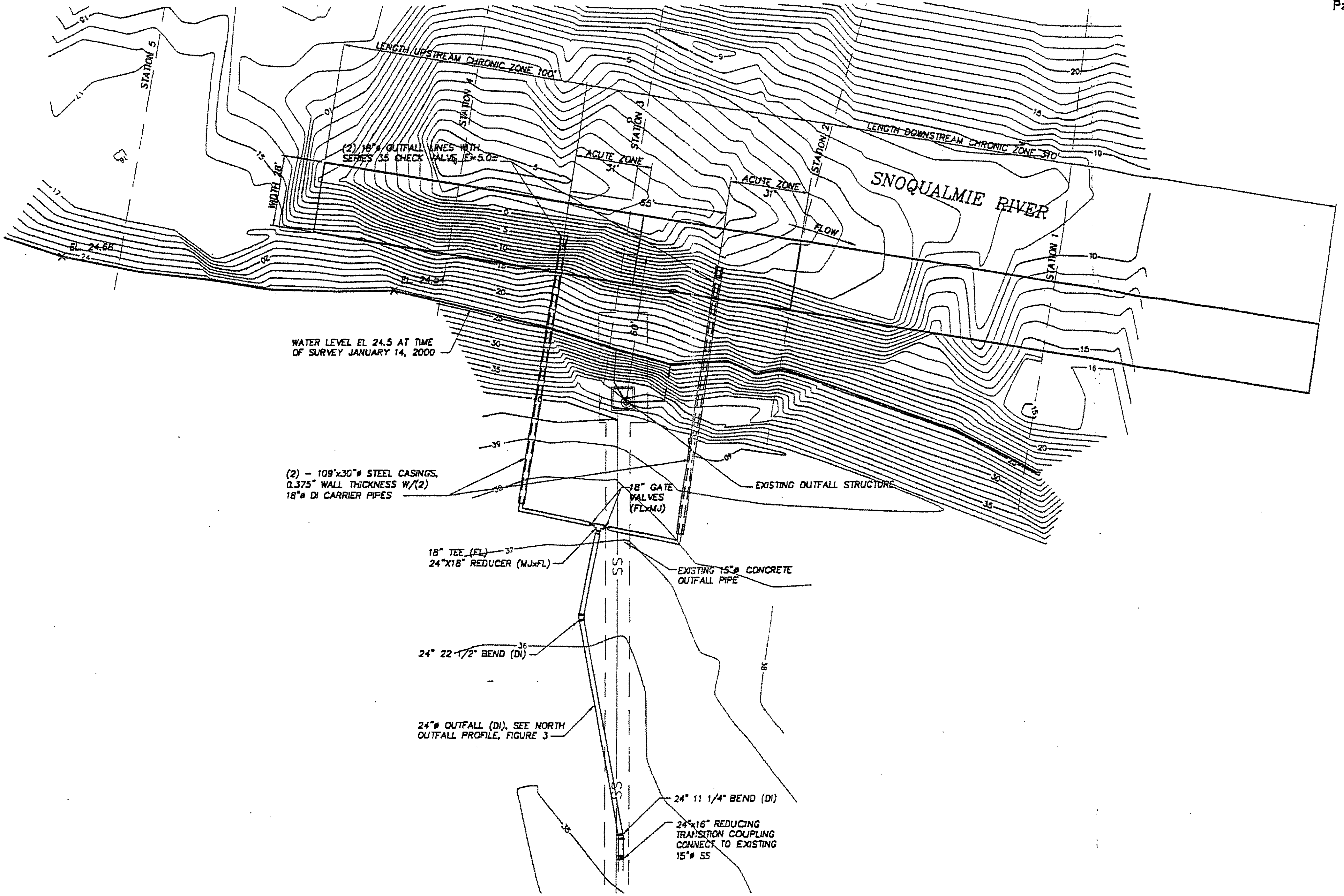
River Flow Occurrence	Snoqualmie River Flow, (cfs)	Water Depth Above Outfall[a], (ft)	River Current Velocity, (ft/s)
7Q10	443	9.9	0.5
7Q20 (August-October)	456	10.0	0.5
7Q20 (November-July)	684	11.1	0.8
Instream Flow Limit for July (WAC-173-507-020)	1850	14.9	1.0

[a] Based on a proposed outfall invert elevation 5.0 feet.

The series of flow values chosen in Table 5-1 have regulatory significance. The first three flows are used to determine the acute and chronic dilution factors that are considered to calculate effluent discharge limitations protective of aquatic life. The values are statistics computed on the basis of an averaging time interval (such as seven days) and an expected average recurrence interval (such as 10 or 20 years). For example, the 7Q10 is the 7-day average low flow with a recurrence interval of 10 years. The 7Q20 is the average 7-day flow with a 20-year recurrence interval. The 7Q20 is used when two seasons are considered as opposed to annual data series to determine effluent limits. Two 7Q20 flows have an equivalent chance of occurring each year compared to the 7Q10.

The instream flow is the required minimum flow to sustain beneficial uses of the river provided under WAC-173-507-020. It is a target flow value that is sought (by regulatory means) but may not be obtained during severe low flow conditions. Its significance is that (except for severe droughts) it is more likely to represent "desired" low flow conditions. Note that the desired instream low flow in July is about four times the 7Q20 flow (1850/456=4.07).

The depth and velocity estimates in Table 5-1 were used in the dilution model input, discussed later in this report. River velocities are similar to those used in previous studies (Cosmopolitan 1999).



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0 20 40
SCALE IN FEET

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NOTES:
ELEVATIONS IN FEET BASED ON SURVEY BY PARAMETRIX, INC. 1/14/2000.
VERTICAL SURVEY DATUM BASED ON NVGD 29.

STATION TRANSECTS USED FOR HEC-RAS HYDRAULIC MODEL.

Figure 5-1
Proposed Two Port Outfall Configuration an
Mixing Zone Sizes

6. PROPOSED OUTFALL CONFIGURATION

6.1 PIPELINE AND OUTLET PORT(S) DESCRIPTION

The outfall extension plan identified here is consistent with the general recommendation provided by an earlier study (HCW-L 1990) for a center of river outfall. The HCW-L 1990 study of potential outfall configurations noted that a center of river location improved dilution factors (compared to the side-bank discharge) to the extent that one outlet port "will easily provide compliance for chronic and acute toxicity". The toxic parameter that was under consideration in the earlier study was unionized ammonia in the effluent. The study noted that a two-port outfall could be expected to provide greater than 100 to 1 dilution, but if the ports were placed in parallel on the same diffuser pipe, the width of the plume would exceed the width allowed for chronic mixing zones.

The configuration proposed here is a two-port center of river outfall that has the ports in series (rather than parallel) to the receiving water flow to minimize the width of the plume. The river channel narrows at the location of the existing outfall and the surface width during the critical low flow period is estimated to be approximately 110 feet.

In the preliminary plan for a new outfall (Figure 5-1), the existing outfall (manhole) structure will be bypassed by a new pipeline that will bifurcate on the high bank above the river and each portal pipe will extend approximately 60 feet riverward from the existing structure. The invert elevation of the outfall ports is planned for the 5± feet elevation. A "tideflex" valve will be attached to the port (See Figure 6-2).

The tideflex diffuser check valve is an elastomeric, fabric-reinforced check valve that transitions from a circular cross section where it is attached to the effluent pipe to a flattened portion known as the "duckbill" that projects into the river. The valve opens in response to forward hydraulic pressure and closes due to the elasticity of the rubber matrix and reverse differential pressure. The valve material is impervious to fresh and saltwater corrosion.

The tideflex valve variable orifice nozzle causes less variance in jet velocity. As the flow rate increases, the tideflex valve opens more, increasing the flow area. The increased flow area reduces the pressure drop or head loss across the nozzle when compared to fixed orifices. The flexible opening also assists in creating a more uniform flow through all of the diffuser nozzles when compared to a fixed orifice.

The new outfall pipeline will be connected to the existing 15-inch diameter concrete outfall pipe approximately 80 feet landward of the existing outfall structure. A flexible coupling will be used to connect the new 24-inch-diameter outfall pipe to the existing pipe.

6.2 OPERATIONAL CONSIDERATIONS DURING SEASONAL FLOW EXTREMES

High river stages increase the hydraulic head (potential energy) needed to create a given effluent flow rate through the outfall. Additional information will be presented in the wastewater treatment plant engineering report to indicate the improvements needed at the treatment plant to provide sufficient hydraulic capacity for a range of river conditions. Partial outfall profiles are provided in Figure 6-1. If improvements at the WWTP are needed, they will be included in the proposed treatment plant upgrade engineering report.

6.3 CONSTRUCTION METHODS AND SEQUENCE

The outfall into the Snoqualmie River is proposed using the following technique:

- A steel casing will be bored into the Snoqualmie River, as shown on Figure 6-1 for each portal pipe. It is estimated that the invert elevation of the casing will be at approximate elevation 5feet. It is assumed that the casing will be 30 inches in diameter and will be of sufficient size to house the effluent portal pipe. The preliminary size of each portal pipe is 18 inches, but may be adjusted during the calculation of hydraulic capacity requirements in the WWTP engineering report. The new outfall line connected to the City's existing outfall line is estimated at this time to be a 24-inch-diameter pipe.

- During installation of the steel casings, a small amount of silt may be deposited in the river as the casing and boring equipment intercept the riverbank. To minimize downstream river turbidity, a flexible membrane will be installed in the river around the construction area to contain any turbid water resulting from the boring operations. If necessary, the turbid water will be treated and returned to the river. Once the boring operations are complete, no other downstream impacts are anticipated as a result of the installation of the effluent pipe.

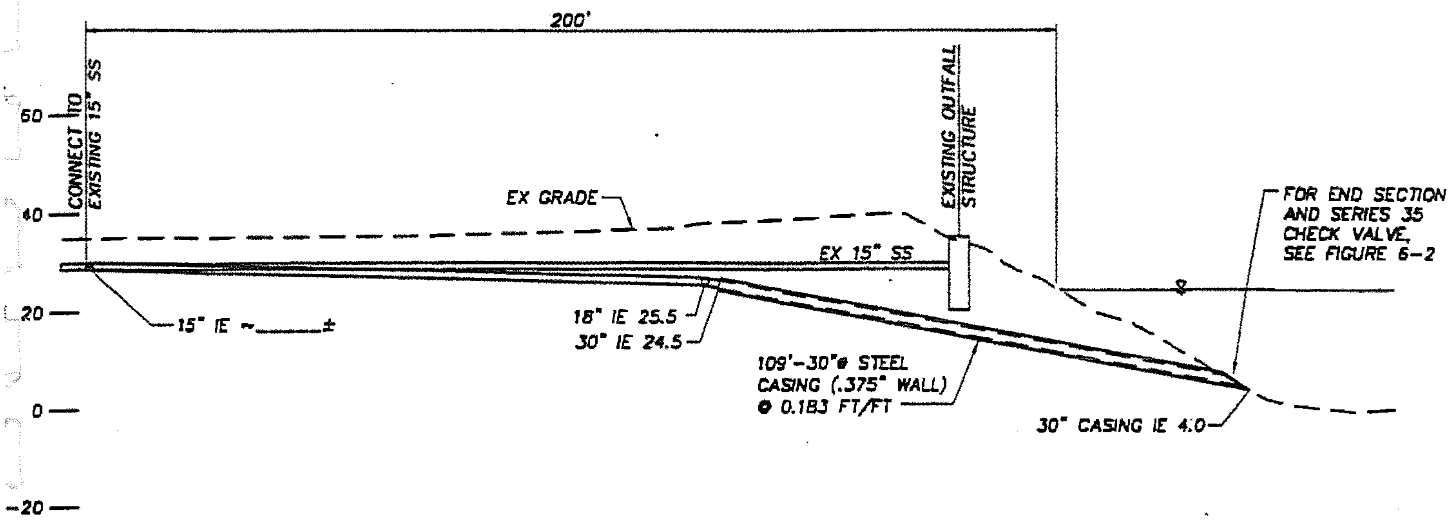
- An effluent pipe of approximately 18 inches in diameter will be installed inside the casing and a tideflex valve installed on the end of the port by divers. The tideflex valve is provided to restrict aquatic life from entering the outfall, minimize headloss, and promote mixing. Details of the installation are shown in Figure 6-2.

- Spoil material excavated within the steel casing need to be protected from erosion. It is anticipated that approximately 25 cubic yards of material will be generated from the installation of the outfall casings. Spoil material will be addressed as follows:

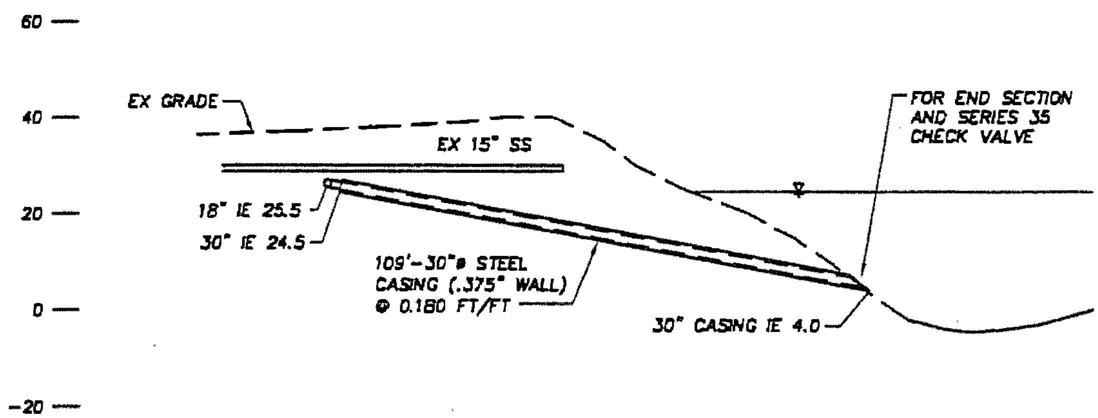
  - All excess spoil materials will be hauled off-site.

  - If spoil material is stockpiled temporarily, it will be protected from localized erosion using best management practices such as silt fences, straw bales or plastic cover.

  - All areas disturbed as a result of construction will be protected from erosion using hydroseeding with native grass seed and jute matting (if needed).



NORTH OUTFALL PROFILE



SOUTH OUTFALL PROFILE

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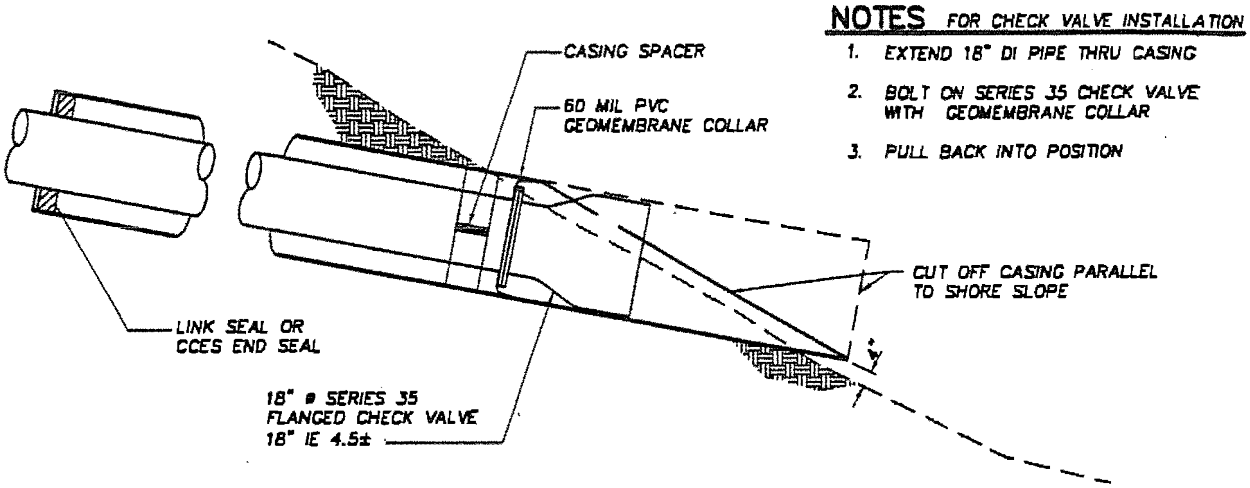
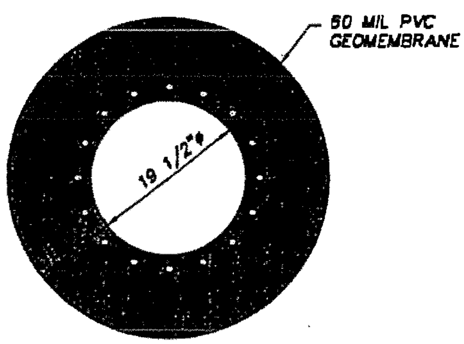
Figure 6-1
Proposed Outfall Profiles



OUTFALL CHECK VALVE



GEOMEMBRANE COLLAR

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Figure 6-2
Proposed Outfall Port Detail

7. DILUTION MODELING

7.1 REGULATORY CONSIDERATIONS

Dilution factors for the acute and chronic mixing zones may not be greater than the volumetric limitations prescribed in WAC 173-201A-100 Mixing Zones. The rule limits the acute zone mixing volume to 2.5 percent of the ambient receiving water volume and the chronic mixing zone to 25 percent of the ambient receiving water volume. Maximum allowable dilution factors are summarized in Table 7-1.

Table 7-1. Limiting Dilution Factors for Acute and Chronic Mixing Zones – Duvall WWTP Outfall

Dilution Factor, DF = (Qa + Qe)/Qe		
	Qa = Fraction 7Q20 Allowed	
	Acute	Chronic
7Q10 or 7Q20		
Annual Basis (286 mgd)	0.025	0.25
Wet Season (442 mgd)	0.025	0.25
Dry Season (295 mgd)	0.025	0.25
	Qe = Maximum Month or Day Flow, (mgd)	
	Max Day	Max Month
Annual Basis	5.25	1.75
Wet Season	5.25	1.75
Dry Season	1.37	1.05
	Maximum Allowable Dilution Factors	
	Acute	Chronic
Annual Basis	2.40	43.1
Wet Season	3.10	64.1
Dry Season	6.38	71.1

Actual dilution factors depend upon the physical mixing processes in the river. These are determined using a mixing model that considers the hydraulic conditions of the outfall and receiving waters.

Figure 7-1 shows the conceptual boundaries of the acute and chronic zones and how to calculate their geometry based on Ecology's guidance (Ecology 1996). The dilution model "near field" model results generally (but not always) coincide with the acute zone. The "farfield" model results depict dilution at the edge of the chronic zone.

The maximum length allowed for the chronic zone boundary is 300 feet plus the depth of water over the discharge port (estimated to be approximately 10 feet). This results in a mixing zone length of 310 feet, or 94.5 meters. The acute zone boundary is ten percent of the chronic zone length, or 31 feet (9.4 meters) assumed for this analysis.

The minimum river width at critical conditions is estimated at 110 feet based on hydraulic model (HEC-RAS) analyses using recent survey data. The maximum allowable plume width is 25 percent of the river width or 27.5 feet (8.38 m).

7.2 DILUTION MODEL SELECTION AND INPUT CONSIDERATIONS

Boundary conditions limit the model selection that can be used to estimate the dilution factors achievable with the existing and proposed outfall configurations. Three considerations are paramount: (1) the potential for plume attachment to the eastern river shoreline, (2) the water surface above a shallow outfall could limit the potential plume entrainment with the ambient water, and (3) the potential plume attachment to the bottom of the river. If the plume is close to the shoreline, Ecology (Appendix 6, Guidance for Conducting Mixing Zone Analyses in Ecology's Permit Writers Manual [Ecology 1996]) recommends the use of RIVPLUM5 to model downstream bank plume attachment. The guidance warns that the models are not reliable for shallow water discharges into a receiving water depth that is three diffuser pipe diameters or less in magnitude.

The estimated distance between the outfall and the nearest (right looking downstream) shoreline is approximately 15 feet (4.57 meters) at critical conditions. The depth of the water over the outfall at critical conditions is estimated to be approximately 10 feet (2.74 meters); therefore, for a potential outfall port diameter of 1.5 feet (0.46 meters), the ratio of the depth to diameter is greater than three plume diameters (10/1.5 = 6.7). The RIVPLUM5 model is based on the analytical solution by Fischer et al. (1979), which considers the principle of superposition to account for boundary conditions.

Acute and chronic zone dilution factors analysis is provided here based on the RIVPLUM5 model. The series of cases (conditions) modeled are shown in Table 7-2. All of the mixing model input and results are contained in Appendix A. Effluent and receiving water conditions were based on the data shown in Table 3-1.

Each of the models results shown in Table 7-2 and discussed in the next two sections applies to a single port outfall. However, an understanding of the magnitude of the mixing obtained using a single port is essential to understanding the need for the recommended second port in series.

Table 7-2. Case Scenarios Modeled and Resulting Dilution Factors

	WWTP Design Considerations		Mixing Zone	Dilution and Seasonal Variables	
	Flow Rate	Diffuser	Boundary	Dilution Ratio RIVPLUM5	Critical Season
1	Plan Max Day	Extended Riverward	Acute	41.1[a]	Dry (Aug-Oct) 7Q20
2	Plan Max Day	Extended Riverward	Acute	19.9[b]	Wet (Nov-Jul) 7Q20
3	Plan Max Month	Extended Riverward	Chronic	122.0[c]	Dry (Aug-Oct) 7Q20
4	Plan Max Month	Extended Riverward	Chronic	132.0[d]	Wet (Nov-Jul) 7Q20
5	Plan Max Day	Extended Riverward	Acute	10.6[e]	Annual 7Q10
6	Plan Max Month[c]	Extended Riverward	Chronic	72.0[f]	Annual 7Q10

(a) Limited to 6.4 based on 2.5% allowable volume set forth in WAC-173-201A-100 for dry season
(b) Limited to 3.1 based on 2.5% allowable volume set forth in WAC-173-201A-100 for wet season
(c) Limited to 71.1 based on 25% allowable volume set forth in WAC-173-201A-100 for dry season
(d) Limited to 64.1 based on 25% allowable volume set forth in WAC-173-201A-100 for wet season
(e) Limited to 2.4 based on 2.5% allowable volume set forth in WAC-173-201A-100 for annual
(f) Limited to 43.1 based on 25% allowable volume set forth inWAC-173-201A-100 for annual
NM Not modeled

7.3 RIVPLUM5

The RIVPLUM5 model contained in the Excel electronic spreadsheet PWSPREAD.xls was developed by Ecology. The revised February 22, 1996 version was used. The model computes the plume spread from a point source and considers the boundary effects of the shoreline and whether they effect plume spreading. The model assumptions include the following (Fischer et al. 1979):

- a single port discharge
- vertical mixing is instantaneous
- analysis considers two-dimensional plume spread (i.e., longitudinal and transverse directions), but not vertical mixing (assumed instantaneous)
- steady effluent and ambient flow rates
- boundaries are accounted for by superposition principle
- velocity at all points in the channel is equal to mean cross sectional velocity, i.e., there is no transverse variation in velocity
- transverse dispersion coefficient constant is equal to 0.6, i.e., a slowly meandering river channel form is assumed

Admittedly, the transverse mixing coefficient constant is an empirical coefficient, however its range is well established by laboratory and field studies (Yotsukura and Cobb 1972). Values for this constant have been determined by dye tests to range from 0.2 to 0.3 in three straight channels. The smaller (0.2) values were obtained in canals. The larger value (0.3) was obtained in a natural stream 2.300-foot long with a few slight bends. The natural stream was approximately 60-foot wide and flow velocity ranged 0.6 to 0.8 fps during the test. Fisher et al. (1979) has indicated transverse coefficient constants less than 0.4 are hardly ever found in natural streams. The first cited study above found the transverse mixing coefficient constant to range from 0.3 to 0.65. The presence of channel curvature increases the coefficient magnitude.

A comparison of the sensitivity of the plume width at the chronic zone boundary (using the RIVPLUM5 model) to different assumed values for transverse mixing coefficient constant at an average river velocity of 0.8 fps is shown below.

Transverse Mixing Coefficient Constant	Plume Width, feet (bounded by shore)
0.6	61
0.4	52
0.2	41

If the river current velocity increases from 0.8 to 1.0 fps, the plume width determined by the RIVPLUM5 model, assuming the same depth of flow, remains the same. The plume width calculations shown above were based on the wet season 7Q20 flow (684 cfs) and maximum month effluent discharge of 2.71 cfs.

A dye study could be performed to evaluate the transverse mixing coefficient. Based on the cited literature, however, it appears that selecting a value of 0.6 for the transverse mixing coefficient is reasonable and not too conservative at this time. A value of 0.4, for example, would only reduce the bounded plume width by 15 percent.

The acute and chronic dilution factors will be significantly increased with the proposed outfall configuration as shown in Table 7-2. The predicted dilution factors for a single-port outfall estimated by the RIVPLUM5 model in Table 7-2 are greater than the maximum dilution factors allowed (see Table 7-1) and therefore the allowable factors for reasonable potential analysis are limited as noted in Table 7-2. Note that the wet season dilutions are less than those for the dry season factors because of the significantly greater effluent design flows in the wet season. The model results indicate that the maximum allowable dilutions can be achieved by a simple riverward extension of the existing outfall.

The RIVPLUM5 model estimates plume widths bounded by the shoreline for the proposed outfall (Table 7-3). Based on the RIVPLUM5 model results, plume widths at the acute zone boundary (case 5 and 6) would slightly exceed the regulatory width limit of 27.5 feet (8.38 meters). The model results also indicate the plume widths at the chronic zone boundary would exceed 25% of the river the width in both dry and wet seasons.

Table 7-3. Modeled Plume Width

	Plume Width RIVPLUM5		
Case (No.)	(feet)	(meters)	Location
1	27.8	8.5	Acute Boundary
2	29.0	8.8	Acute Boundary
3	58.9	18.0	Chronic Boundary
4	60.9	18.6	Chronic Boundary

The plume width simulation using the RIVPLUM5 model is the result of several input parameters. The input parameters include roughness coefficient and the depth of water over the outfall. The roughness coefficient is an engineering assumption based on identification of physical properties of the receiving water. The depth of water over the outfall can be adjusted to any desired elevation.

A different model simulation was prepared in an attempt to reduce the plume width by adjusting the proposed outfall discharge from elevation 5.0 to elevation 12.5. At shallow river depths, plume width criteria can be met. However, as the river elevation changes (15′ Elev. to 50′ Elev.) throughout the year, the depth of water over the outfall will change, affecting the plume width. Therefore, no one set outfall elevation will assure compliance with plume width requirements. Based upon the range of water depths in the Snoqualmie River, it is recommended that the outfall elevation remain at 5.0 to maximize mixing and reduce water quality impacts.

7.4 PLUMES VSW TWO-PORT OUTFALL ANALYSIS

Another model, EPA's PLUMES program, was used to study the dilution effects from two ports in series and the impact on metals limits. A series of two simulation runs were made using the very shallow water (VSW) algorithm in the PLUMES program. This procedure adjusts the model to consider shallow water boundaries, but the model does not recognize when the plume becomes attached to shoreline boundaries.

Therefore, the results are only applicable for a limited distance in the flow direction (when the plume width is large enough to impinge upon the shoreline).

The VSW simulation can be used to study the dilution factors that can be obtained in the acute mixing zone. The first simulation (shown in Appendix A) is based upon one-half of the maximum day design wet season discharge rate of 2.63 mgd. In other words, it is assumed the maximum day flow is split between two port discharge points. The 95th percentile concentration for copper from Table 3-1 is used as the pollutant concentration value in the program input. The plume centerline pollutant concentration result at the downstream distance of 65 feet (20 meters), where the second discharge enters the river flow is used to provide the ambient or background concentration for the second model simulation. The second model simulation is run to the edge of the chronic mixing zone, an additional distance of 245 feet (75 meters), and then stopped.

The pollutant concentrations at the edge of the acute mixing zone boundaries are close (but not less than) the acute zone water quality standards for dissolved copper of 4.61 ug/ℓ. For example, at the edge of the first (upstream) acute mixing zone boundary, the estimated concentration is approximately 11 μg/ℓ (as total recoverable copper). At the second port (downstream) the estimated concentration is approximately 11.6 μg/ℓ. With a one-port outfall, the concentrations would be approximately twice as much. Clearly, the two-port outfall configuration enhances the performance of the outfall and improves the potential to achieve compliance with water quality standards.

Acute mixing ratios of twice those predicted in Table 7-2 will be used in the reasonable potential evaluation/acute permit limit analysis to reflect the two-port outfall. Maximum allowable acute mixing ratios from Table 7-1 likewise may be increased by a factor of two.

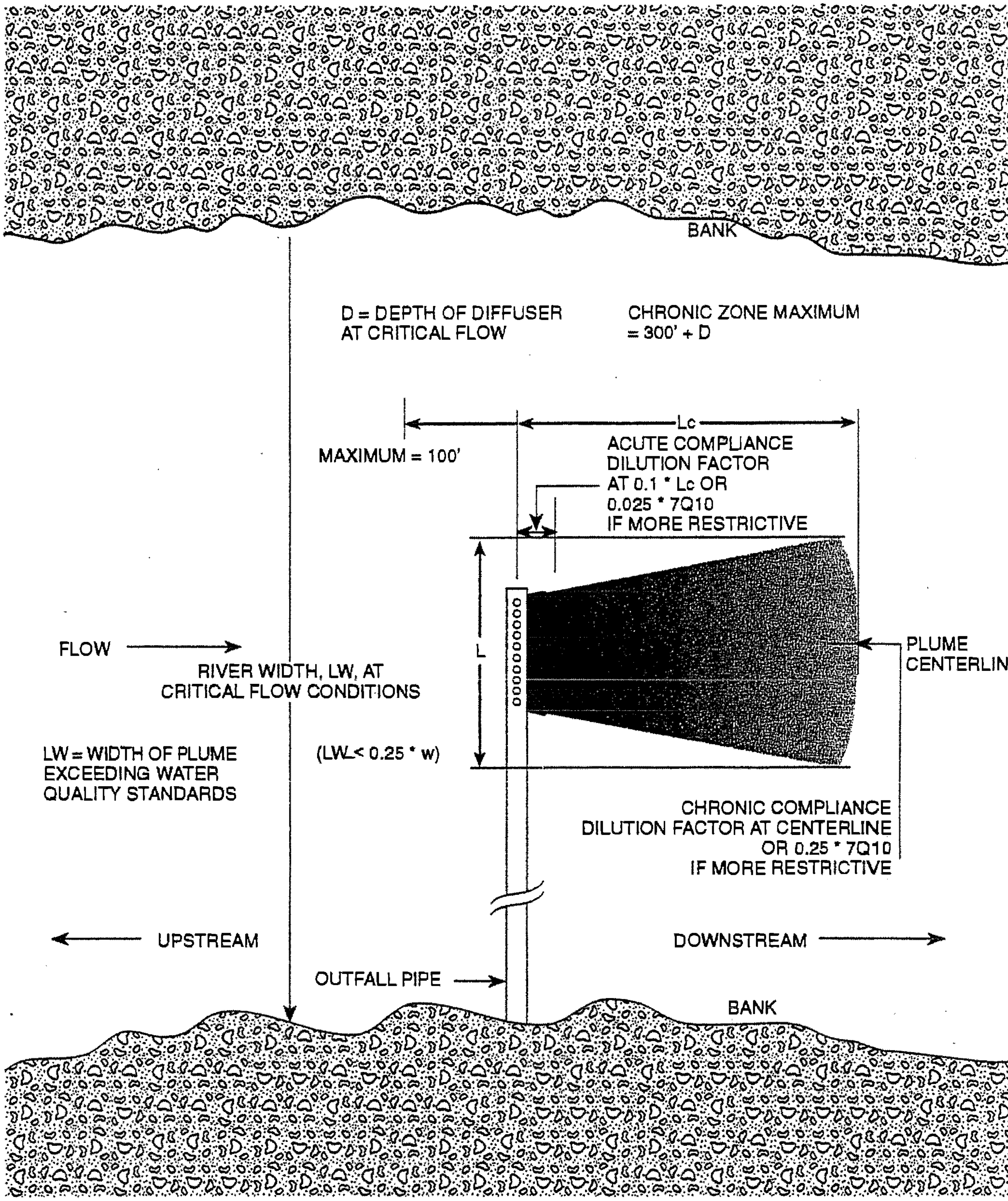


Figure 7-1
Mixing Zones in Rivers

8. REASONABLE POTENTIAL ANALYSIS AND PERMIT LIMIT DERIVATION

8.1 AQUATIC LIFE CRITERIA

Guidelines and procedures in the Permit Writers Manual (Ecology 1996) were used to perform a reasonable potential analysis. The analysis results are shown in Table 8-1. The analysis was performed assuming a single-port outfall. This analysis is presented to justify the need for a double port outfall configuration.

Effluent concentrations shown in Table 8-1 are those shown in Table 3-1 derived using the procedures for estimating the 95th percentile values based on a lognormal probability distribution. Effluent sample analytical results were placed into annual, wet, and dry season data groups.

The ammonia values (greater the 20) were sufficient to allow fitting the seasonal data to lognormal distributions. Where results were reported below detection level (BDL), a value of one-half the detection limit value was assigned. Unionized ammonia water quality criteria, expressed in mg/L NH4-N, were determined using the TSDCALC7.XLW spreadsheet. Values used for receiving water temperature and pH are shown for each season on Table 3-1. Water quality criteria calculations are shown in Appendix B.

Metals water quality criteria, expressed as total dissolved concentration (μg/ℓ), were based on a receiving water hardness of 25 mg/ℓ. Metal criteria translators are based on relationships presented in "Table VI-A1. Recommended estimates of 90th and 95th percentiles of ambient dissolved fractions (df) of Cd, Cu, Pb, and Zn based on data from rivers in Washington" (Ecology 1996). Average seasonal concentrations of receiving water total suspended solids (TSS) were estimated to be 11.0, 12.6, and 5.5 mg/L for annual wet and dry seasons, respectively. TSS data were obtained from Ecology's database for water quality monitoring Station 07D070. Water quality standards calculations are provided in Appendix B.

Note (in Table 8-1) that the metal criteria translators are less than one in the wet season when TSS is higher than the dry season. A translator value of less than one reduces the estimated dissolved metal concentration. The metals effluent concentrations shown in Table 8-1 are converted to diluted effluent concentration dissolved form by multiplying the 95% effluent pollutant concentrations shown in Table 3-1 by the translator.

The shading in Table 8-1 cells indicates the diluted effluent concentrations estimated to exceed the corresponding toxic contaminant water quality criteria. Copper (Cu), silver (Ag), and zinc (Zn) have the potential to exceed acute water quality criteria based on the effluent sample analyses since January 1993. Zinc is not expected to exceed the acute criterion in the wet season, and silver is not expected to exceed the criterion in the dry season. The results indicate the potential is less than the probability assigned to critical conditions that the effluent will exceed the respective water quality criteria at the edge of the chronic mixing zone boundary. Clearly, the mixing in the acute zone is the limiting factor in terms of meeting water quality standards.

Table 8-1. Summary of Reasonable Potential Analysis to Exceed Water Quality Standards Based on Single Port Center of Channel Outfall

Concentration Values in μg/ℓ (except ammonia is mg/ℓ)

Season	Effluent Contaminant	Acute Dil'n Factor	Chronic Dil'n Factor	Metal Criteria Translator Acute	Metal Criteria Translator Chronic	95th % Ambient Concentration River	95th % Effluent Pollutant Conc. WWTP	Diluted Pollutant Conc. Acute[a]	Diluted Pollutant Conc. Chronic[a]	Toxic Criteria Acute[b]	Toxic Criteria Chronic[b]	Criteria Tolerance Acute	Criteria Tolerance Chronic	Ratio = Tolerance/ Criteria Acute	Ratio = Tolerance/ Criteria Chronic
Wet	Ammonia	3.1	64.1	1.00	1.00	0.04	0.74	0.26	0.05	11.60	2.12	11.34	2.07	0.98	0.98
	Mercury	3.1	64.1	0.85	1.00	0.00	0.127	0.03	0.002	2.10	0.012	2.07	0.01	0.98	0.83
	Copper	3.1	64.1	0.81	0.81	0.00	72	19	0.90	4.61	3.47	-14	3	-3	1
	Silver	3.1	64.1	0.85	1.00	0.00	1.80	0.49		0.32		-0.17		-0.54	
	Zinc	3.1	64.1	0.80	0.80	0.00	133	34	1.66	35.36	32.02	1	30	0.03	0.95
Dry	Ammonia	6.4	71.1	1.00	1.00	0.03	0.97	0.18	0.05	10.70	1.64	10.52	1.59	0.98	0.97
	Mercury	6.4	71.1	0.85	1.00	0.00	0.160	0.02	0.002	2.10	0.012	2.08	0.01	0.99	0.81
	Copper	6.4	71.1	1.00	1.00	0.00	61	10	0.86	4.61	3.47	-5.0	2.6	-1.1	0.8
	Silver	6.4	71.1	0.85	1.00	0.00	1.28	0.17		0.32		0.15		0.47	
	Zinc	6.4	71.1	0.97	0.97	0.00	269	41	3.67	35.36	32.02	-5.6	28.4	-0.16	0.89
Annual	Ammonia	2.4	43.1	1.00	1.00	0.04	0.36	0.17	0.04	11.00	1.86	10.83	1.82	0.98	0.98
	Mercury	2.4	43.1	0.85	1.00	0.00	0.132	0.05	0.003	2.10	0.012	2.05	0.01	0.98	0.74
	Copper	2.4	43.1	1.00	1.00	0.00	73	30	1.69	4.61	3.47	-25.8	1.8	-5.6	0.5
	Silver	2.4	43.1	0.85	1.00	0.00	1.60	0.567		0.32		-0.25		-0.77	
	Zinc	2.4	43.1	1.00	1.00	0.00	172	72	3.99	35.36	32.02	-36.3	28.0	-1.03	0.88

Notes:

(a) Concentration = 95% concentration x criteria translator

(b) Assumes hardness value in river of 25 mg/ℓ as $CaCO_3$

Exceeds Criteria

Because of the potential to exceed water quality standards using a single-port outfall, the two-port configuration was developed (see Section 7.4). The concept would permit two acute mixing zones to be authorized as proposed on Figure 5-1. Each acute zone would be allowed to utilize a maximum dilution factor based on the 7Q20 flow condition in the respective season. The configuration would allow the flow to be divided between each port. If the flow through each port is one-half the design flow, the maximum allowed dilution factor in the acute zone is twice that computed on the basis of the maximum day design flow. Therefore, the effect of the two-port system in terms of compliance with water quality standards in the acute mixing zone, and estimation of potential effluent limits can be calculated by assuming the dilution factor is double the previous estimated value in each season (based on a single port). The calculations for potential effluent limits that follow consider the two-port outfall configuration is authorized an acute zone dilution of 4.8 for annual limits, 6.2 for the wet (high river flow) season, and 12.8 for the dry (low river flow) season.

Table 8-2 shows the estimated effluent limits under the proposed double port outfall configuration. As shown in the table, effluent limits are less restrictive if determined on a seasonal basis than an annual basis.

Table 8-2. Proposed Two-Port Outfall Water Quality Based Potential Effluent Limits

Contaminant	EPA Method	MDL[(b)(c)] (μg/L)	QL[(b)(d)] (μg/L)	Wet Season Effluent Limit (μg/L)[(a)] Month – Avg.	Wet Season Effluent Limit (μg/L)[(a)] Day – Max.	Dry Season Effluent Limit (μg/L)[(a)] Month – Avg.	Dry Season Effluent Limit (μg/L)[(a)] Day – Max.	Annual Effluent Limit (μg/L)[(a)] Month – Avg.	Annual Effluent Limit (μg/L)[(a)] Day – Max.
Ammonia[(e)]	350.1	5	25	30,400	71,900	74,000	148,000	23,700	55,700
Copper	220.2	1	5	11.2	35.3	22.6	59.0	7.0	22.1
Silver	272.2	0.2	1	0.7	2.3	1.5	4.8	0.6	1.8
Zinc	289.1	5	25	104	274	158	466	91.3	169.7

(a) Based on analysis assuming proposed outfall with double port (see Appendix C)
(b) Based on the April 1, 2000, NPDES permit
(c) Method detection limit
(d) Quantitation limit
(e) Divide values by 1000 to convert units to mg/L

The two-port outfall system significantly reduces the potential to exceed water quality standards, but it does not provide a 100 percent guarantee. A reanalysis of the results of Table 8-1 using acute zone dilution factors twice the value shown indicates no reasonable potential with each acute water quality standard in each season except for copper. However, the tolerance values (see Table 8-1) provide very little margin of safety. Additional measures should be considered to achieve dissolved metals concentrations in the effluent discharge that lower the risk that the discharge will be out of compliance.

Three potential alternatives for achieving compliance include (1) metal removal in the treatment process, (2) reduction in the effluent discharge magnitude, and (3) reduction in the influent metals concentration (i.e. from the collection system). Dissolved metal removal requires an advanced wastewater treatment process, such as a chemical precipitation (Metcalf and Eddy 1991) or a constructed wetland (Crites and Tchobanoglous 1999). These processes, while technically feasible, may not be practical in terms of cost and operational considerations. Reducing the effluent discharge magnitude would also not be practical. For example, assuming that the allowable regulatory volume for acute zone mixing is the limiting factor, the maximum daily discharge would have to be limited to approximately 0.31 mgd to eliminate the reasonable potential to exceed water quality standards. This would result in an acute dilution factor large enough (about 25:1) to lower the diluted 95th percentile value for dissolved copper concentration in the acute mixing zone to the water quality criteria on an annual basis. Clearly, lowering the dissolved metals concentrations in the influent stream is an alternative deserving additional consideration.

Reducing the dissolved metal concentrations in the influent involves two considerations: 1) accuracy and precision in detecting contaminant concentrations, and 2) source identification and discharge reduction. If there is a risk of exceeding dissolved metals water quality criteria, then the amount of exceedence must be reliably and precisely known so that measurable reduction goals can be set for a source reduction program.

Table 8-3 compares the present method detection limits, effluent limits, and average and maximum effluent sample values. The practical quantification limit for mercury and silver exceed the effluent limits. In general, the method detection limit should be much less (10 to 50 percent) of the criterion value to be able to detect an out-of-compliance condition.

Table 8-3. Comparison of Present Method Detection Limits, NPDES Effluent Limits and Sample Results

					Dry Season Effluent Limit[a]			
Contaminant	Present[b] EPA Method	MDL[c] (µg/ℓ)	QL 5xMDL (µg/ℓ)	QL (µg/ℓ)	Month – Avg. (µg/ℓ)	Day – Max. (µg/ℓ)	Avg of 21 Samples[d]	Max of 21 Samples
Ammonia	350.1	5	25	25	1,200	2,000		
Copper	200.7	1	5	5	4.6	9.3	45	360
Mercury	245.1	0.1	0.5	0.5	0.1	0.2	NQ	NQ
Silver	272.2	10	50	50	0.4	0.8	0.72	5
Zinc	200.7 (3,010)	1	5	5	35.4	71.0	38	98

(a) Based on NPDES permit (Ecology 2000) TMDL derived limit
(b) AMTEST Laboratories Methodology Report (AMTEST 1999)
(c) Instrument detection limit
(d) Arithmetic mean of samples between 4/98 and 12/99; Results <MDL=0
NQ = non-quantifiable

The conclusion is that more precise (method) detection limits are needed for mercury, silver, and possibly copper, to quantify the source reduction needed. The accuracy of the effluent contaminant concentration report is also an important factor in determining compliance. Sampling protocol and laboratory techniques can affect results.

Additional effluent analytical accuracy is needed to determine whether further source reduction programs are needed to remove dissolved metals. Sampling protocol is very important because fastidious sampling techniques reduce contaminating the sample.

Figure 8-1 illustrates the probability distribution of the effluent copper concentrations including two extremely high values in the data set. These two values are suspect; they might be contamination from external sources. In comparison, Figure 8-2 shows the probability distribution based on the same data without the two extreme values. Note there is an order of magnitude difference in the copper concentration scale between the two figures. The 95th percentile concentration in Figure 8-1 is approximately 0.25 mg/ℓ; however, it is approximately 0.038 mg/ℓ in Figure 8-2.

A statistical test of the data shows that the probability that the smaller extreme value (0.3 mg/ℓ total recoverable copper) is from the same population of the other data is approximately 8.0 E–07, about one in a million chance. In other words, these extreme values are not representative of the sample copper distribution. Clearly, accuracy in the reported results is very important to determining the significance of the contaminant concentration.

In summary, a program of additional testing is recommended to achieve water quality standards compliance for dissolved metals. This is preferred to the other two alternatives identified in the previous discussion. Therefore, discharge quantity limits or additional treatment processes are not the preferred strategies to achieve compliance at this time. The suggested strategy is to collect additional samples, analyze statistical trends, and take corrective actions as appropriate. The strategy is listed in the following sections for each metal.

8.2 COPPER COMPLIANCE STRATEGY

- Effluent sampling at least at monthly intervals using a fastidious sampling protocol adapted from EPA guidelines for avoiding sample contamination using "clean techniques".

- Analyze the trend of the total recoverable copper concentrations in the effluent using a statistical procedure such as combined Shewart-CUSUM control chart technique or the Mann-Kendall test (Gibbons 1994) to determine if there is a downward trend in concentration.

Based on the outcome of these tasks, the City will consider options to insure compliance. If the source of dissolved copper is diffuse (i.e. throughout the collection system) one alternative is to verify the significance of the copper toxicity criteria in the receiving water. This involves preparing a site-specific analysis of the dissolved copper fraction of the effluent introduced to the receiving water that will be used to calculate the metal translator used in Table 8-1 to determine the reasonable potential to exceed water quality standards. This step consists of the following tasks:

- Prepare a sampling and analysis plan incorporating clean techniques (EPA Method 1669) for Metals Translator Study and coordinate with Ecology for approval prior to initiating sampling.

- At or beyond the mixing zone edge, collect a minimum of 10 weekly or biweekly samples for total and dissolved copper during design flow conditions or a minimum of 20 biweekly or monthly total and dissolved copper samples over all flow conditions.

- Calculate site-specific translator by dividing the dissolved concentration by the total concentration. Use appropriate estimate of total and dissolved concentrations from data as described in EPA's Metals Translator Guidance.

- Apply site-specific translator to dissolved criterion to determine new permit limit for total copper.

Based on the outcome of these tasks, the City could consider the need to adjust the pH of the City's water supply to reduce copper leaching in household plumbing systems or prepare a site-specific water effects ratio (WER) study to determine the potential adverse effect of dissolved copper in the wastewater effluent. A WER study includes the following tasks:

- Prepare a work plan for developing a site-specific water quality standard through the use of a water-effect ratio (following EPA and Ecology guidelines).

- Obtain Ecology's approval prior to initiating study.

- Collect a minimum of three effluents and receiving water samples during design flow. Simulate site water by mixing effluent and receiving water in ratios representing the edge of the mixing zone.

- Determine the relative toxicity of copper in laboratory water and site water through toxicity tests with *Ceriodaphnia dubia*. Concurrent with one round of testing, an additional set of toxicity tests with copper-spiked laboratory and copper spiked site water will be conducted for *Oncorhynchus mykiss*.

- Determine water-effect ratio (ratio of LC50 for copper in site-water to LC50 in laboratory water) using appropriate methods, depending on the data.

- Apply water-effect ratio to current water quality standard to develop site-specific water quality standard or a new permit limit.

8.3 SILVER COMPLIANCE STRATEGY

- Effluent sampling at minimum monthly intervals using a fastidious sampling protocol adapted from EPA guidelines for avoiding sample contamination using "clean techniques."

- It is recognized that EPA method 270.7 (used in most of the previous analysis of effluent samples) will not provide detection limits low enough to evaluate compliance with the silver effluent limits. Therefore, the City proposes to require the analyses for silver using EPA Method 272.2, which can achieve a detection limit of 0. 1 µg/ℓ, in future testing.

- Analyze the trend of the total recoverable silver concentrations in the effluent using a statistical procedure such as combined Shewart-CUSUM control chart technique or the Mann-Kendall test (Gibbons 1994) to determine whether there is downward trend in concentration.

Based on the outcome of these tasks, the City will reconsider the need to undertake a source identification and pretreatment control plan for silver, or site specific WER studies.

8.4 ZINC COMPLIANCE STRATEGY

- Effluent sampling at minimum monthly intervals using a fastidious sampling protocol adapted from EPA guidelines for avoiding sample contamination using "clean techniques."

- Analyze the trend of the total recoverable zinc concentrations in the effluent using a statistical procedure such as combined Shewart-CUSUM control chart technique or the Mann-Kendall test (Gibbons 1994) to determine whether there is downward trend in concentration due to extraneous contamination in previous samples.

Based on the outcome of these tasks, the City will reconsider the need to undertake a source identification and pretreatment control plan for zinc, or site specific WER studies.

8.5 SOURCE IDENTIFICATION STRATEGY

A reasonable strategy to discover sources of metals discharge into the wastewater collection would be coordinated with Ecology prior to initiating additional sampling. The strategy should include a process of elimination of potential sources; sample collection, handling, and analytical protocols; and statistical methods.

A public information element may be needed to educate the community about the need to identify and remove sources of metals from the wastewater stream. This may be significant if typical sources of metals contamination are identifiable. Case studies have shown, for example, that dentistry practices may be significant sources of copper, silver, and mercury, even after application of treatment technology. The amount of these metals discharged will vary with the type of filtration equipment and solids removal (Water Environmental Federation 1999).

For example, a case study documented the amount of dissolved metal that entered the King County sewer system from general dentistry offices (Water Environmental Federation 1999). Nine water samples were taken, eight while amalgam work was being performed, to identify the magnitude of the metals in the waste streams. The mean sample result and the local limit are compared in Table 8-4.

Table 8-4. Results of dentistry office wastewater discharge monitoring in King County

Metal (dissolved)	Mean, µg/ℓ	Local Limit, µg/ℓ
Silver	33	3
Copper	19	8
Mercury	150	0
Zinc	9.9	10

In the case of nearly each metal, the mean concentration exceeded the local discharge limit. Note the above values were the average concentration of the wastewater stream from each chair; it does not indicate the total loading from each practice. A cursory review of the telephone listings indicated there are at least three general dentistry practices in the City of Duvall.

The magnitude of metals loading may be significant in a small WWTP. For example, if one assumes that one gallon of wastewater is discharged each day with the average concentration of 150 µg/ℓ dissolved mercury and is completely mixed and diluted in the WWTP with a one mgd discharge, the average concentration in the effluent of the WWTP for dissolved mercury is 0.15 µg/L. This must be diluted by at least 12.5:1 to achieve compliance with the mercury chronic water quality criterion (0.012 µg/ℓ).

8.6 TMDL LOADING LIMITATIONS FOR CBOD AND AMMONIA

There are six permitted wastewater discharges on the Snoqualmie River. Three NPDES permits regulate municipal WWTP discharges from the communities of North Bend, Snoqualmie, and Duvall. One state permit regulates process and stormwater discharges to and from the Weyerhaeuser mill pond. A permit covers the Washington State Department of Fisheries and Wildlife hatchery at Tokul Creek. The domestic wastewater and dairy manure from the Carnation Research Farms are applied to spray fields after treatment under limits set by a state permit. The three municipal plants discharge directly to the Snoqualmie River throughout the year. The Weyerhaeuser mill pond discharges intermittently to the River as the pond level clears the outlet weir. The Tokul Fish Hatchery discharges to Tokul Creek. The Carnation spray fields are located in the Ames-Sikes Creek subdrainage, but direct discharge of wastewater to surface waters is not allowed.

Nonpoint source problems in several lower river subdrainages have been documented from agricultural, residential, and silvicultural areas. The King and Snohomish Conservation Districts, state, tribal, and local government agencies have worked to control them. However, watershed or subbasin nonpoint management plans have not been written or implemented in the TMDL study area (Joy 1994).

The TMDL Study provides an allocation of 94 lbs/day of BOD_5 and 43.8 lbs/day of total ammonia to the City of Duvall under a scenario in which the three municipal wastewater treatment plants are expanded to projected dry season capacity with no nonpoint source controls (Joy, 1994). The allocations for each plant were deemed protective of the target DO and Class A criterion in the Snoqualmie River. The TMDL notes that further control of mainstem and tributary nonpoint sources, or limits on point sources beyond what is projected, will provide additional BOD and ammonia loads for reallocation. Adjustments and reallocations were acknowledged as a normal part of the TMDL process.

In May 1999, the City of Duvall submitted the *Mixing Zone Study and TMDL Alternatives Analysis* (May 1999) prepared by Cosmopolitan Engineers. In this report, the QUAL2E model from the TMDL study was updated to a newer version and a sensitivity analysis run for varying ammonia loadings from the Duvall WWTP. The goal of the modeling effort was to determine the "equivalency" between BOD and ammonia in producing downstream dissolved oxygen impacts. By trial and error, it was found that 2.5 lbs of CBOD loading is equivalent to 1 lb of ammonia loading from the Duvall WWTP. This ratio was found to be lower than other watersheds, which have been modeled by Ecology. For example, the Puyallup River TMDL BOD/Ammonia exchange ratio is 13.4:1 (Pelletier 1994). The principal reason for the lower exchange ratio for the Snoqualmie River is believed to be the lower NBOD kinetic rate constant used (Cosmopolitan Engineers 1999).

In Duvall's 1999 NPDES Permit, Ecology agreed to adopt the 2.5:1 CBOD/Ammonia exchange ratio developed in the Mixing Zone Study and TMDL Alternatives Analysis. The resulting allowable "equivalent CBOD" load for the City of Duvall WWTP is therefore 203.5 lbs/day based on the allocations from the TMDL study of 94 and 43.8 lbs/day BOD_5 and ammonia, respectively.

To better meet the intent of the TMDL study and be protective of the Snoqualmie River, it is recommended that the TMDL limitations for CBOD and total ammonia be based on the "equivalent CBOD" loading. This will require that the permit limitations for ammonia and CBOD be linked through a formula, which better describes the connection between these two constituents. This formula is provided in Table 8-5.

It is further recommended that to be protective, the TMDL limitation for CBOD and ammonia be a maximum daily limits in terms of lbs/day of "equivalent CBOD loading" (August-October). This will assure protection of the river on a daily basis, and is more conservative than the TMDL study, which was performed using WWTP maximum monthly dry season design flows (See Table 9, Joy, 1994).

No average monthly TMDL based limits for CBOD or ammonia should be imposed, as noted in Table 8-5. Both the City of Puyallup (Permit No. WA-003716-8, June 30, 1999) and City of Orting (Permit No. WA-002030-3, July 1999) TMDL based permit limitations for ammonia are maximum daily (lbs/day) limits. These permits do not contain average monthly TMDL based loading limitations.

8.7 CONVENTIONAL WATER QUALITY PARAMETERS

Conventional water quality parameters, namely pH, DO, temperature, and fecal coliform concentrations will comply with State water quality standards at the chronic mixing zone boundary. A review of the effluent and receiving water pH and fecal coliform values shown in Table 3-1 at critical conditions indicates these parameters will be within the ranges required to meet water quality standards. The plant effluent and receiving water pH range is between the water quality standard (6.5 to 8.5). The 95% effluent fecal coliform weekly geometric mean is less than 6.8 organisms/100 ml; meeting the standard of 100 organisms/100 ml.

Dry season effluent DO concentrations and temperature values were used to evaluate compliance with water quality standards at the edge of the chronic mixing zone boundary following dilution. These results are shown in Appendix B.

The DO concentration following initial dilution was estimated using Ecology's procedure contained in the spreadsheet PWSPREADmod.xls. Compliance with the DO water quality standard is measured at the chronic zone boundary. The impact of immediate DO demand was estimated using the IDOD2 worksheet (in PWSPREADmod.xls).

The input parameters required for the spreadsheet are the dilution factor at the chronic mixing zone boundary, the ambient (receiving) water DO concentration, the effluent DO concentration, and the immediate DO demand (IDOD). DO concentrations units are expressed in mg/L. The chronic dilution factors are taken from Table 7-1; the ambient and effluent DO concentrations are found in Table 3-1. The IDOD is expected to be less than 1 mg/ℓ for treatment levels better than primary (EPA 1991b) having effluent CBOD of less than 50 mg/ℓ. The NPDES permit maximum, weekly CBOD limit is 27.5 mg/ℓ in the dry season. An IDOD of 0.5 mg/ℓ is assumed since this is approximately one-half the CBOD value with an IDOD of 1 mg/ℓ.

The results of the immediate DO analysis are shown in Appendix B. The allowable maximum dilution factors of 64.1 and 71.1 were used for the wet and chronic seasons, respectively. The calculated DO concentration at the chronic mixing zone boundary is greater than the minimum standard value of 8.0 mg/ℓ. The estimated dry season critical DO concentration is calculated as 9.33 mg/ℓ. Increasing the assumed value for the IDOD parameter to 1.0 mg/ℓ decreases the DO at the mixing zone boundary by less than 0.1 mg/ℓ.

Ambient temperature exceeds the water quality standard of 18.0°C during the dry season, however, the increase in temperature due to the Duvall discharge after dilution at the mixing zone boundary is not estimated to increase the natural background temperature by more than 0.3°C during the critical dry season (see Appendix B).

8.8 POTENTIAL EFFLUENT LIMITS

Table 8-5 summarizes the potential effluent limits and identifies the most limiting criteria (by shading the appropriate cells) relative to whether the limiting basis is based on water quality criteria, TMDL recommendations, or AKART criteria.

Chlorine and mercury are not included in Table 8-5. The proposed method of effluent disinfection that will be developed in the wastewater treatment plant engineering report will eliminate chlorination; therefore, the potential for toxic effects in the effluent discharge due to chlorine will be eliminated. The reasonable potential analysis (Table 8-1) determined that mercury was not a parameter with the potential to exceed water quality standards.

It is important to note that the recommended ammonia limit and corresponding $CBOD_5$ limit as mandated by the TMDL have inverse numerical relationship. If one of the parameters concentration increases the other must decrease to be compliant to the TMDL. Table 8-5 reflects an equivalent CBOD load consistent with the TMDL.

Table 8-5. Potential Effluent Limitations for Year 2020 Proposed Wastewater Treatment Plant Design Discharge

Water Quantity and Quality Parameters, Units	Basis of Limitation	High Flow (wet) Season November 1 through July 31		Low Flow (dry) Season August 1 through October 31	
Conventional Parameters		Average Monthly	Average Weekly	Average Monthly	Average Weekly
Flow[a], mgd		1.75	5.25	1.05	1.37
Carbonaceous biochemical oxygen demand (5 day), mg/ℓ	AKART	25[c]	40[c]	25[c]	40[c]
	TMDL[b]			No Limit	[d]
Total suspended solids, mg/ℓ	AKART	30	45	30	45
Fecal coliform, number/100 mℓ	AKART	200	400	200	400
pH, standard units	AKART	Shall not be outside the range of 6.0 to 9.0		Shall not be outside the range of 6.0 to 9.0	
Toxic Parameters		Average Monthly	Maximum Daily	Average Monthly	Maximum Daily
Ammonia, mg/ℓ	Aquatic life based standards[b]	30.4	71.9	74.0	148.5
	TMDL			No Limit	[d]
Copper, µg/ℓ	Aquatic life based standards[b]	11.2	35.3	22.6	59.0
Silver, µg/ℓ	Aquatic life based standards[b]	0.7	2.3	1.5	4.8
Zinc, µg/ℓ	Aquatic life based standards[b]	104	274	158	466

Shaded cells indicate the governing effluent limit.

(a) Based on forecast for end of planning period year 2020

(b) Based on two-port outfall configuration

(c) Based on current April 1, 2000 NPDES permit limits

(d) Daily limit equivalent CBOD not to exceed 203.5 lbs/day:

Allowable ammonia portion of combined CBOD not to exceed: $\frac{203.5 \text{ lbs/day} - \text{CBOD(lbs/day)}}{2.5}$

Where:
- 203.5 lbs/day is total allowable combined equivalent CBOD loading (Joy, J. 1994)
- CBOD (lbs/day) is concurrent daily composite sample result
- 2.5 is QUAL2E modeled CBOD/NBOD exchange ratio (Cosmopolitan 1999)

Figure 8-1. Effluent Copper Concentration Probability with Two Extreme Values

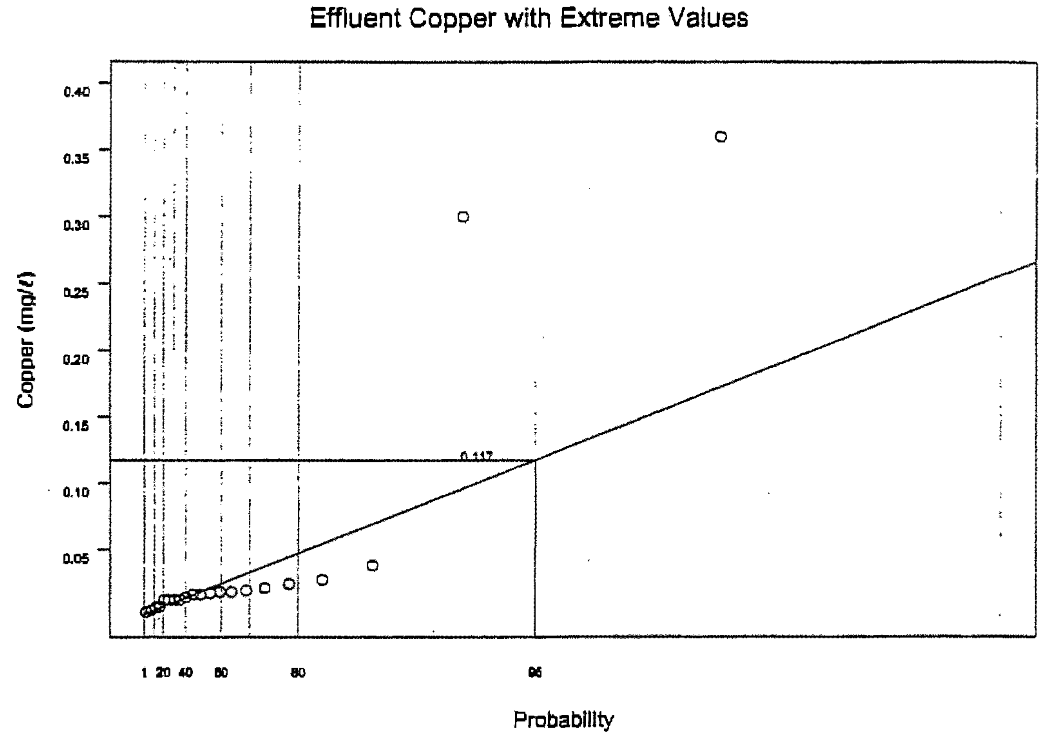
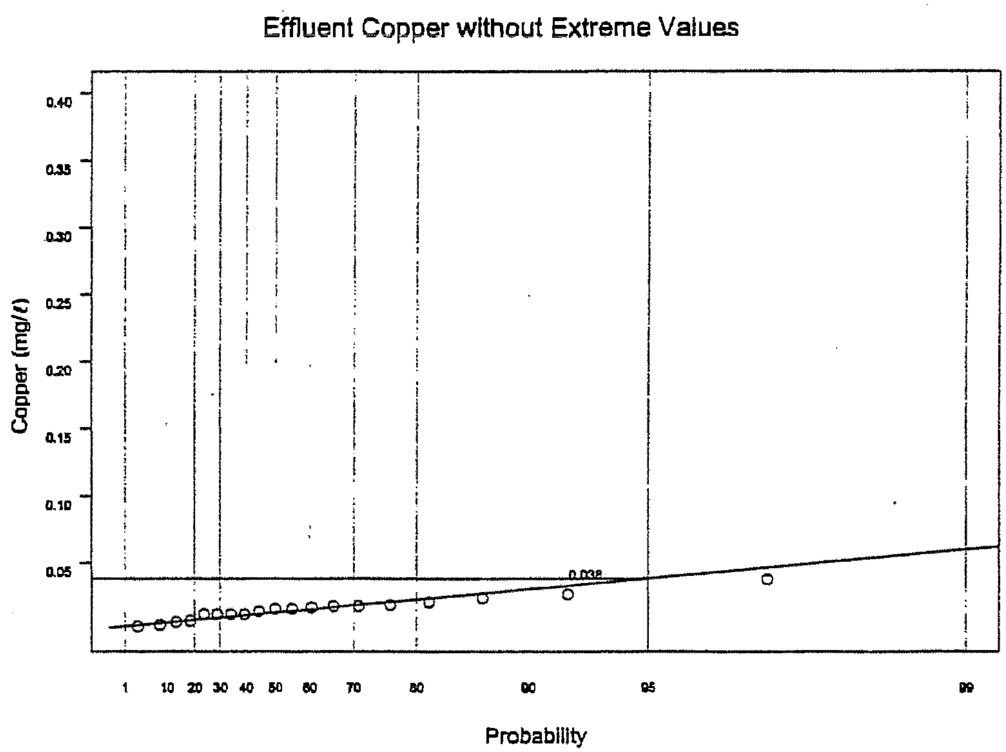


Figure 8-2. Effluent Copper Concentration Probability without Two Extreme Values



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APPENDIX A

Dilution Modeling Input and Results

Spread of a plume from a point source in a river with boundary effects from the shoreline based on the method of Fischer *et al.* (1979) with correction for the effective origin of effluent.

DUVALL PROPOSED CHANNEL OUTFALL

Revised 22-Feb-96	Wet Season Analysis		Dry Season Analysis		Annual Analysis	
	Acute	Chronic	Acute	Chronic	Acute	Chronic
INPUT						
Snoqualmie River Flow (cfs)	684	684	456	456	443	443
1. Effluent Discharge Rate (cfs):	8.12	2.71	2.12	1.62	8.12	2.71
2. Receiving Water Characteristics Downstream From Waste Input						
Stream Depth (ft):	11.10	11.10	10.00	10.00	9.90	9.90
Stream Velocity (fps):	0.80	0.80	0.50	0.50	0.50	0.50
Channel Width (ft):	110.00	110.00	110.00	110.00	110.00	110.00
Stream Slope (ft/ft) or Manning roughness "n":	0.05	0.05	0.05	0.05	0.05	0.05
0 if slope or 1 if Manning "n" in previous cell:	1	1	1	1	1	1
3. Discharge Distance From Nearest Shoreline (ft):	15	15	15	15	15	15
4. Location of Point of Interest to Estimate Dilution						
Distance Downstream to Point of Interest (ft):	31	310	31	310	31	310
Distance From Nearest Shoreline (ft):	15	15	15	15	15	15
5. Transverse Mixing Coefficient Constant (usually 0.6):	0.6	0.6	0.6	0.6	0.6	0.6
6. Original Fischer Method (enter 0) or *Effective Origin* Modification (enter 1)	0	0	0	0	0	0
OUTPUT						
1. Source Conservative Mass Input Rate						
Concentration of Conservative Substance (%):	100.00	100.00	100.00	100.00	100.00	100.00
Source Conservative Mass Input Rate (cfs*%):	812.00	271.00	212.00	162.00	812.00	271.00
2. Shear Velocity						
Shear Velocity based on slope (ft/sec):	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
Shear Velocity based on Manning "n": using Prasuhn equations 8-26 and 8-54 assuming hydraulic radius equals depth for wide channel						
Darcy-Weisbach friction factor "f":	0.130	0.130	0.135	0.135	0.135	0.135
Shear Velocity from Darcy-Weisbach "f" (ft/sec):	0.102	0.102	0.065	0.065	0.065	0.065
Selected Shear Velocity for next step (ft/sec):	0.102	0.102	0.065	0.065	0.065	0.065
3. Transverse Mixing Coefficient (ft2/sec):	0.679	0.679	0.389	0.389	0.386	0.386
4. Plume Characteristics Accounting for Shoreline Effect (Fischer *et al.*, 1979)						
Co	8.31E-01	2.77E-01	3.85E-01	2.95E-01	1.49E+00	4.98E-01
x'	2.18E-03	2.18E-02	1.99E-03	1.99E-02	1.98E-03	1.98E-02
y'o	1.36E-01	1.36E-01	1.36E-01	1.36E-01	1.36E-01	1.36E-01
y' at point of interest	1.36E-01	1.36E-01	1.36E-01	1.36E-01	1.36E-01	1.36E-01
Solution using superposition equation (Fischer eqn 5.9)						
Term for n= -2	0.00E+00	1.40E-80	0.00E+00	7.75E-88	0.00E+00	1.43E-88
Term for n= -1	2.30E-200	1.09E-20	1.67E-218	1.67E-22	2.46E-220	1.09E-22
Term for n= 0	1.00E+00	1.43E+00	1.00E+00	1.39E+00	1.00E+00	1.39E+00
Term for n= 1	1.25E-149	1.29E-15	3.69E-163	5.71E-17	1.59E-164	4.17E-17
Term for n= 2	0.00E+00	4.60E-70	0.00E+00	2.31E-76	0.00E+00	5.33E-77
Upstream Distance from Outfall to *Effective Origin* of Effluent Source (ft)	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
Effective Distance Downstream from Effluent to Point of Interest (ft)	31.00	310.00	31.00	310.00	31.00	310.00
x' Adjusted for *Effective Origin*	2.18E-03	2.18E-02	1.99E-03	1.99E-02	1.98E-03	1.98E-02
C/Co (dimensionless)	6.05E+00	2.73E+00	6.32E+00	2.78E+00	6.34E+00	2.79E+00
Concentration at Point of Interest (Fischer Eqn 5.9)	5.03E+00	7.56E-01	2.44E+00	8.20E-01	9.46E+00	1.39E+00
Unbounded Plume Width at Point of Interest (ft)	29.023	91.778	27.788	87.873	27.672	87.505
Unbounded Plume half-width (ft)	14.511	45.889	13.894	43.936	13.836	43.753
Distance from near shore to discharge point (ft)	15.00	15.00	15.00	15.00	15.00	15.00
Distance from far shore to discharge point (ft)	95.00	95.00	95.00	95.00	95.00	95.00
Plume width bounded by shoreline (ft)	29.02	60.89	27.79	58.94	27.67	58.75
Approximate Downstream Distance to Complete Mix (ft):	4,251	4,251	4,638	4,638	4,677	4,677
Theoretical Dilution Factor at Complete Mix:	120.30	360.44	259.43	339.51	67.06	200.92
Calculated Flux-Average Dilution Factor Across Entire Plume Width:	31.74	199.52	65.54	181.90	16.87	107.32
Calculated Dilution Factor at Point of Interest:	19.89	132.22	41.07	121.96	10.57	72.03

Parametrix, Inc.

PROJECT: DUVALL WWTP OUTFALL - PLUMES SIMULATION JOB NO ____
BY: JRD DATE: 3/2000 CHECKED ____ DATE ____ SHEET ____ OF ____

PLUMES INPUT DATA WET SEASON ACUTE - MAX DAY FLOW

TOTAL FLOW	# PORTS	PORT FLOW	SPACING	EFFL SALINITY	EFFL TEMP	FARFIELD INC.	FARFIELD DIST.
$\frac{5.25}{2}$ = 2.63 MGD	1			0	18.6°C		
PORT DEPTH	PORT DIA	PLUME DIA	TOT VEL	HORIZ VEL	VERT VEL	ASP COEF	PRINT FREQ
3.4 m.	0.6						50
PORT ELEV	VERT ∡	CONTRACT COEF	EFFL DENSITY	POLL CONC	DECAY	FROUDE #	ROBERTS #
0.3 m.	0	1.0	998.5	72	0		
HORIZ ∡	RED SPACE	P AMB	P CURRENT	FARFIELD DIFFUSION	FAR VEL	K VEL	
90°		999	0.24	0.0005	0.24		
DEPTH	CURRENT	DENSITY	SALINITY	TEMP	AMB CONC		
0	0.24	999		14.1	4.4		
3.4	0.23	999		14.2	4.4		

VSW ALGORITHM ACTIVATED

```
Mar 20, 2000,  12:46:46  WED PROGRAM PLUMES, Ed 3.1, 8/7/95   Case:    5 of   8
Title    ^ZSDUVALL WWTP OUTFALL WET SEASON ACUTE MAX DAY 18" PORT     nonlinear
  tot flow   # ports port flow   spacing  effl sal effl temp   far inc   far dis
    0.2304         1    0.2304     7.400       0.0      18.6        10      94.5
  port dep  port dia plume dia total vel horiz vel vertl vel asp coeff print frq
     20.00    0.6505    0.6505    0.6933    0.6933     0.000      0.10        15
 port elev ver angle cont coef  effl den poll conc     decay  Froude # Roberts F
       0.3       0.0       1.0  -1.45404        72         0     10.07     60.95
 hor angle red space p amb den p current   far dif   far vel K:vel/cur Stratif #
        90     7.400 -0.712319      0.24    0.0005      0.24     2.889-0.0003088
     depth   current   density  salinity      temp  amb conc  N (freq) red grav.
       0.0      0.24 -0.705276         0      14.1         0 -0.001859  0.007285
        40      0.23 -0.719361         0      14.2         0 buoy flux puff-ther
                                                           0 0.0002268     3.986
                                                             jet-plume jet-cross
                                                                 6.167     1.665
                                                             plu-cross jet-strat
                                                                0.1214     14.66
                                                             plu-strat
                                                                 22.61
                                                               hor dis =
                                                                    20
CORMIX1 flow category algorithm is turned off.
 22.61 m, 74.17 ft                                                   to  m range
Help: F1.  Quit: <esc>.  Configuration:ATNP0.  FILE: DUVALL.VAR;
UM INITIAL DILUTION CALCULATION (nonlinear mode)
```

95th % COPPER

plume dep (m)	plume dia (m)	poll conc	dilution	hor dis (m)	
20.00	0.6505	72.00	1.000	0.000	
20.00	0.6528	71.50	1.007	0.01702	-> bottom hit
20.00	0.7071	64.89	1.109	0.2006	-> bottom hit
20.00	0.7695	58.48	1.231	0.4137	-> bottom hit
20.00	0.8363	52.71	1.366	0.6497	-> bottom hit
19.99	0.9077	47.50	1.515	0.9114	-> bottom hit
19.99	0.9839	42.81	1.681	1.202	-> bottom hit
19.98	1.065	38.58	1.865	1.525	-> bottom hit
19.97	1.151	34.77	2.070	1.885	-> bottom hit
19.96	1.243	31.34	2.296	2.288	-> bottom hit
19.95	1.340	28.25	2.548	2.738	-> bottom hit
19.93	1.443	25.46	2.827	3.242	-> bottom hit
19.90	1.551	22.94	3.137	3.809	-> bottom hit
19.87	1.666	20.68	3.480	4.447	-> bottom hit
19.83	1.786	18.63	3.861	5.166	-> bottom hit
19.79	1.913	16.79	4.285	5.958	-> bottom hit
19.73	2.047	15.14	4.754	6.812	-> bottom hit
19.66	2.188	13.64	5.275	7.722	-> bottom hit
19.59	2.335	12.29	5.853	8.685	-> bottom hit
19.50	2.490	11.08	6.494	9.700	-> bottom hit
19.41	2.653	9.986	7.205	10.77	-> bottom hit
19.31	2.825	9.000	7.995	11.89	-> bottom hit
19.20	3.004	8.111	8.870	13.07	-> bottom hit
19.08	3.193	7.310	9.842	14.31	-> bottom hit
18.95	3.391	6.588	10.92	15.62	-> bottom hit
18.82	3.598	5.938	12.12	17.00	-> bottom hit
18.67	3.816	5.352	13.44	18.46	-> bottom hit
18.52	4.045	4.823	14.92	20.00	-> bottom hit
18.35	4.286	4.347	16.55	21.65	-> bottom hit
18.18	4.538	3.918	18.37	23.39	-> bottom hit
17.99	4.803	3.531	20.38	25.25	-> bottom hit
17.79	5.081	3.182	22.61	27.23	-> bottom hit
17.58	5.373	2.868	25.09	29.35	
17.36	5.680	2.585	27.84	31.61	
17.13	6.003	2.329	30.89	34.03	
16.88	6.342	2.099	34.27	36.62	
16.62	6.698	1.892	38.03	39.40	
16.34	7.072	1.705	42.19	42.38	
16.07	7.439	1.548	46.49	45.36	-> surface reflection begi
16.05	7.468	1.537	46.82	45.59	

10TH IS <85m

APPROXIMATE CONCENTRATION AT ACUTE BOUNDARY (1ST PORT-U/S)

COMPLIANCE W/ WQC

15.72	7.960	1.385	51.94	49.23	
15.36	8.556	1.248	57.64	53.32	
14.95	9.250	1.125	63.95	57.92	
14.50	10.05	1.014	70.96	63.05	
13.99	10.96	0.9138	78.73	68.78	
13.43	11.99	0.8236	87.36	75.15	
12.80	13.15	0.7422	96.93	82.21	
12.11	14.46	0.6690	107.6	90.02	
11.34	15.92	0.6029	119.3	98.63	
10.48	17.55	0.5434	132.4	108.1	
9.520	19.38	0.4897	146.9	118.5	-> bank(s) reached
8.458	21.41	0.4413	163.0	129.8	
7.277	23.67	0.3978	180.9	142.2	
5.964	26.19	0.3585	200.7	155.6	
4.505	28.98	0.3231	222.7	170.1	
2.883	32.08	0.2912	247.1	185.7	
1.079	35.51	0.2624	274.2	202.4	
-0.09834	37.49	0.2483	289.8	212.9	

Boundary conflict: centerline above the surface
FARFIELD CALCULATION (based on Brooks, 1960, see guide)
Farfield dispersion based on wastefield width of 37.49m

--4/3 Power Law--			--Const Eddy Diff--					
conc	dilution	width	conc	dilution	width	distance	time	
		m			m	m	sec	hrs
0.246	290	38.1	0.246	290	38.1	220	29.4	0.0082

```
Mar 20, 2000,  13:10:28  WED PROGRAM PLUMES, Ed 3.1, 8/7/95   Case:   6 of   8
Title    ^ZSDUVALL WWTP OUTFALL WET SEASON ACUTE MAX DAY                nonlinear
 tot flow   # ports port flow   spacing  effl sal effl temp   far inc   far dis
  0.2304          1    0.2304     7.400       0.0      18.6        10      94.5
  port dep  port dia plume dia total vel horiz vel vertl vel asp coeff print frq
   20.00    0.4243    0.4243     1.629     1.629     0.000      0.10        10
port elev ver angle cont coef  effl den poll conc     decay  Froude # Roberts F
    0.3       0.0       1.0  -1.45404      76.8         0     29.31     60.95
hor angle red space p amb den p current   far dif  far vel K:vel/cur Stratif #
     90     7.400 -0.712319      0.24    0.0005      0.24     6.789-0.0002014
    depth   current   density  salinity      temp  amb conc  N (freq) red grav.
    0.0      0.24 -0.705276         0      14.1       4.8 -0.001859  0.007285
     40      0.23 -0.719361         0      14.2       4.8 buoy flux puff-ther
                                                          0.0002268     7.047
                                                          jet-plume jet-cross
                                                              11.71     2.553
                                                          plu-cross jet-strat
                                                             0.1214     18.16
                                                          plu-strat
                                                              22.61
                                                            hor dis>=
                                                                75
CORMIX1 flow category algorithm is turned off.
 10                                                         1 to 2000  range
Help: F1.  Quit: <esc>.  Configuration:ATNP0.  FILE: DUVALL.VAR;
UM INITIAL DILUTION CALCULATION (nonlinear mode)
 plume dep plume dia poll conc  dilution   hor dis
        m         m                              m
    20.00    0.4243     76.80     1.000     0.000

    20.00    0.4511     71.98     1.072   0.07843
    20.00    0.4808     67.48     1.149    0.1603
    20.00    0.5124     63.28     1.231    0.2477
    20.00    0.5458     59.37     1.319    0.3410
    20.00    0.5812     55.71     1.414    0.4407
    20.00    0.6034     53.64     1.474    0.5037 -> bottom hit
    20.00    0.6187     52.30     1.515    0.5471 -> bottom hit
    20.00    0.6583     49.12     1.624    0.6607 -> bottom hit
    20.00    0.7002     46.15     1.740    0.7820 -> bottom hit
    20.00    0.7444     43.38     1.865    0.9115 -> bottom hit
    20.00    0.7911     40.80     1.999     1.050 -> bottom hit
    20.00    0.8403     38.39     2.143     1.197 -> bottom hit
    20.00    0.8922     36.14     2.296     1.355 -> bottom hit
    20.00    0.9469     34.04     2.461     1.523 -> bottom hit
    20.00     1.004     32.08     2.638     1.703 -> bottom hit
    19.99     1.065     30.26     2.827     1.895 -> bottom hit
    19.99     1.128     28.55     3.030     2.101 -> bottom hit
    19.99     1.195     26.96     3.247     2.320 -> bottom hit
    19.99     1.265     25.48     3.480     2.555 -> bottom hit
    19.99     1.338     24.09     3.730     2.806 -> bottom hit
    19.98     1.415     22.80     3.998     3.075 -> bottom hit
    19.98     1.495     21.59     4.285     3.363 -> bottom hit
    19.98     1.578     20.47     4.592     3.671 -> bottom hit
    19.97     1.666     19.42     4.922     4.002 -> bottom hit
    19.97     1.757     18.44     5.275     4.357 -> bottom hit
    19.96     1.852     17.53     5.653     4.738 -> bottom hit
    19.95     1.952     16.68     6.059     5.147 -> bottom hit
    19.95     2.055     15.88     6.494     5.588 -> bottom hit
    19.94     2.162     15.14     6.960     6.062 -> bottom hit
    19.92     2.274     14.45     7.459     6.573 -> bottom hit
    19.91     2.390     13.80     7.995     7.125 -> bottom hit
    19.90     2.510     13.20     8.568     7.720 -> bottom hit
    19.88     2.635     12.64     9.183     8.364 -> bottom hit
    19.86     2.765     12.11     9.842     9.060 -> bottom hit
    19.84     2.899     11.62    10.55      9.814 -> bottom hit
    19.81     3.038     11.16    11.31     10.63 -> bottom hit
    19.78     3.182     10.74    12.12     11.52 -> bottom hit
    19.74     3.331     10.34    12.99     12.49 -> bottom hit
```

APPROXIMATE CONCENTRATION AT ACUTE BOUNDARY (2ND PORT -D/S)

19.70	3.485	9.969	13.92	13.54 -> bottom hit
19.65	3.645	9.623	14.92	14.68 -> bottom hit
19.60	3.810	9.300	15.99	15.91 -> bottom hit
19.54	3.980	8.999	17.14	17.22 -> bottom hit
19.47	4.157	8.718	18.37	18.61 -> bottom hit
19.39	4.339	8.455	19.68	20.07 -> bottom hit
19.31	4.527	8.210	21.10	21.61 -> bottom hit
19.22	4.721	7.982	22.61	23.23 -> bottom hit
19.12	4.922	7.769	24.23	24.91 -> bottom hit
19.01	5.129	7.570	25.97	26.66 -> bottom hit
18.90	5.343	7.385	27.84	28.49 -> bottom hit
18.78	5.564	7.212	29.83	30.40 -> bottom hit
18.65	5.792	7.050	31.98	32.38 -> bottom hit
18.51	6.028	6.899	34.27	34.44 -> bottom hit
18.37	6.271	6.759	36.73	36.58 -> bottom hit
18.22	6.523	6.628	39.37	38.80 -> bottom hit
18.06	6.782	6.505	42.19	41.12 -> bottom hit
17.89	7.050	6.391	45.22	43.53 -> bottom hit
17.71	7.327	6.284	48.47	46.04 -> bottom hit
17.64	7.440	6.244	49.83	47.07 -> bottom hit
-> surface reflection begins				
17.52	7.632	6.185	51.94	48.75 -> bottom hit
17.31	7.997	6.092	55.67	51.72 -> bottom hit
17.08	8.410	6.006	59.67	54.92 -> bottom hit
16.83	$\boxed{8.871}$	5.925	63.95	58.37 -> bottom hit
16.55	9.379	5.850	68.54	62.07 -> bottom hit
16.25	9.938	5.779	73.46	66.03 -> bottom hit
15.93	10.55	5.714	78.73	70.27 -> bottom hit
15.59	11.22	5.653	84.38	74.80 -> bottom hit
15.55	11.29	5.647	84.97	75.27 -> bottom hit

IDTH
8.5M
RELINE
TTACHMENT

FARFIELD CALCULATION (based on Brooks, 1960, see guide)
Farfield dispersion based on wastefield width of 11.29m

--4/3 Power Law--			--Const Eddy Diff--					
conc	dilution	width	conc	dilution	width	distance	time	
		m			m	m	sec	hrs
5.65	85.1	11.6	5.65	85.1	11.5	80.0	19.7	0.0055
5.65	85.0	12.1	5.65	85.0	12.1	90.0	61.4	0.017
5.6								

Engineering Report
The City of Duvall
Wastewater Treatment Plant Outfall Improvements

APPENDIX B

Water Quality Criteria Worksheets

2/6/00 12:13 PM
tsdcalcrev.xlw.xls
AMMONIA.XLS

AMMONIA WATER QUALITY CRITERIA CALCULATION

NPDES Permit #

Calculation Of Ammonia Concentration and Criteria for fresh water. Based on EPA Quality Criteria for Water (EPA 400/5-86-001) and WAC 173-201A. Revised 1-5-94 (corrected total ammonia criterion). Revised 3/10/95 to calculate chronic criteria in accordance with EPA Memorandum from Heber to WQ Stds Coordinators dated July 30, 1992.

INPUT	
1. Ambient Temperature (deg C; 0<T<30)	14.2
2. Ambient pH (6.5<pH<9.0)	7.55
3. Acute TCAP (Salmonids present- 20; absent- 25)	20
4. Chronic TCAP (Salmonids present- 15; absent- 20)	15
OUTPUT	
1. Intermediate Calculations:	
Acute FT	1.49
Chronic FT	1.49
FPH	1.37
RATIO	17
pKa	9.59
Fraction Of Total Ammonia Present As Un-ionized	0.9061%
2. Un-ionized Ammonia Criteria	
Acute (1-hour) Un-ionized Ammonia Criterion (ug NH3/L)	127.5
Chronic (4-day) Un-ionized Ammonia Criterion (ug NH3/L)	23.4
3. Total Ammonia Criteria:	
Acute Total Ammonia Criterion (mg NH3+ NH4/L)	14.1
Chronic Total Ammonia Criterion (mg NH3+ NH4/L)	2.6
4. Total Ammonia Criteria expressed as Nitrogen:	
Acute Ammonia Criterion as mg N	11.6
Chronic Ammonia Criterion as N	2.12

DUVALL WWTP WET SEASON

2/6/00 12:14 PM
tsdcalcrev.xlw.xls
AMMONIA.XLS

AMMONIA WATER QUALITY CRITERIA CALCULATION

NPDES Permit #

Calculation Of Ammonia Concentration and Criteria for fresh water. Based on EPA Quality Criteria for Water (EPA 400/5-86-001) and WAC 173-201A. Revised 1-5-94 (corrected total ammonia criterion). Revised 3/10/95 to calculate chronic criteria in accordance with EPA Memorandum from Heber to WQ Stds Coordinators dated July 30, 1992..

INPUT	
1. Ambient Temperature (deg C; 0<T<30)	18.4
2. Ambient pH (6.5<pH<9.0)	7.59
3. Acute TCAP (Salmonids present- 20; absent- 25)	20
4. Chronic TCAP (Salmonids present- 15; absent- 20)	15
OUTPUT	
1. Intermediate Calculations:	
Acute FT	1.11
Chronic FT	1.41
FPH	1.32
RATIO	16
pKa	9.45
Fraction Of Total Ammonia Present As Un-ionized	1.3592%
2. Un-ionized Ammonia Criteria	
Acute (1-hour) Un-ionized Ammonia Criterion (ug NH3/L)	177.3
Chronic (4-day) Un-ionized Ammonia Criterion (ug NH3/L)	27.1
3. Total Ammonia Criteria:	
Acute Total Ammonia Criterion (mg NH3+ NH4/L)	13.0
Chronic Total Ammonia Criterion (mg NH3+ NH4/L)	2.0
4. Total Ammonia Criteria expressed as Nitrogen:	
Acute Ammonia Criterion as mg N	10.7
Chronic Ammonia Criterion as N	1.64

DUVALL WWTP DRY SEASON

2/6/00 12:15 PM
tsdcalcrev.xlw.xls
AMMONIA.XLS

AMMONIA WATER QUALITY CRITERIA CALCULATION

NPDES Permit #

Calculation Of Ammonia Concentration and Criteria for fresh water. Based on EPA Quality Criteria for Water (EPA 400/5-86-001) and WAC 173-201A. Revised 1-5-94 (corrected total ammonia criterion). Revised 3/10/95 to calculate chronic criteria in accordance with EPA Memorandum from Heber to WQ Stds Coordinators dated July 30, 1992.

INPUT	
1. Ambient Temperature (deg C; 0<T<30)	16.7
2. Ambient pH (6.5<pH<9.0)	7.58
3. Acute TCAP (Salmonids present- 20; absent- 25)	20
4. Chronic TCAP (Salmonids present- 15; absent- 20)	15
OUTPUT	
1. Intermediate Calculations:	
Acute FT	1.26
Chronic FT	1.41
FPH	1.33
RATIO	16
pKa	9.51
Fraction Of Total Ammonia Present As Un-ionized	1.1694%
2. Un-ionized Ammonia Criteria	
Acute (1-hour) Un-ionized Ammonia Criterion (ug NH3/L)	155.8
Chronic (4-day) Un-ionized Ammonia Criterion (ug NH3/L)	26.5
3. Total Ammonia Criteria:	
Acute Total Ammonia Criterion (mg NH3+ NH4/L)	13.3
Chronic Total Ammonia Criterion (mg NH3+ NH4/L)	2.3
4. Total Ammonia Criteria expressed as Nitrogen:	
Acute Ammonia Criterion as mg N	11.0
Chronic Ammonia Criterion as N	1.86

DUVALL WWTP ANNUAL SERIES

B-4

	PRIORITY	CARCIN	Water Quality Criteria				Human Health			Metals Translators	
	ITY	CIN	Fresh		Marine		Criteria		Source and	Freshwater	
Pollutant, CAS No. & Application Ref. No.	PLTNT	GEN	acute	chronic	acute	chronic	Fresh	Marine	Comments	Acute	Chronic
WATER QUALITY CRITERIA (in ug/L unless otherwise noted)											
	PRIOR	CAR	Water Quality Criteria				Human Health			Metals Translators	
	ITY	CIN	Fresh		Marine		Criteria		Source and	Freshwater	
Pollutant, CAS No. & Application Ref. No.	PLTNT	GEN	acute	chronic	acute	chronic	Fresh	Marine	Comments	Acute	Chronic
ENTER RECEIVING WATER TSS (IF UNKNOWN LEAVE BLANK) >	11										
EIVING WATER TSS IS ANNUAL DATA INSERT A, OR IF FROM CRITICAL PERIOD INSERT S>	A										
ENTER HARDNESS>>>>>>>>>	25										
ACENAPTHENE 83329 1B	Y	N	1,700.*	520.*	970.*	710*			Gold Book		
ACROLEIN 107028 1V	Y	N	68.*	21.*	55.*		320	780	NTR, Gold Book		
ACRYLONITRILE 107131 2V	Y	Y	7,550.*	2,600.*			0.059	0.66	Gold Book, NTR - HH		
ALKALINITY	N	N		20,000.					Gold Book		
ALDRIN 309002 1P	Y	Y	2.50	0.0019	0.71	0.0019	0.00013	0.00014	WAG 173-201A, NTR		
ALUMINUM	N	N	750	87					EPA 440/5-86-008		
AMMONIA unionized -see seperate spreadsheets for FW criteria	N	N			233	35			WAC 173-201A		
ANTHRACENE 120127 3B	Y	N					9600	110000	NTR		
ANTIMONY (INORGANIC) 7440360 1M	Y	N	9000	1600			14	4300	NTR - HH		
ARSENIC (dissolved) 7440382 2M	Y	Y	360	190	69	36			WAC 173-201A	1.00	1.00
ARSENIC (inorganic)	Y	Y					0.018	0.14	NTR		
ARSENIC(PENT)	Y	Y	850	48	2319	13			Gold Book		
ARSENIC(TRI)	Y	Y	360	190	69	36			Gold Book		
ASBESTOS 1332214	Y	Y					7000,000 fibers/L		NTR-HH		
BACTERIA	N	N	see document								
BARIUM	N	N		EPA recommends 1 mg/L for drinking water					Gold Book		
BENZENE 71432 3V	Y	Y	5300		5100	700	1.20	71	Gold Book, NTR - HH		
BENZIDINE 92875 4B	Y	Y	2500				0.00012	0.00054	Gold Book, NTR - HH		
BENZO(a)ANTHRACENE 56553 5B	Y	Y					0.0028	0.031	NTR		
BENZO(a)PYRENE 50328 6B	Y	Y					0.0028	0.031	NTR		
BENZO(b)FLUORANTHENE 205992 7B	Y	Y					0.0028	0.031	NTR		
BENZO(k) FLUORANTHENE 207089 9B	Y	Y					0.0028	0.031	NTR		
BERYLLIUM 7440417 3M	Y	Y	130	5.30					Gold Book		
BHC - ALPHA 319846 2P	Y	Y	100		0.34		0.0039	0.013	Gold Book, NTR - HH		
BHC - BETA 319857 3P	Y	Y	100		0.34		0.014	0.046	Gold Book, NTR - HH		
BHC - GAMMA 58899 4P (Lindane)	N	Y	2	0.08	0.16		0.0190	0.063	173-201A, NTR - HH		
BHC - DELTA 319868 5P	Y	Y							no criteria available, substance listed on NPDES applic.		
BIS(2-CHLOROETHYL)ETHER 111444 11B	Y	Y					0.031	1.4	NTR		
BIS(2 CHLOROISOPROPYL)ETHER 108601 102601 12B	Y	N					1400	170000	NTR		
BIS(2-ETHYLHEXYL) PHTHALATE 117817 13B	Y	Y	940	3	2944	3.40	1.8	5.9	Gold Book, NTR		
BROMOFORM 75252 5V	Y	Y					4.3	360	NTR		

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Pollutant, CAS No. & Application Ref. No.	PRIORITY PLTNT	CARCINGEN	Water Quality Criteria Fresh acute	Fresh chronic	Marine acute	Marine chronic	Human Health Criteria Fresh	Marine	Source and Comments	Metals Translators Freshwater Acute	Chronic
CADMIUM - 7440439 4M Hardness dependent	Y	N	0.82	0.37	42.00	9.3			WAC 173-201A	0.943	0.943
Based on hardness in next column	25										
CARBON TETRACHLORIDE 56235 6V	Y	Y	35200		50000		0.25	4.40	Gold Book, NTR - HH		
CHLOROBENZENE 108907 7V	Y	N					680	21000	NTR		
CHLORDANE 57749 6P	Y	Y	2.4	0.0043	0.09	0.004	0.00057	0.00059	WAC 173-201A, NTR		
CHLORODIBROMOMETHANE 124481 8V	Y	Y					0.41	34	NTR		
CHLORIDE (dissolved) in mg/L			860	230					SEE WAC 173-201A FOOTNOTES		
2-CHLORONAPTHALENE 91587 16B	Y	N	1600		7.50				Gold Book		
CHLORINE	N	N	19	11	13	7.50			WAC 173-201A		
CHLOROALKYL ETHERS	Y	N	238000						Gold Book		
CHLOROETHYL ETHER (BIS.-2) 111444	Y	Y					0.031	1.40	NTR		
CHLOROFORM 67663 11V	Y	Y	28900	1240			5.70	470	Gold Book, NTR - HH		
CHLOROISOPROPYL ETHER (BIS-2) 108601	Y	N					1400	170000	NTR		
CHLOROMETHYL ETHER (BIS)	N	Y					0.03	1.36	Gold Book		
CHLOROPHENOL 2 95578 1A	Y	N	4380	2000					Gold Book		
CHLOROPHENOL 4	N	N			29700				Gold Book		
CHLOROPHENOXY HERBICIDES(2,4,5-TP)	N	N		10 in drinking water					Gold Book		
CHLOROPHENOXY HERBICIDES(2,4-D)	N	N		100 in drinking water					Gold Book		
CHLORPYRIFOS	N	N	0.083	0.041	0.011	0.0056			WAC 173-201A		
CHLORO-4METHYL-3 PHENOL	N	N	30						Gold Book		
CHROMIUM(HEX) 18540299	Y	N	15	10	1100	50			WAC 173-201A	0.982	0.962
CHROMIUM(TRI) 7440473 5M Hardness dependent	N	N	176.31	57.19	*10300*	NA			WAC 173-201A; EXCEPT MARINE ACUTE		
Based on hardness in next column	25.00									0.316	0.86
CHRYSENE 218019 18B	Y	Y					0.0028	0.031	NTR		
COLOR	N	N	narrative statement see document								
COPPER - 744058 6M Hardness dependent	Y	N	4.61	3.47	4.80	3.10			WAC 173-201A	1.000	1.000
Based on hardness in next column	25.000										
CYANIDE 57125 14M	Y	N	22	5.20	1.00	1.00	700	220000	WAC 173-201A, NTR		
DDT 50293 7P	Y	Y	1.10	0.001	0.13	0.001	0.00059	0.00059	WAC 173-201A, NTR		
DDT METABOLITE (DDE) 72559 8P	Y	Y	1.10	0.001	0.13	0.001	0.00059	0.00059	WAC 173-201A, NTR		
DDT METABOLITE (DDD) 72548 9P	Y	Y	1.10	0.001	0.13	0.001	0.00083	0.00084	WAC 173-201A, NTR		
DEMETON	Y	N		0.10		0.10			Gold Book		
DIBENZO(a,h)ANTHRACENE 53703 19B	Y	Y					0.0028	0.031	NTR		
DIBUTYLPHTHALATE 84742	Y	N	940	3	2944	3.40	2700	12000	Gold Book, NTR - HH		
1,2 DICHLOROBENZENE 95501 20B	Y	N	1120	763	1970		2700	17000	NTR - HH		
1,3 DICHLOROBENZENE 541731 21B	Y	N	1120	763	1970		400	2600	NTR - HH		
1,4 DICHLOROBENZENE 106467 22B	Y	N	1120	763	1970		400	2600	NTR - HH		
3,3 DICHLOROBENZIDINE 91941 23B	Y	Y					0.04	0.077	NTR		
DICHLOROBROMOMETHANE 75274 12V	Y	Y					0.27	22	NTR		

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	PRIORITY	CARCIN	Water Quality Criteria				Human Health Criteria			Metals Translators	
			Fresh		Marine				Source and	Freshwater	
Pollutant, CAS No. & Application Ref. No.	PLTNT	GEN	acute	chronic	acute	chronic	Fresh	Marine	Comments	Acute	Chronic
DICHLOROETHANE 1,2 107062 15V	Y	Y	118000	20000	113000		0.38	99	Gold Book, NTR - HH		
1,1-DICHLOROETHYLENE 75354 16V	Y	Y	11600		224000		0.057	3.20	Gold Book, NTR - HH		
DICHLOROPHENOL 2,4 1208312 2A	N	N	2020	365			93.00	790.00	NTR - HH		
DICHLOROPROPANE	Y	N	23000	5700	10300	3040			Gold Book		
DICHLOROPROPENE	Y	N	6060	244	790				Gold Book		
1,3-DICHLOROPROPYLENE 542756 18V	Y	N					10	1700	NTR		
DIELDRIN 60571 10P	Y	Y	2.50	0.0019	0.71	0.0019	0.00014	0.00014	WAC 173-201A, NTR		
DIETHYLPHTHALATE 84662 24B	Y	N	940	3	2944	3.40	23000	120000	Gold Book, NTR - HH		
DIMETHYLPHENOL 2,4 105679	Y	N	2120								
DIMETHYLPHTHALATE 131113 25B	Y	N	940	3	2944	3.40	313000	2900000	Gold Book, NTR - HH		
DI-n-BUTYL PHTHALATE 84742 26B	Y	N					2700	12000	NTR		
2-METHYL-4,6-DINITROPHENOL 534521 4A	Y	N					13.4	765	NTR		
2,4-DINITROPHENOL 51285 5A	Y	N					70.0	14000	NTR		
DINITROTOLUENE 2,4 121142 27B	Y	Y	330	230	590	370	0.11	9.10	Gold Book, NTR - HH		
DINITROTOLUENE 2,6 606202 28B	Y	N	330	230	590	370			Gold Book		
DINITRO-O-CRESOL 2,4	Y	N					13.40	765.00	Gold Book		
DIOXIN (2,3,7,8-TCDD) 1746016	Y	Y	0.01	0.00001			0.000000013	0.000000014	Gold Book, NTR - HH		
DIPHENYLHYDRAZINE	Y	N									
DIPHENYLHYDRAZINE 1,2 122667 30B	Y	Y	270				0.04	0.54	Gold Book, NTR - HH		
DI-2-ETHYLHEXYLPHTHALATE 117817	Y	Y	940	3	2944	3.40	1.8	5.9	WQC based on Gold Book values for phthalate esthers, HH-NTR		
ENDOSULFAN a 959988 11P, b 33213659 12P	Y	N	0.22	0.056	0.034	0.0087	0.93	2.0	WAC 173-201A, NTR		
ENDOSULFAN SULFATE 1031078 13P	Y	N					0.93	2.0	NTR		
ENDRIN 72208 14P	Y	N	0.18	0.0023	0.037	0.0023	0.76	0.81	WAC 173-201A, NTR		
ENDRIN ALDEHYDE 7421934 15P	Y	N					0.76	0.81	NTR		
ETHYLBENZENE 100414 19V	Y	N	32000		430		3100	29000	Gold Book, NTR - HH		
FLUORANTHENE 206440 31B	Y	N	3980		40	16	300	370	Gold Book, NTR - HH		
FLUORENE 86737 32B	Y	N					1300	14000	NTR		
GASSES, TOTAL DISSOLVED	N	N	see WAC 173-201A and the Gold Book								
GUTHION	N	N		0.01		0.01			Gold Book		
HALOETHERS	Y	N	380	122					Gold Book		
HALOMETHANES	Y	Y	11000		12000	6400			Gold Book		
HEPTACHLOR 76448 16P	Y	Y	0.52	0.0038	0.0530	0.0036	0.00021	0.00021	WAC 173-201A, NTR		
HEPTACHLOR EPOXIDE 1024573 17P	Y	Y	0.52	0.0038	0.0530	0.0036	0.00010	0.00011	WAC 173-201A, NTR		
HEXACHLOROBENZENE 118741 33B	Y	Y					0.00075	0.00077	NTR - HH		
HEXACHLOROBUTADIENE 87683 34B	Y	Y	90	9.30	32		0.44	50	NTR - HH		
HEXACHLOROCYCLOHEXANE-ALPHA 319846 2P	Y	Y					0.0039	0.013	NTR		
HEXACHLOROCYCLOHEXANE-BETA 319857 3P	Y	Y					0.014	0.046	NTR		
HEXACHLOROCYCLOHEXANE-GAMMA (lindane) 58899 4P	Y	Y	2	0.08	0.16		0.019	0.063	WAC 173-201A, NTR		
HEXACHLOROCYCLOHEXANE-DELTA 319868 5P	Y	Y							no criteria available, substance listed on NPDES applic.		

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	PRIORITY	CARCIN	Water Quality Criteria				Human Health Criteria		Source and Comments	Metals Translators Freshwater	
			Fresh		Marine						
Pollutant, CAS No. & Application Ref. No.	PLTNT	GEN	acute	chronic	acute	chronic	Fresh	Marine		Acute	Chronic
HEXACHLOROCYCLOPENTADIENE 77474 35B	Y	N	7	5.20	7.0		240	17000	Gold Book, NTR - HH		
HEXACHLOROETHANE 67721 36B	N	Y	980	540	940		1.90	8.90	Gold Book, NTR - HH		
INDENO(1,2,3-cd)PYRENE 193395 37B	Y	Y					0.0028	0.031	NTR		
IRON	N	N		1000					Gold Book		
ISOPHORONE 78591	Y	Y	117000		12900		8.40	600	Gold Book, NTR - HH		
LEAD - 7439921 7M Dependent on hardness	Y	N	13.88	0.54	210.00	8.10			WAC 173-201A,	0.466	0.466
Based on hardness in next column	25.00										
MALATHION	N	N		0.10		0.10			Gold Book		
MANGANESE	N	N		See Gold Book							
METHYL BROMIDE 74839 20V	Y	N					48	4000	NTR		
METHYLENE CHLORIDE 75092 22V	Y	Y					4.7	1600	NTR		
MERCURY 7439976 8M	Y	N	2.10	0.012	1.80	0.0250	0.14	0.15	WAC 173-201A, NTR - HH	0.85	
METHOXYCHLOR	N	N		0.03		0.03			Gold Book		
MIREX	N	N		0.001		0.001			Gold Book		
MONOCHLOROBENZENE 108907	Y	N		See Chlorobenzene							
NAPHTHALENE 91203 39B	Y	N	2300	620	2350				Gold Book		
NICKEL 7440020 9M - Dependent on hardness	Y	N	438.06	48.65	74.00	8.20	610	4600	WAC 173-201A, NTR	0.998	0.997
Based on hardness in next column	25.00										
NITRATES	N	N		See Gold Book							
NITROBENZENE 98953 40B	Y	N	27000		6680		17	1900	Gold Book, NTR - HH		
NITROPHENOL	Y	N	230	150.00	4850				Gold Book		
NITROSAMINES	Y	Y	5850		3300000				Gold Book		
NITROSODIBUTYLAMINE N	Y	Y		See Gold Book							
NITROSODIETHYLAMINE N	Y	Y		See Gold Book							
NITROSODIMETHYLAMINE N 62759 41B	Y	Y					0.00069	8.10	NTR		
NITROSODIPHENYLAMINE N 86306 43B	Y	Y					5	16	NTR		
NITROSOPYRROLIDINE N	Y	Y		See Gold Book							
OIL AND GREASE	N	N		See Gold Book and Ecology WQ Technical Guidance							
OXYGEN DISSOLVED	N	N		See WAC 173-201A							
PARATHION	N	N	0.065	0.013					WAC 173-201A,		
Polychlorinated Biphenyls (PCB's) 53469219, 11097691, 11042	Y	Y	2	0.014	10	0.03	0.000044	0.000045	WAC 173-201A, NTR		
PENTACHLOROBENZENE	N	N		See Gold Book							
PENTACHLOROPHENOL 87865 8A (pH dependent in	Y	Y	16.25	10.26	13.	7.90	0.28	8.20	WAC 173-201A, NTR		
fresh water): Enter pH in next cell>>>>>>>>	7.58										
pH	N	N		6.5 - 8.5		7.0 - 8.5			WAC 173-201A,		
PHENOL 108952 10A	Y	N	10200	2560	5800		21000	4600000	Gold Book, NTR - HH		
PHOSPHORUS ELEMENTAL	N	N				0.10			Gold Book		
POLYNUCLEAR AROMATIC HYDROCARBONS	Y	Y			300				Gold Book		
PYRENE 129000 45B	Y	N					960	11000	NTR		

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	PRIORITY	CARCIN	Water Quality Criteria				Human Health Criteria		Source and	Metals Translators Freshwater	
			Fresh		Marine						
Pollutant, CAS No. & Application Ref. No.	PLTNT	GEN	acute	chronic	acute	chronic	Fresh	Marine	Comments	Acute	Chronic
SELENIUM 7782492 10M	Y	N	20	5	290	71			WAC 173-201A,		
SILVER - 7740224 11M dependent on hardness.	Y	N	0.32	NA	1.90	NA			SEE WAC 173-201A, acute level no	0.85	
Based on hardness in next column	25.00								to be exceeded at any time		
SOLIDS,DISSOLVED AND SALINITY	N	N		See Gold Book							
SOLIDS,SUSPENDED AND TURBIDITY	N	N		See Gold Book and WAC 173-201A					Gold Book		
TETRACHLORINATED ETHANES	Y	N	9320						Gold Book		
TETRACHLOROBENZENE 1,2,4,5	Y	N		See Gold Book							
TETRACHLOROETHANE 1,1,2,2 79345 23V	Y	Y		2400	9020		0.17	11.00	Gold Book, NTR - HH		
TETRACHLOROETHANE	Y	N	9320						Gold Book		
TETRACHLOROETHYLENE 127184 24V	Y	Y	5280	840	10200	450	0.80	8.85	Gold Book, NTR - HH		
TETRACHLOROPHENOL 2,3,5,6	Y	N			440				Gold Book		
THALLIUM 7440280 12M	Y	N	1400	40	2130		1.70	6.30	Gold Book, NTR - HH		
TOLUENE 108883 25V	Y	N	17500		6300	5000	6800	200000	Gold Book, NTR - HH		
TOXAPHENE 8001352 25P	Y	Y	0.73	0.0002	0.21	0.0002	0.00073	0.00075	WAC 173-201A, NTR		
TRICHLORINATED ETHANES	Y	Y	18000						Gold Book		
TRICHLOROETHANE 1,1,1 71556 27V	Y	N			31200				Gold Book		
TRICHLOROETHANE 1,1,2 79005 28V	Y	Y		9400			0.60	42.00	Gold Book, NTR - HH		
TRICHLOROETHYLENE 79016 29V	Y	Y	45000	21900	2000		2.70	81.00	Gold Book, NTR - HH		
TRICHLOROPHENOL 2,4,5	N	N		See Gold Book							
TRICHLOROPHENOL 2,4,6 88062 11A	Y	Y		970			2.10	6.50	Gold Book, NTR - HH		
VINYL CHLORIDE 75014 31V	Y	Y					2	525	NTR		
ZINC - 7440666 13M hardness dependent	Y	N	35.36	32.29	90.00	81.00			WAC 173-201A,	1.000	1.000
Based on hardness in next column	25.00										
* = INSUFFICIENT DATA TO DEVELOP CRITERIA VALUE											
PRESENTED IS THE L.O.E.L.-LOWEST OBSERVED											
a CADMIUM ACUTE CONVERSION FACTOR			1.00								
b CADMIUM CHRONIC CONVERSION FACTOR			0.97								
c LEAD CONVERSION FACTOR			0.99								

Dissolved oxygen concentration following initial dilution.
References: EPA/600/6-85/002b and EPA/430/9-82-011

Based on Lotus File IDOD2.WK1 Revised 19-Oct-93 **DUVALL WWTP - PROPOSED CHANNEL OUTFALL**	Wet Season Chronic	Dry Season Chronic
INPUT		
1. Dilution Factor at Mixing Zone Boundary:	64.1	71.1
2. Ambient Dissolved Oxygen Concentration (mg/L):	10.35	9.38
3. Effluent Dissolved Oxygen Concentration (mg/L):	6.66	6.36
4. Effluent Immediate Dissolved Oxygen Demand (mg/L):	0.5	0.5
OUTPUT		
Dissolved Oxygen at Mixing Zone Boundary (mg/L):	10.28	9.33

Dissolved oxygen concentration following initial dilution.
References: EPA/600/6-85/002b and EPA/430/9-82-011

Based on Lotus File IDOD2.WK1 Revised 19-Oct-93 **DUVALL WWTP - PROPOSED CHANNEL OUTFALL**	Wet Season Chronic	Dry Season Chronic
INPUT		
1. Dilution Factor at Mixing Zone Boundary:	64.1	71.1
2. Ambient Dissolved Oxygen Concentration (mg/L):	10.35	9.38
3. Effluent Dissolved Oxygen Concentration (mg/L):	6.66	6.36
4. Effluent Immediate Dissolved Oxygen Demand (mg/L):	1	1
OUTPUT		
Dissolved Oxygen at Mixing Zone Boundary (mg/L):	10.28	9.32

APPENDIX C

Water Quality-Based Effluent Permit Limits Worksheets

WATER QUALITY BASED
PERMIT LIMIT CALCULATIONS

Dilution (Dil'n) factor is the inverse of the percent effluent concentration at the edge of the acute or chronic mixing zone.

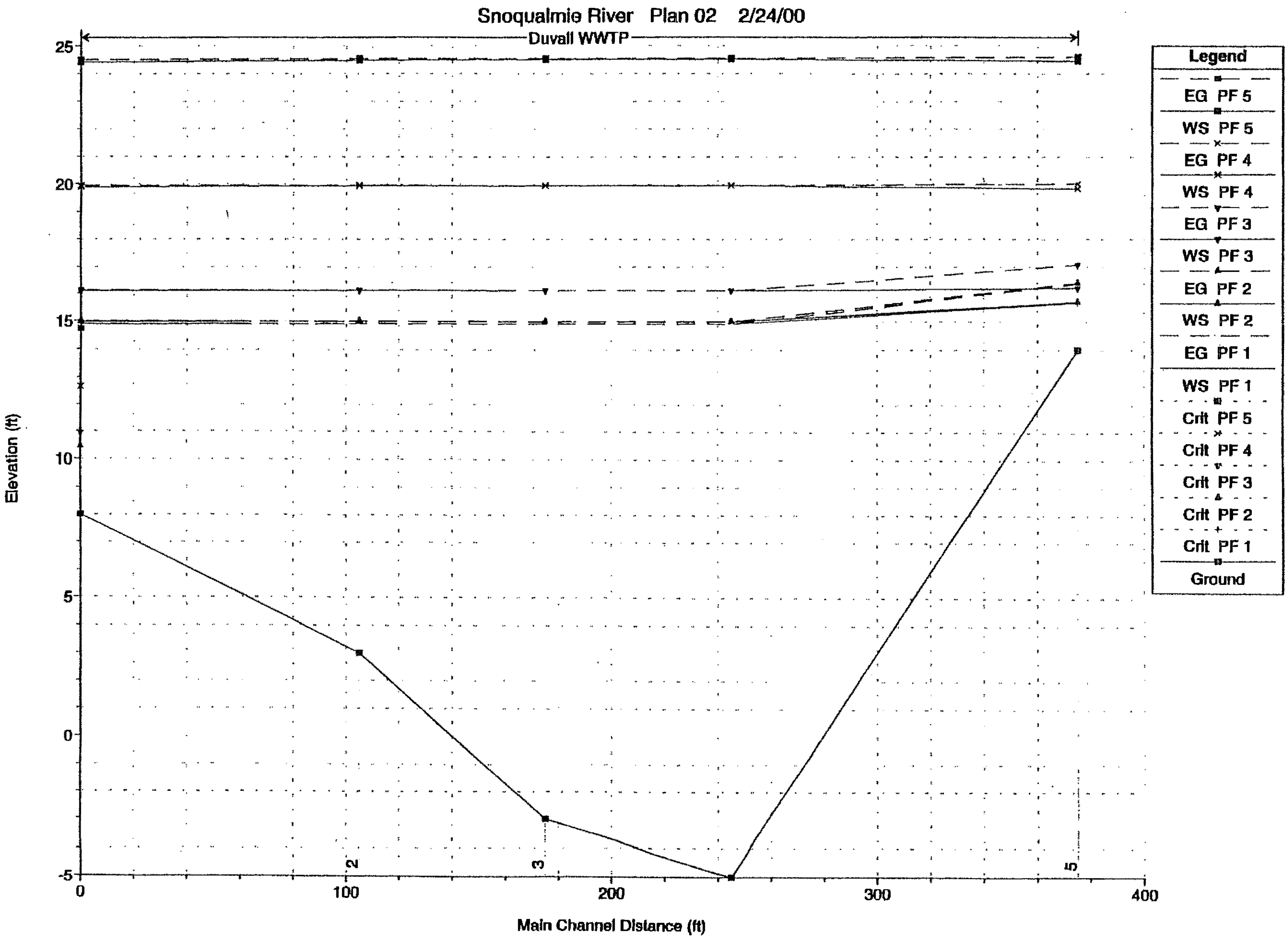
DUVALL WWTP PROPOSED CENTER CHANNEL OUTFALL PARAMETER	Permit Limit Calculation Summary: Acute Dil'n Factor	Chronic Dil'n Factor	Metal Criteria Translator or Acute	Metal Criteria Translator or Chronic	Ambient Concentration ug/L	Water Quality Standard Acute ug/L	Water Quality Standard Chronic ug/L	Average Monthly Limit (AML) ug/L	Maximum Daily Limit (MDL) ug/L	Comments	Waste Load Allocation (WLA) and Long Term Average (LTA) Calculations: WLA Acute ug/L	WLA Chronic ug/L	LTA Acute ug/L	LTA Chronic ug/L	LTA Coeff. Var. (CV) decimal	LTA Prob'y Basis decimal	Limiting LTA ug/L	Statistical variables for permit limit calculation: Coeff. Var. (CV) decimal	AML Prob'y Basis decimal	MDL Prob'y Basis decimal	# of Samples per Month n	
SINGLE PORT																						
ANNUAL																						
Ammonia	2.40	43.10	1.00	1.00		11600	2120	11871	27840		27840	91372.00	6623.4	38709.8	0.84	0.99	6623.4	0.84	0.95	0.99	4.00	1.00
Copper	2.40	43.10	1.00	1.00		4.61	3.47	3.5	11.1		11	149.56	1.2	26.2	2.38	0.99	1.2	2.38	0.95	0.99	4.00	1.00
Silver	2.40	43.10	0.85	1.00		0.32	1000.00	0.3	0.9		1	43100.00	0.1	9037.7	1.94	0.99	0.1	1.94	0.95	0.99	4.00	0.85
Zinc	2.40	43.10	1.00	1.00		35.36	32.02	45.7	84.9		85	1380.06	31.2	796.0	0.51	0.99	31.2	0.51	0.95	0.99	4.00	1.00
WET SEASON																						
Ammonia	3.10	64.10	1.00	1.00		11600	2120	15207	35960		35960	#######	8411.1	56795.8	0.86	0.99	8411.1	0.86	0.95	0.99	4.00	1.00
Copper	3.10	64.10	0.81	0.81		4.61	3.47	5.6	17.6		14	222.43	1.5	40.6	2.27	0.99	1.5	2.27	0.95	0.99	4.00	0.81
Silver	3.10	64.10	0.85	1.00		0.32	1000.00	0.4	1.2		1	64100.00	0.1	11146.0	2.40	0.99	0.1	2.40	0.95	0.99	4.00	0.85
Zinc	3.10	64.10	0.80	0.80		35.36	32.02	52.2	137.0		110	2052.48	20.4	703.8	1.11	0.99	20.4	1.11	0.95	0.99	4.00	0.80
DRY SEASON																						
Ammonia	6.40	71.10	1.00	1.00		11600	2120	37005	74240		74240	#######	######	79501.1	0.60	0.99	23837.2	0.60	0.95	0.99	4.00	1.00
Copper	6.40	71.10	1.00	1.00		4.61	3.47	11.3	29.5		30	246.72	5.5	85.1	1.10	0.99	5.5	1.10	0.95	0.99	4.00	1.00
Silver	6.40	71.10	0.85	1.00		0.32	1000.00	0.8	2.4		2	71100.00	0.2	12425.9	2.38	0.99	0.2	2.38	0.95	0.99	4.00	0.85
Zinc	6.40	71.10	0.97	0.97		35.36	32.02	78.9	233.3		228	2276.62	30.3	551.1	1.65	0.99	30.3	1.65	0.95	0.99	4.00	0.97
DOUBLE PORT																						
ANNUAL																						
Ammonia	4.80	43.10	1.00	1.00		11600	2120	23741	55680		55680	91372.00	######	38709.8	0.84	0.99	13246.9	0.84	0.95	0.99	4.00	1.00
Copper	4.80	43.10	1.00	1.00		4.61	3.47	7.0	22.1		22	149.56	2.3	26.2	2.38	0.99	2.3	2.38	0.95	0.99	4.00	1.00
Silver	4.80	43.10	0.85	1.00		0.32	1000.00	0.6	1.8		2	43100.00	0.2	9037.7	1.94	0.99	0.2	1.94	0.95	0.99	4.00	0.85
Zinc	4.80	43.10	1.00	1.00		35.36	32.02	91.3	169.7		170	1380.06	62.5	796.0	0.51	0.99	62.5	0.51	0.95	0.99	4.00	1.00
WET SEASON																						
Ammonia	6.20	64.10	1.00	1.00		11600	2120	30414	71920		71920	#######	######	56795.8	0.86	0.99	16822.3	0.86	0.95	0.99	4.00	1.00
Copper	6.20	64.10	0.81	0.81		4.61	3.47	11.2	35.3		29	222.43	3.1	40.6	2.27	0.99	3.1	2.27	0.95	0.99	4.00	0.81
Silver	6.20	64.10	0.85	1.00		0.32	1000.00	0.7	2.3		2	64100.00	0.2	11146.0	2.40	0.99	0.2	2.40	0.95	0.99	4.00	0.85
Zinc	6.20	64.10	0.80	0.80		35.36	32.02	104.5	274.0		219	2052.48	40.8	703.8	1.11	0.99	40.8	1.11	0.95	0.99	4.00	0.80
DRY SEASON																						
Ammonia	12.80	64.10	1.00	1.00		11600	2120	74011	148480		14848	#######	######	71674.0	0.60	0.99	47674.4	0.60	0.95	0.99	4.00	1.00
Copper	12.80	64.10	1.00	1.00		4.61	3.47	22.6	59.0		59	222.43	11.0	76.7	1.10	0.99	11.0	1.10	0.95	0.99	4.00	1.00
Silver	12.80	64.10	0.85	1.00		0.32	1000.00	1.5	4.8		4	64100.00	0.4	11202.6	2.38	0.99	0.4	2.38	0.95	0.99	4.00	0.85
Zinc	12.80	64.10	0.97	0.97		35.36	32.02	157.8	466.6		453	2052.48	60.6	496.8	1.65	0.99	60.6	1.65	0.95	0.99	4.00	0.97

This spreadsheet calculates water quality based permit limits based on the two value steady state model using the State Water Quality standards contained in WAC 173-201A. The procedure and calculations are done per the procedure in Technical Support Document for Water Quality-based Toxics Control, U.S. EPA, March, 1991 (EPA/505/2-90-001) on page 99. Last revision date 9/98. Written by G. Shervey

Engineering Report
The City of Duvall
Wastewater Treatment Plant Outfall Improvements

APPENDIX D

HEC-RAS River Model Output

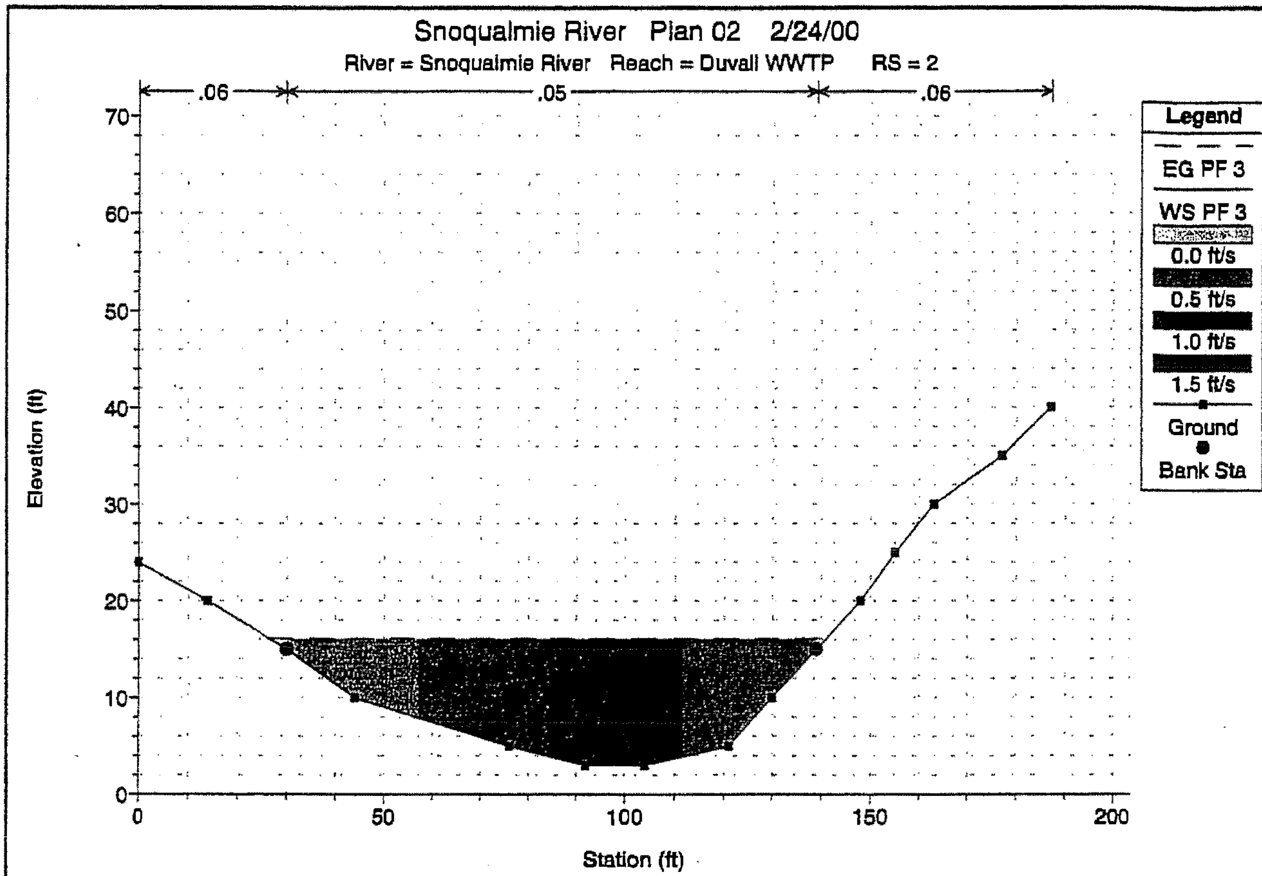

Snoqualmie River Plan 02 2/24/00
Duvall WWTP
Elevation (ft)
Main Channel Distance (ft)
25
20
15
10
5
0
-5
0
100
200
300
400
2
3
5
Legend
EG PF 5
WS PF 5
EG PF 4
WS PF 4
EG PF 3
WS PF 3
EG PF 2
WS PF 2
EG PF 1
WS PF 1
Crit PF 5
Crit PF 4
Crit PF 3
Crit PF 2
Crit PF 1
Ground

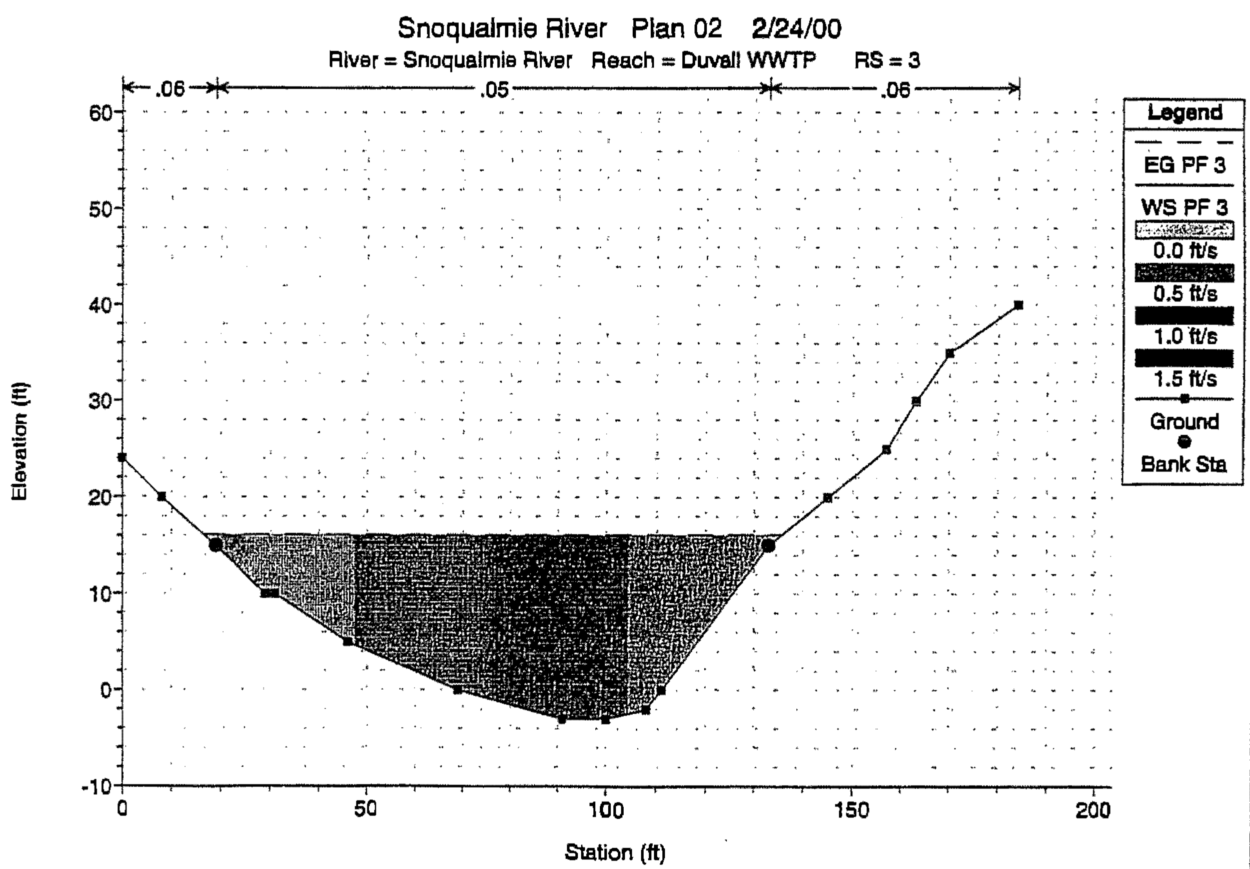
D-1

HEC-RAS Plan: Plan 01 River: Snoqualmie River Reach: Duvall WWTP

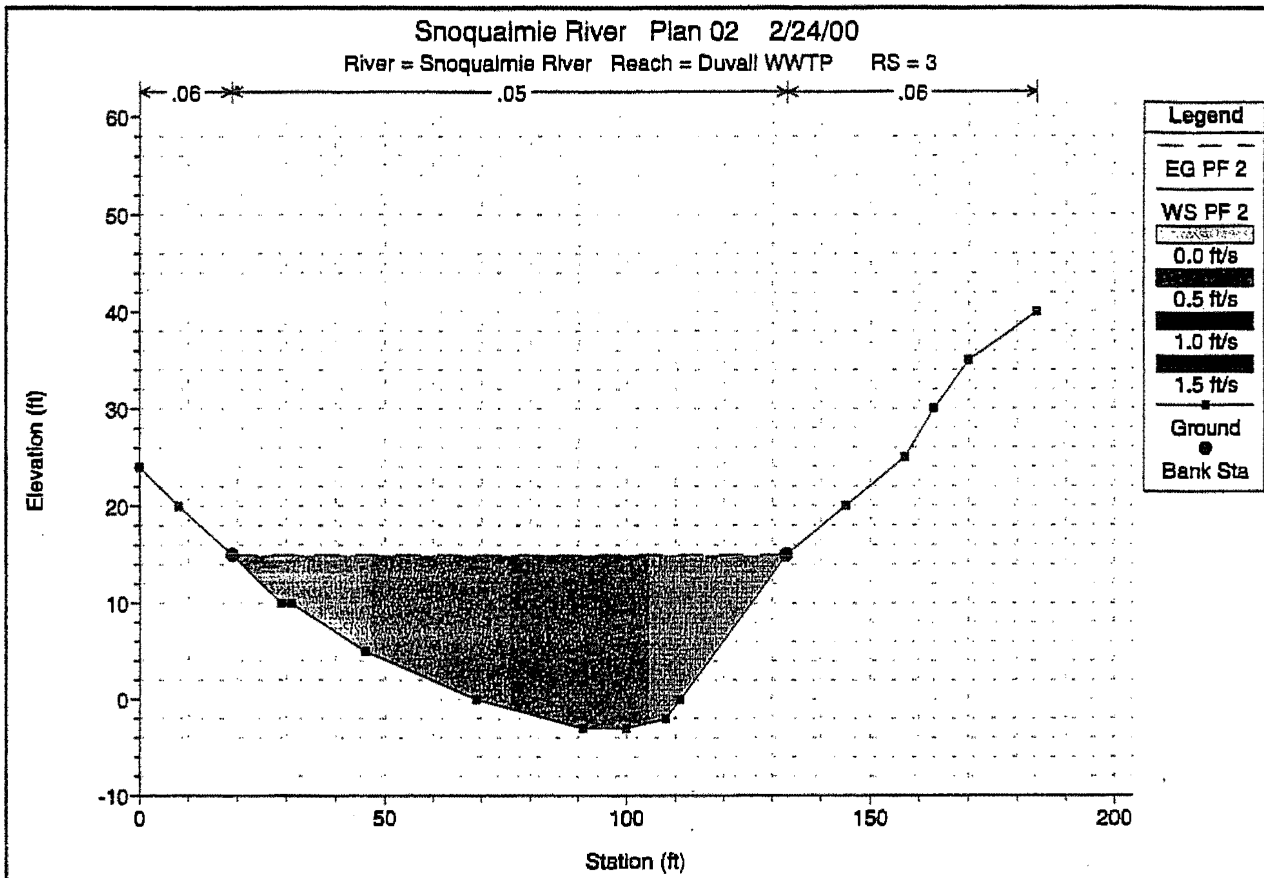
Reach	River Sta	Q Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Crit W.S. (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel Chnl (ft/s)	Flow Area (sq ft)	Top Width (ft)	Froude # Chl
Duvall WWTP	5	443.00	14.00	15.70	15.70	16.40	0.029955	6.74	68.18	53.09	0.97
Duvall WWTP	5	456.00	14.00	15.73	15.73	16.44	0.029389	6.77	69.98	53.58	0.96
Duvall WWTP	5	684.00	14.00	16.25	16.25	17.08	0.024246	7.45	101.27	76.98	0.92
Duvall WWTP	5	1850.00	14.00	19.83		20.02	0.001990	4.19	592.11	153.03	0.31
Duvall WWTP	5	4000.00	14.00	24.44		24.60	0.000779	3.91	1363.26	179.00	0.22
Duvall WWTP	4	443.00	-5.00	14.91		14.91	0.000004	0.31	1429.49	116.66	0.02
Duvall WWTP	4	456.00	-5.00	15.00		15.00	0.000004	0.32	1439.83	116.99	0.02
Duvall WWTP	4	684.00	-5.00	16.14		16.14	0.000007	0.43	1576.15	122.24	0.02
Duvall WWTP	4	1850.00	-5.00	19.95		19.96	0.000023	0.91	2074.88	139.75	0.04
Duvall WWTP	4	4000.00	-5.00	24.51		24.55	0.000048	1.53	2763.66	161.12	0.06
Duvall WWTP	3	443.00	-3.00	14.91		14.91	0.000006	0.34	1302.68	113.69	0.02
Duvall WWTP	3	456.00	-3.00	15.00		15.00	0.000006	0.35	1312.76	113.99	0.02
Duvall WWTP	3	684.00	-3.00	16.14		16.14	0.000009	0.47	1445.59	119.23	0.02
Duvall WWTP	3	1850.00	-3.00	19.94		19.96	0.000028	0.98	1932.50	136.73	0.04
Duvall WWTP	3	4000.00	-3.00	24.50		24.54	0.000057	1.63	2601.82	155.81	0.06
Duvall WWTP	2	443.00	3.00	14.91		14.91	0.000020	0.51	861.79	108.57	0.03
Duvall WWTP	2	456.00	3.00	14.99		15.00	0.000020	0.52	871.41	108.97	0.03
Duvall WWTP	2	684.00	3.00	16.13		16.14	0.000029	0.69	998.56	114.66	0.04
Duvall WWTP	2	1850.00	3.00	19.93		19.95	0.000066	1.30	1469.65	133.63	0.06
Duvall WWTP	2	4000.00	3.00	24.47		24.54	0.000107	2.02	2127.80	154.26	0.09
Duvall WWTP	1	443.00	8.00	14.88	10.41	14.90	0.000258	1.22	363.91	87.87	0.11
Duvall WWTP	1	456.00	8.00	14.97	10.44	14.99	0.000258	1.23	371.68	88.70	0.11
Duvall WWTP	1	684.00	8.00	16.10	10.93	16.13	0.000258	1.44	494.37	126.59	0.11
Duvall WWTP	1	1850.00	8.00	19.88	12.65	19.94	0.000258	2.05	1015.50	149.26	0.12
Duvall WWTP	1	4000.00	8.00	24.42	14.72	24.52	0.000258	2.69	1759.84	176.84	0.13

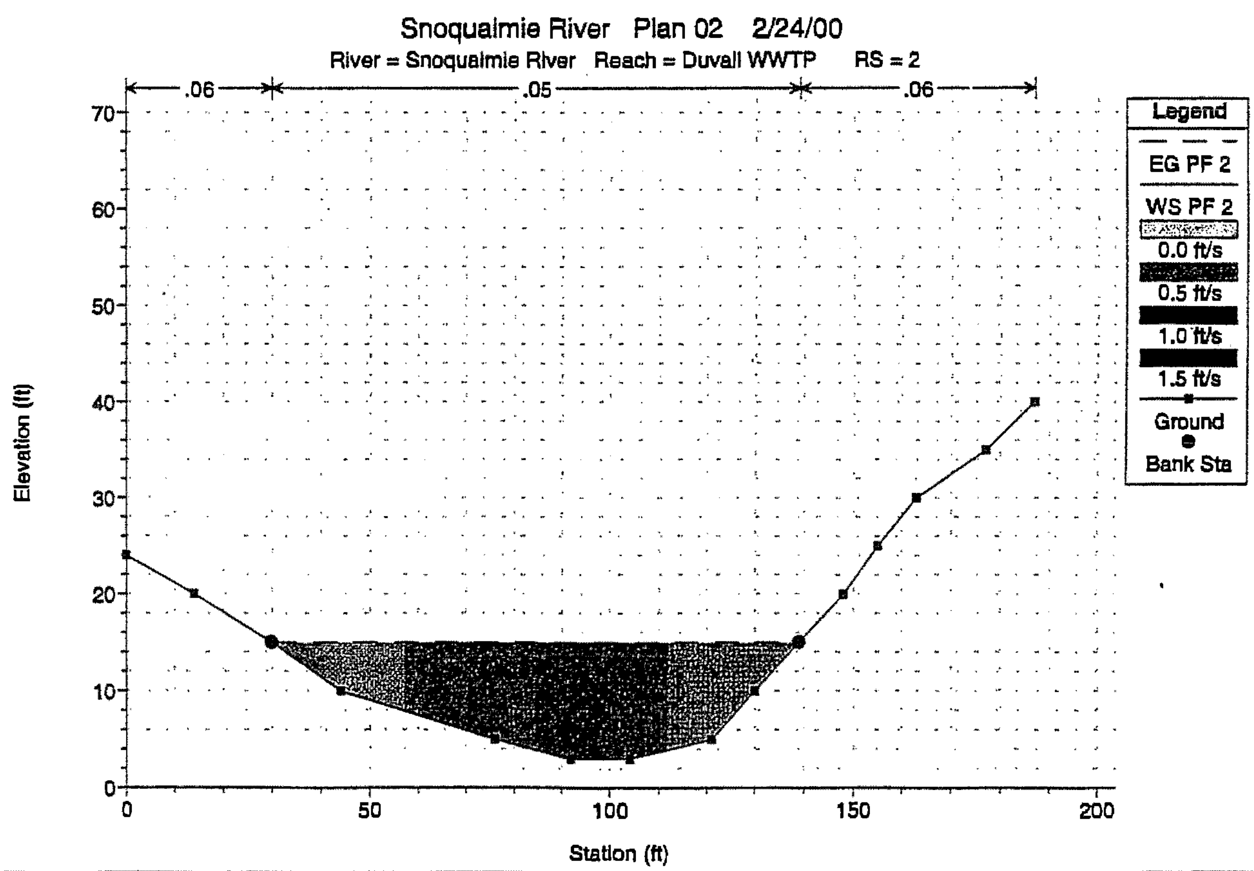
D-2





1 in Horiz. = 40 ft 1 in Vert. = 20 ft





1 in Horiz. = 40 ft 1 in Vert. = 20 ft

TABLE 5-6. VALUES OF THE ROUGHNESS COEFFICIENT n (*continued*)

Type of channel and description	Minimum	Normal	Maximum
C. EXCAVATED OR DREDGED			
a. Earth, straight and uniform			
1. Clean, recently completed	0.016	0.018	0.020
2. Clean, after weathering	0.018	0.022	0.025
3. Gravel, uniform section, clean	0.022	0.025	0.030
4. With short grass, few weeds	0.022	0.027	0.033
b. Earth, winding and sluggish			
1. No vegetation	0.023	0.025	0.030
2. Grass, some weeds	0.025	0.030	0.033
3. Dense weeds or aquatic plants in deep channels	0.030	0.035	0.040
4. Earth bottom and rubble sides	0.028	0.030	0.035
5. Stony bottom and weedy banks	0.025	0.035	0.040
6. Cobble bottom and clean sides	0.030	0.040	0.050
c. Dragline-excavated or dredged			
1. No vegetation	0.025	0.028	0.033
2. Light brush on banks	0.035	0.050	0.060
d. Rock cuts			
1. Smooth and uniform	0.025	0.035	0.040
2. Jagged and irregular	0.035	0.040	0.050
e. Channels not maintained, weeds and brush uncut			
1. Dense weeds, high as flow depth	0.050	0.080	0.120
2. Clean bottom, brush on sides	0.040	0.050	0.080
3. Same, highest stage of flow	0.045	0.070	0.110
4. Dense brush, high stage	0.080	0.100	0.140
D. NATURAL STREAMS			
D-1. Minor streams (top width at flood stage <100 ft)			
a. Streams on plain			
1. Clean, straight, full stage, no rifts or deep pools	0.025	0.030	0.033
2. Same as above, but more stones and weeds	0.030	0.035	0.040
3. Clean, winding, some pools and shoals	0.033	0.040	0.045
4. Same as above, but some weeds and stones	0.035	0.045	0.050
5. Same as above, lower stages, more ineffective slopes and sections	0.040	0.048	0.055
SELECTED 6. Same as 4, but more stones	0.045	$\boxed{0.050}$	0.060
7. Sluggish reaches, weedy, deep pools	0.050	0.070	0.080
8. Very weedy reaches, deep pools, or floodways with heavy stand of timber and underbrush	0.075	0.100	0.150

D-5

TABLE 5-6. VALUES OF THE ROUGHNESS COEFFICIENT n (*continued*)

Type of channel and description	Minimum	Normal	Maximum
b. Mountain streams, no vegetation in channel, banks usually steep, trees and brush along banks submerged at high stages			
1. Bottom: gravels, cobbles, and few boulders	0.030	0.040	0.050
2. Bottom: cobbles with large boulders	0.040	0.050	0.070
D-2. Flood plains			
a. Pasture, no brush			
1. Short grass	0.025	0.030	0.035
2. High grass	0.030	0.035	0.050
b. Cultivated areas			
1. No crop	0.020	0.030	0.040
2. Mature row crops	0.025	0.035	0.045
3. Mature field crops	0.030	0.040	0.050
c. Brush			
1. Scattered brush, heavy weeds	0.035	0.050	0.070
2. Light brush and trees, in winter	0.035	0.050	0.060
3. Light brush and trees, in summer	0.040	0.060	0.080
4. Medium to dense brush, in winter	0.045	0.070	0.110
5. Medium to dense brush, in summer	0.070	0.100	0.160
d. Trees			
1. Dense willows, summer, straight	0.110	0.150	0.200
2. Cleared land with tree stumps, no sprouts	0.030	0.040	0.050
3. Same as above, but with heavy growth of sprouts	0.050	0.060	0.080
4. Heavy stand of timber, a few down trees, little undergrowth, flood stage below branches	0.080	0.100	0.120
5. Same as above, but with flood stage reaching branches	0.100	0.120	0.160
D-3. Major streams (top width at flood stage >100 ft). The n value is less than that for minor streams of similar description, because banks offer less effective resistance.			
a. Regular section with no boulders or brush	0.025	.....	0.060
b. Irregular and rough section	0.035	.....	0.100

SOURCE: Ven Te Chow 1959. Open Channel Hydraulics, McGraw Hill, NY

Engineering Report
The City of Duvall
Wastewater Treatment Plant Outfall Improvements

APPENDIX E

Population and Flow Projections

Parametrix, Inc. *Consultants in Engineering and Environmental Sciences*

1231 Fryar Avenue P.O. Box 460 Sumner, WA 98390-1516
253-863-5128 • Fax: 253-863-0946 • www.parametrix.com

April 25, 2000
PMX# 216-3240-001/01

Ms. Elizabeth Goode, Director of Public Works
Public Works Department
City of Duvall
14525 Main St. SE
Duvall, WA 98019

Re: Letter Report

Dear Ms. Goode:

In accordance with the scope of services with the City of Duvall, Parametrix is providing five (5) copies of this engineering analysis forecasting the future population and wastewater flows within the City's Urban Growth Area (UGA) and Urban Growth Area (UGA) Reserve.

PURPOSE

The purpose of the analysis is to:

- Forecast the total population anticipated to occupy the City's current urban growth area (UGA) and the urban growth area (UGA) Reserve.
- Estimate of the total wastewater flow generated from the UGA and UGA Reserve.
- Estimate milestones for wastewater treatment plant improvements.
- Recommend the size of the wastewater treatment plant upgrade.

ANALYSIS

The analysis focused on verification of previous population estimates within the UGA, forecasting population within the UGA Reserve, estimating total flows entering the City's treatment plant based on buildout of the City's UGA and UGA Reserve, and when buildout of the UGA and UGA Reserve will occur. To address population forecast, the elements of the analysis include:

- The City of Duvall Planning staff provided an estimate within the UGA based on recent platted land or land pending plat population approval. The City has estimated that the City's population could increase to approximately 6,600 residents without further subdivision development within the UGA or UGA reserve area. This population estimate does not include development of all vacant lots within the older platted portions of the City of Duvall. See enclosed letter from Camille Chriest, dated January 4, 2000, and Figure 1.
- Parametrix calculated the additional acreages available for residential development outside the developed properties estimated by the City of Duvall but within the City's UGA and UGA Reserve.

- Population projections within the undeveloped portion of the UGA and the UGA Reserve were calculated using land use densities and estimates for residential occupancies provided by the City Planning Department as shown on Table 1.

- Parametrix's population forecast shown on Table 1 was compared to the population estimates provided in the City's 1994 comprehensive plan. It was noted that the comprehensive plan used 80% land utilization versus Parametrix's 100% land use utilization for undeveloped acreage. It was also noted that the City's comprehensive plan included only a small portion of the total UGA Reserve within the population estimates. These two differences resulted in Parametrix's forecasting a total of 12,500 citizens in the UGA and UGA Reserve, which is 3,500 higher than the City's forecast of 9,000 included in the 1994 comprehensive plan.

Total estimated wastewater flow generated within the UGA and UGA Reserve was calculated using the following methodology:

- Parametrix calculated the total wastewater flow using 85 gallons per capita per day of wastewater flow plus an I/I (infiltration/inflow) allowance of 500 gallons per acre per day for wet weather conditions, as shown on Table 1.

- It was noted that the existing per capita flow is less than 85 gallons per capita per day. However, Parametrix recommends that the City use 85 gallons per capita per day, which is consistent with similar sized communities and the 1998 Criteria for Sewage Works Design prepared by the Department of Ecology.

To better understand the time schedule for plant expansion, Parametrix estimated the year that the UGA and UGA Reserve would reach 85% and 100% buildout. The methodology used to determine these milestones included:

- Population trends were taken from planning documents previously prepared for the City of Duvall. The documents used for population trends include the 1990 Engineering Report prepared by Hammond Collier & Wade (Figure 1 enclosed), the 1996 General Sewer Plan prepared by Gray & Osborne (Table 2-1 enclosed), and the City of Duvall's Comprehensive Plan (Table 1 enclosed).

- The population trends were superimposed on Figure 2 along with 85% of the buildout of the UGA and UGA Reserve, and 100% buildout of the UGA and UGA Reserve.

- Estimated timeline trends milestones were approximated based on visual observation, as shown in Figure 3.

RESULTS OF ANALYSIS

Analysis of the City's population trends and flow forecast has determined the following:

- Parametrix's population forecast is very similar to the City Comprehensive Plan with the following exceptions:
    1. The City Comprehensive Plan assumed 80% land usage for undeveloped acreage and did not include the total UGA Reserve area in the population forecast of 9,000.

2. Parametrix's population forecast assumes a higher percent of land usage within the UGA and estimates Duvall's population at 9,666 individuals. Parametrix's population estimation for buildout of the UGA and the UGA Reserve area is 12,516.
3. Parametrix estimates flow generated by the UGA and UGA Reserve area at a minimum of 1.75 million gallons per day as maximum monthly wet weather flow.
4. It is estimated that the City will reach 85% buildout of the UGA and UGA Reserve in year 2014.
5. It is estimated that the City will reach buildout of the UGA and UGA Reserve approximately year 2019.

RECOMMENDATIONS

Parametrix recommends the City consider expansion of the Duvall wastewater treatment plant for a minimum maximum wet weather flow of 1.75 mgd. This recommendation allows the City approximately 10+ years between when the plant improvements have been completed and 85% capacity of the new treatment facility. It also allows the City five years to plan, design, and build future plant expansions. This should be sufficient time to plan and build the next plant expansion without requiring a future self-imposed moratorium on the service area.

Parametrix also recommends that the City improve the outfall to accommodate a minimum of 1.75 mgd with appropriate features to meet the existing plant NPDES permit requirements of .9 mgd.

As previously discussed, Parametrix needs the City to review and concur with the recommended size of the plant expansion prior to finalizing the outfall analysis and proceeding with the treatment plant engineering report. I look forward to discussing our findings with you and finalizing the plant expansion sizing requirements. If you have any questions in the interim, please feel free to call me at (253) 863-5128.

Sincerely,

PARAMETRIX, INC.

Michael T. Ollivant, P.E.
Project Engineer

MTO:jk

Enclosures

cc: Dwight Miller, P.E., Project Manager

CITY OF DUVALL

January 4, 2000

RECEIVED
JAN - 6 2000
Mike O
Parametrix, Inc.

Michael Ollivant, P.E.
Parametrix, Inc.
P.O. Box 460
Sumner, Washington 98390-1516

Dear Mike:

Per our discussion on Monday, January 3, I applied our estimated population figures to a base map to assist you in calculating the estimated future sewer treatment plant capacity. In reviewing the cell population numbers included in our Comprehensive Plan (page 37), I realized that we did apply some population to the Urban Growth Area Reserve (see cells 50 and 54), although the numbers are far too low. Also, the densities were assumed to be 2.4 and 3.1 dwelling units per acre, which I believe is a much lower density than what we would be expected to accommodate in the future. As a very conservative estimate, I believe that approximately one-third of the Urban Growth Area Reserve should be 8 units per acre, with the remaining two-thirds at 3 units per acre.

The base map I used was developed by Gray & Osborne in conjunction with the 1996 General Sewer Plan Update and does include cell numbers that correspond with those used in the City's Comprehensive Plan. You will probably need to refer to the Official Zoning Map and Future Land Use Map (the colored maps I gave you) as you do your calculations, since the base map I used does not show any of the zoning designations. Please feel free to contact me at (425) 788-2779 if you have any questions or if the information I have provided is not exactly what you need to do your work.

Sincerely,

Camille

Camille Chriest
Interim Planning Director

Enclosures

City of Duvall
Flow Determinations

Max Day			
Month	YEAR		
	1997	1998	1999
Jan	1.060	0.726	0.790
Feb	0.536	0.552	0.893
Mar	1.018	0.634	0.743
Apr	0.651	0.582	0.483
May	0.718	0.646	0.380
Jun	0.712	0.490	0.439
Jul	0.444	0.352	0.583
Aug	0.319	0.346	0.408
Sept	0.756	0.353	0.365
Oct	0.539	0.393	0.373
Nov	0.725	1.209	1.024
Dec	0.598	1.034	0.768
Winter Max Day			
Nov-98	1.209		26th
Summer Max Day			
Sep-97	0.712		18th

*September (.756) & May (.718) Max Day excluded due to extreme weather on previous days

Max Month				
	YEAR (avg month)			PerCapita
Month	1997	1998	1999	1999
Jan	0.511	0.568	0.513	115.67
Feb	0.394	0.428	0.636	143.40
Mar	0.536	0.479	0.497	112.06
Apr	0.407	0.433	0.361	81.40
May	0.352	0.374	0.308	69.45
Jun	0.369	0.347	0.293	66.07
Jul	0.341	0.290	0.342	77.11
Aug	0.249	0.274	0.291	65.61
Sept	0.345	0.275	0.286	64.49
Oct	0.357	0.318	0.296	66.74
Nov	0.461	0.419	0.535	120.63
Dec	0.488	0.571	0.532	119.95

Winter Max Month		30-day Winter	
Feb-99	0.636	0.642	
		3/5/99	
Summer Max Month		**30-day Summer**	
May-98	0.374	0.395	
		10/13/97	6/9/98

Average Per Capita Flow		
91.88		
Max	Min	30-day Max
0.636	0.286	0.642
Estimated Population		
4435		
per capita flow		
143.4	64.5	144.7

Ratio Max Day to Max Month
1.90

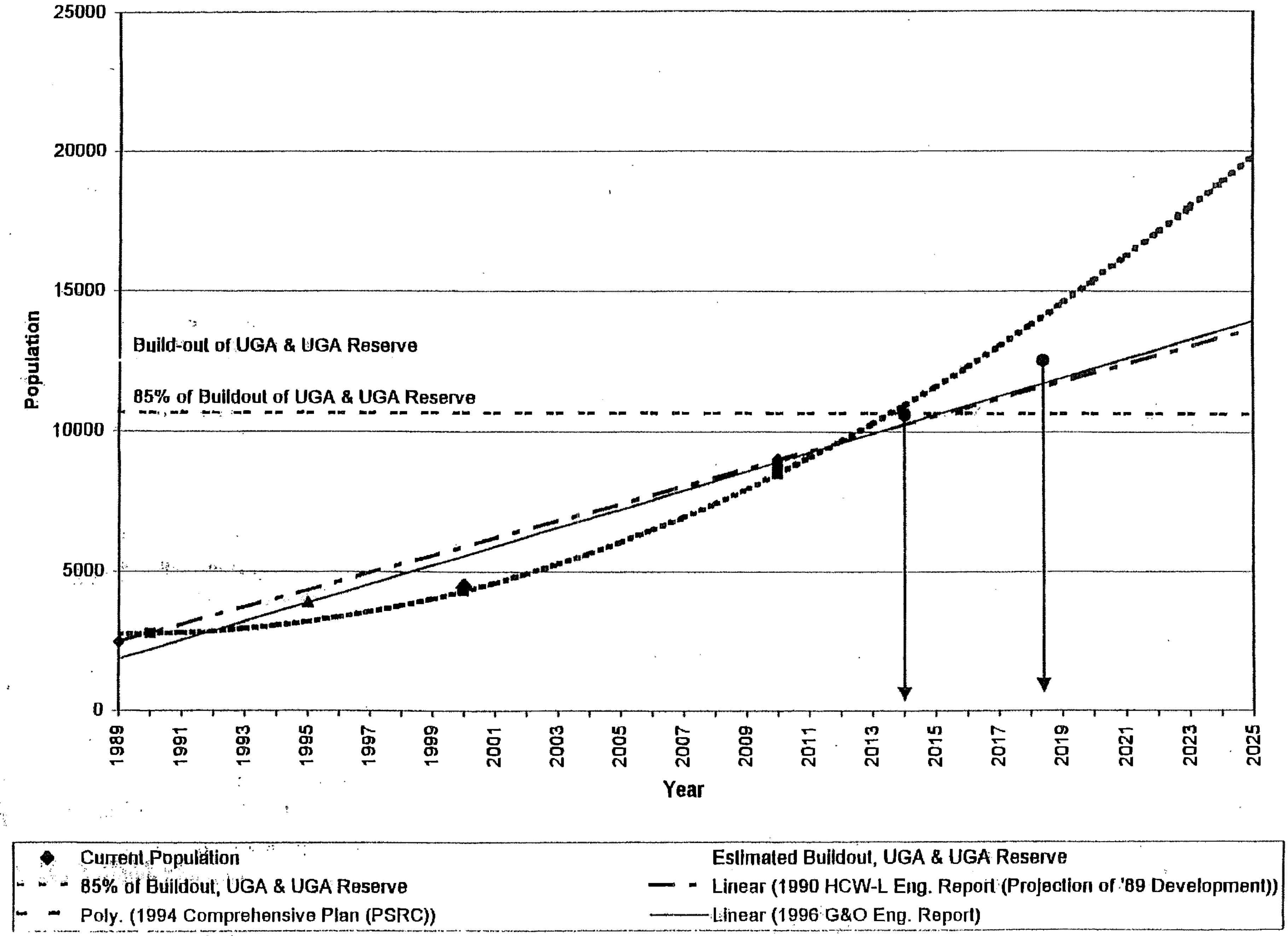
Ratio Max Month Wet to Dry
1.70

Total Anticipated Flow, UGA & UGA Reserve
1,749,860

Using the Projected Future Anticipated Flow for UGA and UGA Reserve along with the current ratios above.
Using the Department of Ecology's *Criteria for Sewage Works Design 1998* Peak Hour to Average Day is 2.88

Anticipated Future Max Day	Anticipated Max Dry Day	Anticipated Peak Hour
3,326,385	1,029,006	5,031,975

Figure 3
City of Duvall - Population Projection

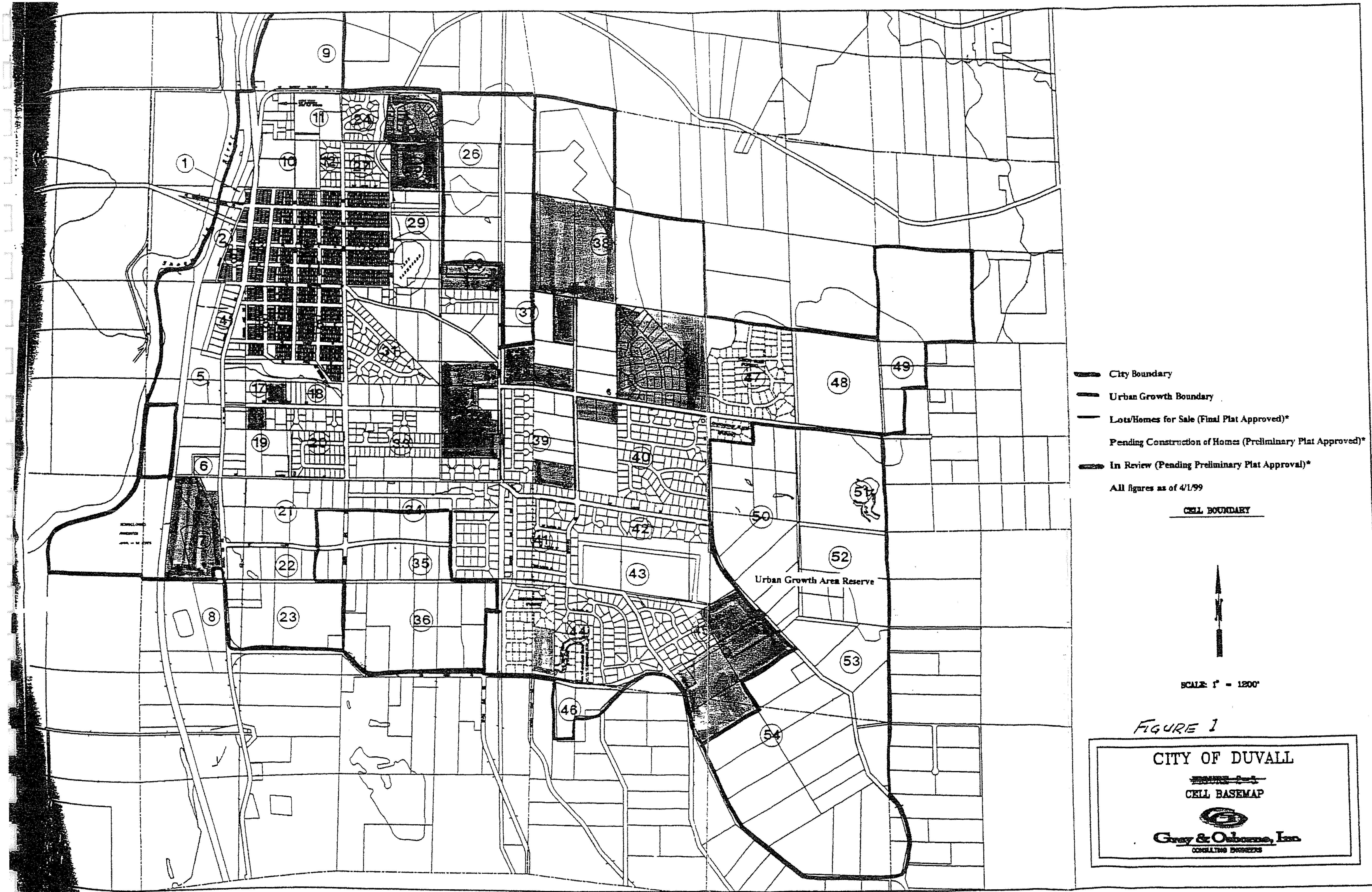


Population Source	Persons per Dwelling Unit	# of Residential Dwelling Units	Subtotal	Total
OEM Baseline Population as of 4/1/99			*4,435*	*4,435*
Lots/Homes for Sale (Final Plat Approved)*				
R3 zone	3.25	126	410	
R6 zone	2.5	6	15	
R8 zone	2.25	26	59	
R12, MR12, Mxd12 zone	1.75	18	32	
Subtotal			*515*	*4,950*
Pending Construction of Homes (Preliminary Plat Approved)*				
R3 zone	3.25	44	143	
R4.5 zone	3	7	21	
R8 zone	2.25	72	162	
R12, MR12, Mxd12 zone	1.75	150	263	
Subtotal			*589*	*5,538*
In Review (Pending Preliminary Plat Approval)*				
R3 zone	3.25	181	588	
R4.5 zone	3	7	21	
R8 zone	2.25	34	77	
R12, MR12, Mxd12 zone	1.75	215	376	
Subtotal			*1062*	*6,600*
			TOTAL	**6,600**

***All figures as of 4/1/99**

Note: Any fractional totals have been rounded up/down as needed.

Completed 6/18/99


City Boundary
Urban Growth Boundary
Lots/Homes for Sale (Final Plat Approved)*
Pending Construction of Homes (Preliminary Plat Approved)*
In Review (Pending Preliminary Plat Approval)*
All figures as of 4/1/99
CELL BOUNDARY
Urban Growth Area Reserve
SCALE: 1" = 1200'
FIGURE 1
CITY OF DUVALL
~~FIGURE 2-1~~
CELL BASEMAP
Gray & Osborne, Inc.
CONSULTING ENGINEERS

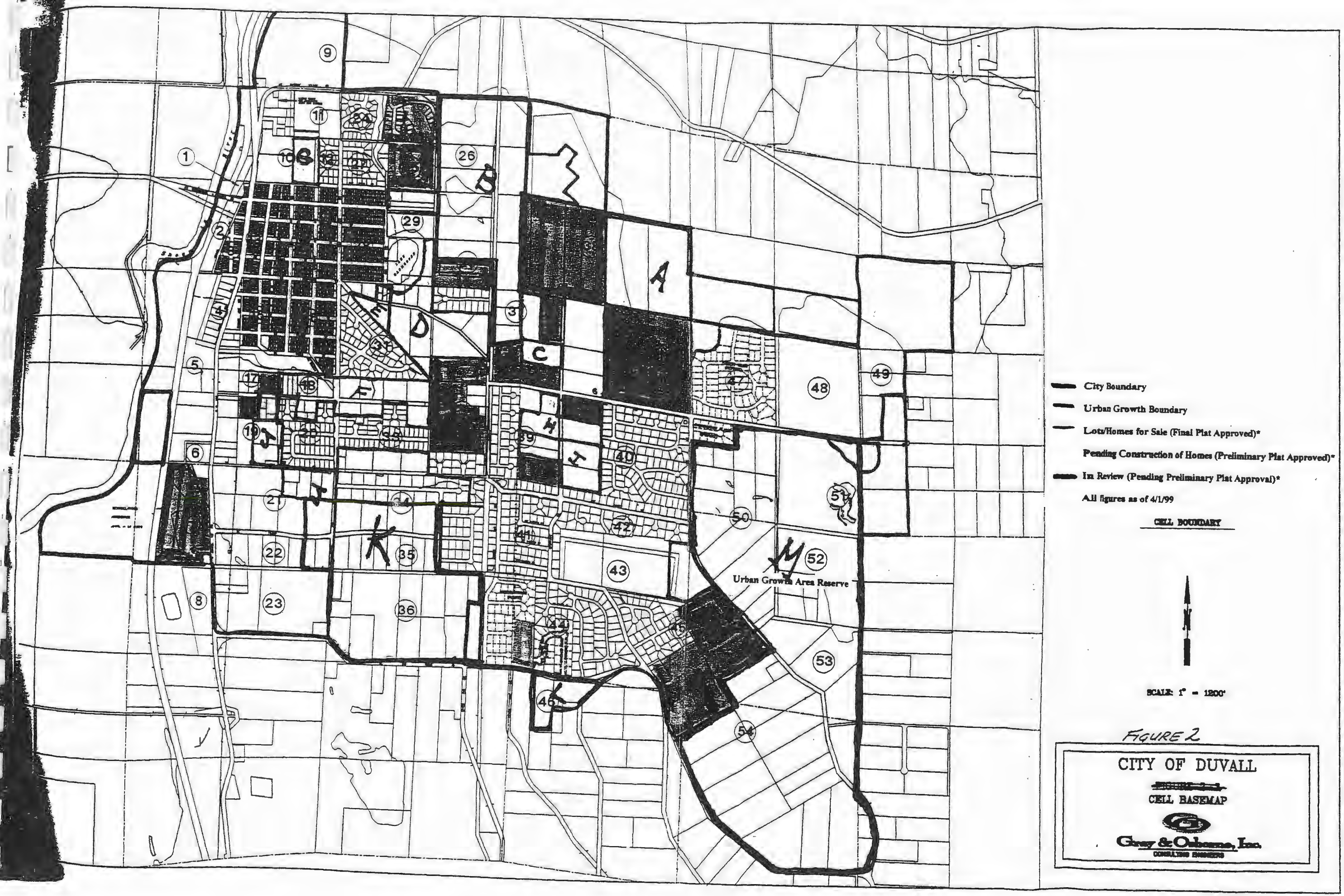


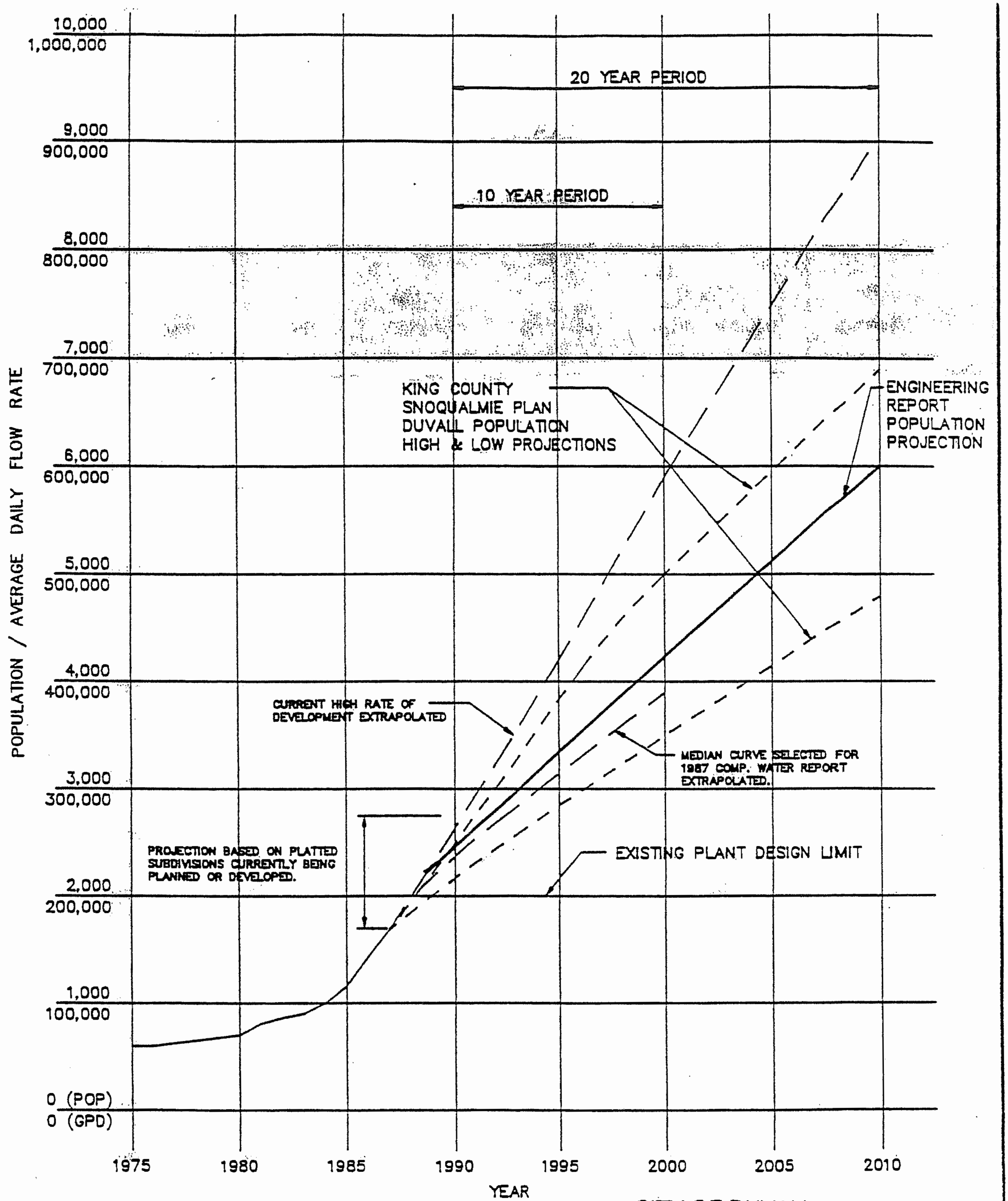
FIGURE 2

CITY OF DUVALL
~~FIGURE 2-1~~
CELL BASEMAP

Table 1

Population and Flow Projection, City of Duvall UGA&UGA Reserve Area Buildout Prepared By: Cole Elliott/Michael Ollivant P.E., Parametrix Inc. Date: 1/20/99									
Description	**Acres**	**ERU's/AC**	**ERU's (1)**	**Capita / ERU**	**Capita**	**Flow/Capita GPD (2)**	**Wastewater Flow**	**I&I GPAD (3)**	**Total Flow - Max Month Wet Weather**
Information Provided by Duvall									
OFM Baseline Population 4/1/99					4435	85	376975		376975
Final Plat Approved			176		515	85	43775		43775
Preliminary Plat Approved			273		589	85	50065		50065
Pending Preliminary Plat Approval			274		1062	85	90270		90270
I & I for Existing/Pending Developed Property (4)	856							500	428000
Total Population/Flow, Existing/Pending Developed Prop.					*6601*				*989085*
Additional Undeveloped Property in UGA (5)									
Area A: Zoning Designation; R3	37	3	111	3.25	361	85	30685	500	49185
Area B: Zoning Designation; R3	68	3	204	3.25	663	85	56355	500	90355
Area C: Zoning Designation; R8	4	8	32	2.25	72	85	6120	500	8120
Area D: Zoning Designation; R3	20	3	60	3.25	195	85	16575	500	26575
Area E: Zoning Designation; R4.5	4	4.5	18	3	54	85	4590	500	6590
Area F: Zoning Designation; R4.5	18	4.5	81	3	243	85	20655	500	29655
Area G: Zoning Designation; R6	3	3	9	3.25	29	85	2465	500	3965
Area H: Zoning Designation; R8	7	8	56	2.25	126	85	10710	500	14210
Area I: Zoning Designation; R3	10	3	30	3.25	98	85	8330	500	13330
Area J: Zoning Designation; R4.5	22	4.5	99	3	297	85	25245	500	36245
Area K: Zoning Designation; R3	89	3	267	3.25	868	85	73780	500	118280
Area L: Zoning Designation; R3	6	3	18	3.25	59	85	5015	500	8015
Total Anticipated Population/Flow, Total UGA					*9666*				*1393610*
Additional Undeveloped Property UGA Reserve Area (5)									
Area M: Zoning Designation; R8	76	8	608	2.25	1368	85	116280	500	154280
Area M: Zoning Designation; R3	152	3	456	3.25	1482	85	125970	500	201970
Total Anticipated Population/Flow, UGA Reserve					*2850*				*356250*
Total Anticipated Future Population/Flow, UGA and UGA Reserve					**12516**				**1749860**

(1) ERU = Equivalent Residential Unit
(2) GPD = Gallons Per Day
(3) GPAD = Gallons Per Acre Per Day or I&I Assumed at 500 GPAD maximum
(4) I/I = Infiltration and Inflow of Storm Water Entering the Duvall Sanitary Sewer Collection System
(5) See Attached Figure 2 for Parcel Locations. Parcels Refer to Currently Undeveloped Parcels That are Not Pending City Review / Approval



CITY OF DUVALL
ENGINEERING REPORT
WASTEWATER TREATMENT PLANT EXPANSION
POPULATION PROJECTION
FIGURE 1

NOVEMBER 1990

\DWG\DUVALL\89038003\FIG1 10'

Sewer Plan

TABLE 2-1

City of Duvall - Population Growth Projections

Land Use Cell Number	Use (1) Density (du/acre)	1995 POP.	2000 POP.	2005 POP.	2010 POP.
1	C/M/17.8	0	0	0	7
2	M/17.8	46	64	64	86
3	M/16.0	0	24	24	45
4	C	0	0	0	0
5	C	0	0	0	0
7	M/1.9	3	51	51	93
10M	M/13.3/20	23	23	23	23
10R	R/1/7.1/10/13.3/15	78	315	315	323
12	R/3.9	104	104	104	104
13M	M/17.8	0	12	12	54
13R	R/17.8	5	32	32	41
14M					
14R	R/3.6/3.8/8.9	242	242	242	242 *
15M					
15R	R/17.8	5	26	26	55
16	R/3.7/5.4	258	258	258	258
17M	M/15	0	25	25	25
17R	R/2.1	13	13	13	13 *
18	R/1.7/5.8	10	34	67	49
19M	M/15	21	108	108	108
19R					
20	R/3.3/5.8	180	180	232	295
21	C/R/10	20	181	181	181
22	C/R/10	20	27	27	63
23	C	0	0	0	0
24	R/3.0	63	96	96	98
25	R/2.7/3.1	10	10	10	184
26	R/3.1	10	13	58	176
27	R/4.0	153	153	153	153 *
28	R/3.5	183	183	183	189
29	R/5.8	15	15	18	89

TABLE 2-1 con't.

City of Duvall - Population Growth Projections

Land Use Cell Number	Use (1) Density (du/acre)	1995 POP.	2000 POP.	2005 POP.	2010 POP.	
30	R/2.3/3.1	68	174	174	217	
31	R/3.1/5.8	221	284	360	445	
32	R/2.7/3.1	85	313	313	274	
33	R/3.1/5.8	182	182	182	313	
34	R/1.3/3.1	107	107	130	175	
35	R/2.3/3.1	29	121	164	216	
36	R/3.1	26	26	414	348	
37	R/3.1/10	29	333	351	415	
38	R/1.5/3.1/10	98	669	669	669	
39	R/2.3/3.1/10	137	150	369	326	
40	R/2.8/3.1/10	393	453	584	618	
41	R/2.6	205	205	205	211	
42	R/2.3	124	124	137	172	
43	R/6.3	264	264	264	264	*
44	R/2.4/3.1	237	436	436	436	
45	R/3.1/2.3	98	219	219	208	
46	R/3.1	16	16	30	68	
47	R/2.0/3.1	0	286	286	375	
49	R/UGR/Sch					
50	R/2.3/UGR	36	36	36	36	
51	UGR	3	3	3	3	*
52	UGR	13	13	13	13	*
53	UGR	16	16	16	16	*
54	R/3.1/UGR	23	168	168	138	
Total Pop. =	N/A	3875	6787	7845	8910	

NOTES:

* indicates cell is now exceeding residential build-out capacity as defined by Final EIS - 1995.

(1) M = mixed; R = Residential; C = Commercial; Sch = Future School; UGR = Urban Growth Rese

TABLE 1

Comprehensive Plan Duvall

Population change

Year	United States	State of Washington	Puget Sound (King/Kitsap/Snohomish/Pierce Cos)	King County	Duvall Planning Area (Census Tract 324)	City of Duvall (incorporated 1913)
1900	76,094,000	518,100				
1910	92,407,000	1,142,000				
1920	106,466,000	1,356,600				258
1930	123,077,000	1,563,400	736,996	463,517		200
1940	132,594,000	1,736,200	820,202	504,980		234
1950	152,271,000	2,379,000	1,196,172	732,992		236
1960	180,671,000	2,853,200	1,512,979	935,014		345
1970	204,879,000	3,413,300	1,938,899	1,159,587		607
1980	226,500,000	4,132,200	2,240,269	1,269,749	3,078	729
1990	250,410,000	4,640,457	2,748,895	1,507,319	6,958	2,770
2000	268,266,000	5,249,372	3,148,200	1,697,500	11,450	4,300
Percent change by decade						
1900-1910	21.4%	120.4%				
1910-1920	15.2%	18.8%				
1920-1930	15.6%	15.2%				-22.5%
1930-1940	7.7%	11.1%	11.3%	8.9%		17.0%
1940-1950	14.8%	37.0%	45.8%	45.2%		0.9%
1950-1960	18.7%	19.9%	26.5%	27.6%		46.2%
1960-1970	13.4%	19.6%	28.2%	24.0%		75.9%
1970-1980	10.6%	21.1%	15.5%	9.5%		20.1%
1980-1990	10.6%	12.3%	22.7%	18.7%	126.1%	280.0%
1990-2000	7.1%	13.1%	14.5%	12.6%	64.6%	55.2%

Sources:

US Bureau of the Census, Current Population Reports, Series P-25, Number 1018, Mid Series 14: fertility=1.8 births/woman, mortality=81.2 years of age, 500,000 yearly net immigration.

Washington State, Office of Financial Management, Forecasting Division, 1987 Population Trends for Washington State

Puget Sound Council of Governments, Puget Sound Trends, June 1988

King County Planning Division, Snoqualmie River Valley Community Plan DEIS, 1988 (shows midpoint population estimates)

The Information Press, Almanac of Washington Counties & Cities, 1990

Alternative population projections

Year	Linear trend extrapltn (2)	Exponential trend method (2)	Vacant land/building permits (2)	King County low growth estimate (1)	King County high growth estimate (1)	Puget Sound Regional Council (PSRC) (3)
1990	2,770	2,770	2,770	2,770	2,770	2,770
1995	2,440	2,927	3,203	1,650	2,600	
2000	2,996	6,135	4,183	1,990	3,500	
2010						8,500
Percent change by 5 year increments						
1990-1995	-11.9%	5.7%	15.6%	-40.4%	-6.1%	
1995-2000	22.8%	109.6%	30.6%	20.6%	34.6%	
1990-2010						206.9%

Sources:

1990 estimates based on US Bureau of the Census.

(1) King County Planning Division, Snoqualmie Valley Community Plan 1988.

(2) Duvall Planning Commission, Duvall General Sewer Plan, 1989.

(3) Puget Sound Regional Council, April 1992.

24 November 1992

Duvall Comprehensive Plan Update – Residential holding capacities

Low growth scenario - proposed new zoning densities - proposed urban growth area

Plus high economic options w/o plateau

w/portions of cells 21/22/23 as employment and 34/35 and other residential additions

unit	useable acres	number platted lots	remaining undvpd acreage	percent buildable	buildable acreage	land use	dwelling units/buildable acreage	number dwelling units	platted lots plus potential du's	persons/dwelling unit	number of persons
1	0.9					community business mxd					0
2	4.3					community business/mxd mh park					0
3	5.0					community business mxd					0
4	4.6					community business mxd					0
5	12.0					industrial commercial					0
6	2.8					public fcty – wastewater tmnt plnt					0
7	19.1					community business mxd					0
10	24.5	8				residential – ur–12	12.0	0	8	2.5	20
			12.3	80%	9.8	residential – ur–12	12.0	118	118	2.5	295
	5.0					community business mxd					0
11	8.8					public fcty – school					0
12	8.7	34				residential – sf–5.8	5.8		34	2.5	85
13	7.3					community business mxd					0
	0.3					public fcty – fire stn					0
			1.1	80%	0.9	residential – ur–18	18.0	16	16	2.0	32
14	21.7	19				residential – ur–12	12.0		19	2.5	48
		57				residential – sf–5.8	5.8		57	2.5	143
15	12.6					community business mxd					0
			0.9	80%	0.7	residential – ur–18	18.0	13	13	2.0	26
16	25.8	23				residential – ur–8	8.0		23	3.0	69
		58				residential – sf–5.8	5.8		58	2.5	145
17	6.5					community business mxd					0
18	7.4		7.4	80%	5.9	residential – sf–4.5	4.5	27	27	2.5	67
19	12.6					community business mxd					0
20	20.2	71				residential – sf–4.5			71	2.5	178
	6.0		6.0	80%	4.8	residential – sf–4.5	4.5	22	22	2.5	54
21add	12.5					community business mxd					0
	25.1		25.1	80%	20.1	residential – ur–8	8.0	160	160	3.0	481
22add	10.1					community business mxd					0
	6.7					community business mxd					0
23add	30.3					community business mxd					0
	10.1					community business mxd					0
24	10.5		10.5	80%	8.4	residential – sf–3.1	3.1	26	26	3.1	81
25	4.0		4.0	80%	3.2	residential – sf–2.4	2.4	8	8	2.0	15
26	24.0		24.0	80%	19.2	residential – sf–2.4	2.4	46	46	3.2	149
27	12.0	49				residential – sf–5.8			49	2.5	123
28	17.2	60				residential – sf–5.8			60	2.5	150
29	3.0		3.0	80%	2.4	residential – sf–4.5	4.5	11	11	2.5	27
30	25.0		25.0	80%	20.0	residential – sf–3.1	3.1	62	62	3.1	193
	6.8	16				residential – sf–3.1			16	3.1	50
31	22.4		22.4	80%	17.9	residential – sf–4.5	4.5	81	81	2.5	202
	19.4	63				residential – sf–4.5			63	2.5	158
32	34.1		34.1	80%	27.3	residential – sf–3.1	3.1	85	85	3.1	263
	5.9	16				residential – sf–3.1			16	3.1	50

33	13.0		13.0	80%	10.4	residential – sf–4.5	4.5	47	47	2.5	117
	18.3	52				residential – sf–4.5			52	2.5	130
34	19.5	25				residential – sf–3.1			26	3.1	81
34add	13.3		13.3	80%	11.0	residential – sf–3.1	3.1	34	34	3.1	106
35	15.0		15.0	80%	12.0	residential – sf–3.1	3.1	37	37	3.1	118
35add	17.2		17.2	80%	13.3	residential – sf–3.1	3.1	43	43	3.1	133
36add	53.8		53.8	80%	42.9	residential – sf–3.1	3.1	133	133	3.1	414
37	43.2		43.2	80%	34.8	residential – sf–3.1	3.1	108	108	3.1	333
	9.2		9.3	80%	7.4	residential – ur–8	8.0	60	60	3.0	179
38	95.1	146				residential – sf–2.4			146	3.2	467
	9.3		8.3	80%	7.4	residential – sf–3.1	3.1	23	23	3.1	72
	8.2		9.3	80%	7.4	residential – ur–8	8.0	60	60	3.0	179
39	16.1	37				residential – sf–2.4	2.4		37	3.2	118
	10.4		10.4	80%	8.4	residential – sf–2.4	2.4	20	20	3.2	65
	9.7		9.7	80%	7.3	residential – ur–8	8.0	62	62	3.0	186
40	48.7	111				residential – sf–2.4			111	3.2	355
	8.6		8.6	80%	6.9	residential – sf–2.4	2.4	17	17	3.0	50
	9.3		9.3	80%	7.4	residential – ur–8	8.0	60	60	3.0	179
41	24.8	65				residential – sf–3.1			65	3.1	202
42	18.6	38				residential – sf–3.1			38	3.1	118
	7.4		7.4	80%	6.0	residential – sf–3.1	3.1	19	19	3.1	57
43	31.2		31.2	80%	25.0	mobile home – mp–5	5.0	125	125	2.0	250
44	25.3		25.3	80%	20.2	residential – sf–3.1	3.1	53	63	3.2	201
	32.7	71				residential – sf–2.4			71	3.2	227
44add	10.0		10.0	80%	8.0	residential – sf–3.1	3.1	25	25	3.2	79
45	36.1	25				residential – sf–3.1			25	3.1	78
	17.7		17.7	80%	14.2	residential – sf–3.1	3.1	44	44	3.2	141
46	10.5		10.5	80%	8.4	residential – sf–2.4	2.4	20	20	3.2	65
47	13.8		13.8	80%	11.0	residential – sf–3.1	3.1	34	34	3.2	110
	22.2		22.2	80%	17.8	residential – sf–3.1	3.1	55	55	3.2	176
48	38.5					public fcty – school					0
50	4.8		4.8	80%	3.8	residential – sf–2.4	2.4	9	9	3.2	30
54add	21.2		21.2	80%	17.0	residential – sf–3.1	3.1	53	53	3.2	168
Allotment for residential use in commercial business mixed use district											720
Totals	1,226.1	1,045	561.7		449.4			1,324	2,369		9,000

Average dwelling units/gross acre developed in planning area 2.2

Source: Beckwith Consulting Group w/Hough Beck & Baird

ur-8 Urban residential 8 units per acre
ur-12 Urban residential 12 units per acre
ur-18 Urban residential 18 units per acre
sf-2.4 Single family residential 2.4 units per acre
sf-3.1 Single family residential 3.1 units per acre
sf-4.5 Single family residential 4.5 units per acre
sf-5.8 Single family residential 5.8 units per acre

APPENDIX F

Extension of Time for Outfall Relocation and April 1, 2000 NPDES Permit

STATE OF WASHINGTON
DEPARTMENT OF ECOLOGY
Northwest Regional Office, 3190 - 160th Ave S.E. • Bellevue, Washington 98008-5452 • (425) 649-7000

RECEIVED
APR 24 2000
Mike O.

March 10, 2000

The Honorable Glen Kunz
Mayor, City of Duvall
P.O. Box 1300
Duvall, WA 98019

Dear Mayor Kunz:

Re: City of Duvall PCHB 91-67
Request for Time Extension for Relocated WWTP Outfall

This letter will acknowledge receipt of the transmittal from the Duvall Public Works Department dated August 23, 1999, responding to the Draft NPDES Permit requesting an extension of time for relocating the current outfall to the Snoqualmie River.

Following review of this written request, the following has been determined:

1. In accordance with paragraph 3 of PCHB 91-67 Stipulation and Order of Dismissal, approval is hereby granted extending the date for submission of the plans and specifications for construction of the new outfall to December 31, 2002.

2. In accordance with paragraph 3 of PCHB 91-67 Stipulation and Order of Dismissal, approval is hereby granted extending the date for completion of construction of the new river outfall to July 31, 2004.

Sincerely,

John H. Glynn
Water Quality Manager

JHG:DEW:ct

cc: Ron Lavigne, ATG
NWRO Central Files NPDES 6.4

RECEIVED
MAR 2 0 2000
CITY OF DUVALL

STATE OF WASHINGTON

DEPARTMENT OF ECOLOGY

Northwest Regional Office, 3190 - 160th Ave S.E. • Bellevue, Washington 98008-5452 • (425) 649-7000

March 10, 2000

CERTIFIED MAIL
7099 3220 0000 1119 7993

The Honorable Glen Kuntz
Mayor, City of Duvall
PO Box 1300
Duvall, WA 98019

Dear Mayor Kuntz:

RE: NPDES Permit Issuance
City of Duvall Wastewater Treatment Plant; Permit No. WA-002951-3
Expiration Date: June 30, 2004

Under the provisions of Chapter 90.48 RCW Water Pollution Control Laws as amended and the Federal Water Pollution Control Act (The Clean Water Act) Title 33 United States Code, Section 1251 et seq., the enclosed NPDES Permit No. WA-002951-3 is hereby issued to the City of Duvall Wastewater Treatment Plant located at 14525 Main Street, Duvall, WA (King County).

The permit authorizes the Permittee to discharge secondary treated and disinfected effluent to the Snoqualmie River subject to the terms and conditions of the permit.

Pursuant to RCW 90.48.465, a permit fee will be assessed. Semi-annual notices for payment will be mailed to you from our office in Olympia.

Any person feeling aggrieved by this NPDES permit may obtain review thereof by application, within 30 days of receipt of this permit, to the Washington Pollution Control Hearings Board, Post Office Box 40903, Olympia, WA 98504-0903. Concurrently, a copy of the application must be sent to the Department of Ecology, Post Office Box 47600, Olympia, WA 98504-7600. These procedures are consistent with the provisions of Chapter 43.21B RCW and the rules and regulations adopted thereunder.

Any appeal must contain the following in accordance with the rules of the hearings board:

a) The appellant's name and address;
b) The date and number of the permit appealed;
c) A description of the substance of the permit, that is the subject of the appeal;
d) A clear, separate, and concise statement of every error alleged to have been committed;
e) A clear and concise statement of facts which the requester relies to sustain his or her statements of error;
f) A statement setting forth the relief sought; and
g) A copy of the order, decision, or application appealed from.

An application for permit renewal must be made at least 180 days prior to the expiration date of this permit. If at any time during the term of this permit a question should arise regarding the permit or discharge, or if there is a significant change in the discharge or operation, please contact Dave Wright at (425) 649-7059.

Also enclosed is Ecology's Fact Sheet and a pre-printed Discharge Monitoring Report (DMR) form with a key for codes used. Please note that your permit limits, frequency, and sample type are printed in the shaded areas of you DMR. Please make copies as needed for your submittals. If no discharge occurs during a monitoring period, you must still submit a DMR with a statement that no discharge occurred. Copies of the Discharge Monitoring Report (DMR) forms have been forwarded to the public works department with a copy of the permit.

Sincerely,

John H. Glynn
Water Quality Manager
Northwest Regional Office

JHG:TM:tm
Enclosures

cc: John Light, City of Duvall Public Works
Bev Poston, Permit Fee Unit
Laura Fricke, Municipal Unit Supervisor
Dave Wright, Facility Manager
Chris Smith, WPLCS
Central Files: WQ 1.1, WA-002951-3

RECEIVED
MAR 2 0 2000
CITY OF DUVALL

DISCHARGE MONITORING REPORT (DMR) INSTRUCTIONS

To avoid processing delays and the need to resubmit your DMR's, please comply with the following requirements:

- Enter the monitoring period at the top of the form. Monitoring periods consist of a calendar month or months (quarterly reporting). (For example, July 1-July 31, not June 27-July 27)
- The forms must be received at the Department of Ecology Northwest Regional Office by the date specified in your permit. Address the envelope to the attention of Chris Smith, WPLCS Coordinator, 3190 160th Avenue SE, Bellevue, WA 98008-5452.
- All entries on the forms must be in ink or typewritten. The forms must be signed in ink by the responsible official for the facility or by a person who has been designated authority to do so in writing by the responsible official. The Department must have a record of the designation letter on file to accept signatures by persons other than the responsible official.
- Circle permit violations and provide a written explanation of the cause of the violation and remedies used to correct the problem. The number of violations must be entered on the DMR form under the "No. Ex" column on the right side of the DMR form. See the instructions on the back of the DMR form for details on how to fill in that column.
- Failure to report the results of tests required by your permit is a permit violation. If your facility did not discharge during the monitoring period, indicate by checking the box in the upper right hand corner for no discharge. Items that are not required for the monitoring period (such as tests done once per quarter) should be labeled "NA" for not applicable.

If you encounter difficulty using the enclosed form, contact your facility manager. Enclosed are double sided forms. Keep at least one blank form to photocopy. You are responsible for keeping forms on hand for use at your facility.

Questions; contact Chris Smith, WPLCS Coordinator, (425) 649-7214.

STATE OF WASHINGTON

DEPARTMENT OF ECOLOGY

Northwest Regional Office, 3190 - 160th Ave S.E. • Bellevue, Washington 98008-5452 • (425) 649-7000

March 10, 2000

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7099 3220 0000 1119 7993

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Mayor, City of Duvall
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Duvall, WA 98019

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Sincerely,

John H. Glynn
Water Quality Manager
Northwest Regional Office

JHG:TM:tm
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Chris Smith, WPLCS
Central Files: WQ 1.1, WA-002951-3

Issuance Date: March 10, 2000
Effective Date: April 1, 2000
Expiration Date: June 30, 2004

NATIONAL POLLUTANT DISCHARGE ELIMINATION SYSTEM
WASTE DISCHARGE PERMIT No. WA-002951-3

State of Washington
DEPARTMENT OF ECOLOGY
Northwest Regional Office
3190 – 160th Avenue SE
Bellevue, WA 98008-5452

In compliance with the provisions of
The State of Washington Water Pollution Control Law
Chapter 90.48 Revised Code of Washington
and
The Federal Water Pollution Control Act
(The Clean Water Act)
Title 33 United States Code, Section 1251 et seq.

CITY OF DUVALL

P.O. Box 1300

Duvall, Washington 98019

Plant Location: 14525 Main Street Duvall, Washington	Receiving Water: Snoqualmie River
Water Body I.D. No.: WA-07-1100	Discharge Location Latitude: 47° 43' 20" N Longitude: 121° 59' 37" W
Plant Type: Oxidation Ditch	

is authorized to discharge in accordance with the special and general conditions that follow.

John H. Glynn
Water Quality Manager
Northwest Regional Office
Washington State Department of Ecology

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GENERAL CONDITIONS

SUMMARY OF SCHEDULED PERMIT REPORT SUBMITTALS

Permit Section	Submittal	Frequency	First Submittal Date
S3.	Discharge Monitoring Report	Monthly	
S4. D.	Infiltration/Inflow Evaluation	Annual	January 1, 2001
S6.F.	Industrial User Survey	If required	
S9.C.	Chronic WET Compliance Report	1/year	July 1, 2000
G1.	Notice of Change in Authorization	As necessary	
G7.	Application for Permit Renewal	1/permit cycle	December 31, 2003

SPECIAL CONDITIONS

S1. DISCHARGE LIMITATIONS

A. Effluent Limitations Low River Flow Period

All discharges and activities authorized by this permit shall be consistent with the terms and conditions of this permit. The discharge of any of the following pollutants more frequently than, or at a concentration in excess of, that authorized by this permit shall constitute a violation of the terms and conditions of this permit.

Beginning on the effective date of this permit and lasting through the expiration date, the Permittee is authorized to discharge municipal wastewater at the permitted location during **August, September, and October** subject to the following limitations:

	EFFLUENT LIMITATIONS[a]: OUTFALL # 001	
Parameter	**Average Monthly**	**Average Weekly**
Carbonaceous Biochemical Oxygen Demand (5 day)	18.3 mg/L, (114 lbs./day)	27.5 mg/L, (172 lbs./day)
Total Suspended Solids[b]	30 mg/L, (188 lbs./day)	45 mg/L, (281 lbs./day)
Fecal Coliform Bacteria	200 cfu/100 mL	400 cfu/100 mL
pH[c]	Daily minimum is equal to or greater than 6 and the daily maximum is less than or equal to 9.	
Parameter	**Average Monthly**	**Maximum Daily**
Total Ammonia (as NH3-N)	1.2 mg/L (7.5 lbs./day)	(12.5 lbs./day)
Copper	4.6 ug/L (0.029 lbs./day)	9.3 ug/L
Mercury	0.1 ug/L (0.0006 lbs./day)	0.2 ug/L
Silver	0.4 ug/L (0.002 lbs./day)	0.8 ug/L
Zinc	35.4 ug/L (0.221 lbs./day)	71 ug/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 TSS shall not exceed 30 mg/L or 19 percent of the respective monthly average influent concentrations, whichever is more stringent.		
[c]Indicates the range of permitted values.		

B. Effluent Limitations High River Flow Period

All discharges and activities authorized by this permit shall be consistent with the terms and conditions of this permit. The discharge of any of the following pollutants more frequently than, or at a concentration in excess of, that authorized by this permit shall constitute a violation of the terms and conditions of this permit.

Beginning on the effective date of this permit and lasting through the expiration date, the Permittee is authorized to discharge municipal wastewater at the permitted location during **November through July** subject to the following limitations:

	EFFLUENT LIMITATIONS[a]: OUTFALL # 001	
Parameter	**Average Monthly**	**Average Weekly**
Carbonaceous Biochemical Oxygen Demand[b] (5 day)	25 mg/L, 188 lbs./day	40 mg/L, 300 lbs./day
Total Suspended Solids[c]	30 mg/L, 225 lbs./day	45 mg/L, 338 lbs./day
Fecal Coliform Bacteria	200 cfu/100 mL	400 cfu/100 mL
pH[d]	Daily minimum is equal to or greater than 6 and the daily maximum is less than or equal to 9.	
Parameter	**Average Monthly**	**Maximum Daily**
Total Ammonia (as NH3-N)	5 mg/L (37.5 lbs./day)	8 mg/L (60 lbs./day)
Copper	5.3 ug/L (0.040 lbs./day)	10.6 ug/L
Mercury	0.1 ug/L (0.0008 lbs./day)	0.3 ug/L
Silver	0.4 ug/L (0.003 lbs./day)	0.9 ug/L
Zinc	40.7 ug/L (0.306 lbs./day)	81.7 ug/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 CBOD5 shall not exceed 25 mg/L or 25 percent of the respective monthly average influent concentrations, whichever is more stringent.		
[c]The average monthly effluent concentration for TSS shall not exceed 30 mg/L or 19 percent of the respective monthly average influent concentrations, whichever is more stringent.		
[d]Indicates the range of permitted values.		

C. Mixing Zone Descriptions

The maximum boundaries of the mixing zones are defined as follows:

Outfall 001:

1. The width of the mixing zone is limited to 35 feet and is located adjacent to the right riverbank.

2. The length of the mixing zone is limited to 400 feet total length. The mixing zone extends 100 feet upstream and 300 feet downstream of the diffusion structure. The flow of the river available for chronic dilution in the mixing zone is limited to 25 percent of the 7Q20 flow of 465 cfs; therefore, the flow available for chronic dilution is limited to a maximum of 116.25 cfs. The Chronic Dilution Factor $\mathbf{DF_c}$ = 10.4

3. The length of the zone of acute criteria exceedance is limited to 10 feet upstream and 30 feet downstream of the diffusion structure. The flow of the river available for acute dilution is limited to 2-1/2 percent of the 7Q20 flow of 465 cfs; therefore, the flow available for acute dilution is limited to a maximum of 11.62 cfs. The Acute Dilution Factor $\mathbf{DF_a}$ = 2.0

D. Compliance Assessment for Metals

All metals are to be analyzed as total recoverable metals Section 4.1.4 (Methods for Chemical Analysis of Water and Wastes, 1979) using the methods, detection, and quantitation levels specified below:

1. Copper

   The method detection level (MDL) for copper is 1 µg/L using graphite furnace atomic absorption spectrometry and method number 220.2 from 40 CFR Part 136. The quantitation level (QL) for copper is 5 µg/L (5 x MDL).

2. Mercury

   The method detection level (MDL) for mercury is 0.2 µg/L using cold vapor extraction absorption spectrometry and method number 245.1 or 245.2 from 40 CFR 136. The quantitation level (QL) for mercury is 1 µg/L (5 x MDL).

3. Silver

   The method detection level (MDL) for silver is 0.2 µg/L using graphite furnace atomic absorption spectrometry and method number 272.2 from 40 CFR 136. The quantitation level (QL) for silver is 1 µg/L (5 x MDL).

4. Zinc

   The method detection level (MDL) for zinc is 5 µg/L using flame atomic absorption spectrometry and method number 289.1 from 40 CFR 136. The quantitation level (QL) for zinc 25 µg/L (5 x MDL).

For copper, silver, and zinc compliance with the maximum daily limit shall be made by direct comparison of the effluent limitation and the sample measurement.

For mercury because the maximum daily effluent limit is below the quantitation limit, the quantitation limit (QL) will be used for assessment of compliance with the effluent limit. In this case, for mercury, if the effluent concentration is below 1 µg/L, the Permittee shall report the measured value with the qualifier NQ for non-quantifiable.

Values for compliance with average monthly concentration limitations and average monthly mass-based limitations will be calculated as follows:

Measurements below the MDL = 0
Measurements greater than the MDL = measurement

S2. MONITORING REQUIREMENTS

A. Monitoring Schedule

Category	Parameter	Units	Sample Point	Minimum Sampling Frequency	Sample Type
Wastewater Influent	BOD5	mg/L	Plant influent	1/week	24 hour composite
"	CBOD5	mg/L	Plant influent	2/week	24 hour composite
"	TSS	mg/L	Plant influent	2/week	24 hour composite
Wastewater Effluent	Flow	MGD	Final effluent	7/week	Continuous
"	CBOD5	mg/L	Final effluent	2/week	24 hour composite
"	TSS	mg/L	Final effluent	2/week	24 hour composite
"	Fecal Coliform Bacteria	cfu/100 mL	Final effluent	2/week	grab
"	pH	Standard Units	Final effluent	7/week	grab
"	Ammonia	mg/L	Final effluent	1/week	24 hour composite
"	Metals: Copper, Mercury, Silver, Zinc	ug/L	Final effluent	1/week	24 hour composite
Chronic WET Compliance Condition S9.B			Final effluent	1/year	24 hour composite
Acute WET Characterization Condition S8.A			Final effluent	2/permit cycle, summer 2003 and winter 2003	24 hour composite

B. Sampling and Analytical Procedures

Samples and measurements taken to meet the requirements of this permit shall be representative of the volume and nature of the monitored parameters, including representative sampling of any unusual discharge or discharge condition, including bypasses, upsets, and maintenance-related conditions affecting effluent quality.

Sampling and analytical methods used to meet the water and wastewater monitoring requirements specified in this permit shall conform to the latest revision of the *Guidelines Establishing Test Procedures for the Analysis of Pollutants* contained in 40 CFR Part 136 or to the latest revision of *Standard Methods for the Examination of Water and Wastewater* (APHA), unless otherwise specified in this permit or approved in writing by the Department of Ecology (Department).

C. Flow Measurement

Appropriate flow measurement devices and methods consistent with accepted scientific practices shall be selected and used to ensure the accuracy and reliability of measurements of the quantity of monitored flows. The devices shall be installed, calibrated, and maintained to ensure that the accuracy of the measurements are consistent with the accepted industry standard for that type of device. Frequency of calibration shall be in conformance with manufacturer's recommendations and at a minimum frequency of at least one calibration per year. Calibration records shall be maintained for at least three years.

D. Laboratory Accreditation

All monitoring data shall be prepared by a laboratory registered or accredited under the provisions of, *Accreditation of Environmental Laboratories*, Chapter 173-50 WAC. Flow, temperature, settleable solids, conductivity, pH, and internal process control parameters are exempt from this requirement. Conductivity and pH shall be accredited if the laboratory must otherwise be registered or accredited. Crops, soils and hazardous waste data are exempted from this requirement pending accreditation of laboratories for analysis of these media by the Department.

S3. REPORTING AND RECORDKEEPING

The Permittee shall monitor and report in accordance with the following conditions. The falsification of information submitted to the Department shall constitute a violation of the terms and conditions of this permit.

A. Reporting

The first monitoring period begins on the effective date of the permit. Monitoring results shall be submitted monthly. Monitoring data obtained during the previous month shall be summarized and reported on a form provided, or otherwise approved, by the Department, and be received no later than the 15th day of the month following the completed reporting period, unless otherwise specified in this permit. The report shall be sent to the Department of Ecology, Northwest Regional Office, 3190 160th Avenue SE, Bellevue, Washington 98008-5452.

All lab reports providing data for organic and metal parameters shall include the following information: sampling date, sample location, date of analysis, parameter name, CAS number, analytical method/number, method detection limit (MDL), lab practical quantitation limit (PQL), reporting units and concentration detected.

In addition to the monthly report, a monthly summary report form (EPA No. 3320-1) shall be received no later than the 15th day of the following month. This report is limited to the parameters specified in condition S1A and S1B.

B. Records Retention

The Permittee shall retain records of all monitoring information for a minimum of three years. Such information shall include all calibration and maintenance records and all original recordings for continuous monitoring instrumentation, copies of all reports required by this permit, and records of all data used to complete the application for this permit. This period of retention shall be extended during the course of any unresolved litigation regarding the discharge of pollutants by the Permittee or when requested by the Director.

C. Recording of Results

For each measurement or sample taken, the Permittee shall record the following information: (1) the date, exact place, method, and time of sampling; (2) the individual who performed the sampling or measurement; (3) the dates the analyses were performed; (4) who performed the analyses; (5) the analytical techniques or methods used; and (6) the results of all analyses.

D. Additional Monitoring by the Permittee

If the Permittee monitors any pollutant more frequently than required by this permit using test procedures specified by Condition S2. of this permit, then the results of this monitoring shall be included in the calculation and reporting of the data submitted in the Permittee's self-monitoring reports.

E. Noncompliance Notification

In the event the Permittee is unable to comply with any of the permit terms and conditions due to any cause, the Permittee shall:

1. Immediately take action to stop, contain, and cleanup unauthorized discharges or otherwise stop the violation, and correct the problem;

2. Repeat sampling and analysis of any violation and submit the results to the Department within 30 days after becoming aware of the violation;

3. Immediately notify the Department of the failure to comply; and

4. Submit a detailed written report to the Department within thirty days (5 days for upsets and bypasses), unless requested earlier by the Department. The report should describe the nature of the violation, corrective action taken and/or planned, steps to be taken to prevent a recurrence, results of the resampling, and any other pertinent information.

Compliance with these requirements does not relieve the Permittee from responsibility to maintain continuous compliance with the terms and conditions of this permit or the resulting liability for failure to comply.

S4. FACILITY LOADING

A. Design Criteria

Flows or wasteloadings of the following design criteria for the permitted treatment facility shall not be exceeded:

Average flow for the maximum high flow month:	0.9 MGD
Average flow for the maximum low flow month:	0.75 MGD
BOD_5 loading for maximum month:	900 LB/day
TSS loading for maximum month:	1200 LB/day

B. Plans for Maintaining Adequate Capacity

When the actual flow or wasteload reaches 85 percent of any one of the design criteria in S4.A. for three consecutive months, or when the projected increases would reach design capacity within five years, whichever occurs first, the Permittee shall submit to the Department, a plan and a schedule for continuing to maintain capacity at the facility sufficient to achieve the effluent limitations and other conditions of this permit. This plan shall address any of the following actions or any others necessary to meet this objective.

1. Analysis of the present design including the introduction of any process modifications that would establish the ability of the existing facility to achieve the effluent limits and other requirements of this permit at specific levels in excess of the existing design criteria specified in paragraph A above.

2. Reduction or elimination of excessive infiltration and inflow of uncontaminated ground and surface water into the sewer system.

3. Limitation on future sewer extensions or connections or additional wasteloads.

4. Modification or expansion of facilities necessary to accommodate increased flow or wasteload.

5. Reduction of industrial or commercial flows or wasteloads to allow for increasing sanitary flow or wasteload.

The plan must meet the requirements of WAC 173-240-060, "Engineering Report," and be approved by the Department prior to any construction. The plan shall specify any contracts, ordinances, methods for financing, or other arrangements necessary to achieve this objective.

C. Notification of New or Altered Sources

The Permittee shall submit written notice to the Department whenever any new discharge or increase in volume or change in character of an existing discharge into the sewer is proposed which: (1) would interfere with the operation of, or exceed the design capacity of, any portion of the collection or treatment system; (2) is not part of an approved general sewer plan or approved plans and specifications; or would be subject to pretreatment standards under 40 CFR Part 403 and Section 307(b) of the Clean Water Act. This notice shall include an evaluation of the system's ability to adequately transport and treat the added flow and/or wasteload.

D. Infiltration and Inflow Evaluation

1. The Permittee shall conduct an infiltration and inflow evaluation. Refer to the U.S.EPA publication, *I/I Analysis and Project Certification*, Office of Municipal Pollution Control, Wash. DC, 20460. Plant monitoring records may be used to assess measurable infiltration and inflow.

2. A report shall be prepared which summarizes any measurable infiltration and inflow. If infiltration and inflow have increased by more than 15 percent from that found in the first report based on equivalent rainfall, the report shall contain a plan and a schedule for: (1) locating the sources of infiltration and inflow; and (2) correcting the problem.

3. The report shall be submitted by January 1, 2001, and annually thereafter.

S5. OPERATION AND MAINTENANCE

The Permittee shall at all times be responsible for the proper operation and maintenance of any facilities or systems of control installed to achieve compliance with the terms and conditions of the permit.

A. Certified Operator

An operator certified for at least a Class II plant by the State of Washington shall be in responsible charge of the day-to-day operation of the wastewater treatment plant. An operator certified for at least a Class I plant shall be in charge during all regularly scheduled shifts.

B. O & M Program

The Permittee shall institute an adequate operation and maintenance program for their entire sewage system. Maintenance records shall be maintained on all major electrical and mechanical components of the treatment plant, as well as the sewage system and pumping stations. Such records shall clearly specify the frequency and type of maintenance recommended by the manufacturer and shall show the frequency and type of maintenance performed. These maintenance records shall be available for inspection at all times.

C. Short-term Reduction

If a Permittee contemplates a reduction in the level of treatment that would cause a violation of permit discharge limitations on a short-term basis for any reason, and such reduction cannot be avoided, the Permittee shall give written notification to the Department, if possible, 30 days prior to such activities, detailing the reasons for, length of time of, and the potential effects of the reduced level of treatment. This notification does not relieve the Permittee of their obligations under this permit.

D. Electrical Power Failure

The Permittee is responsible for maintaining adequate safeguards to prevent the discharge of untreated wastes or wastes not treated in accordance with the requirements of this permit during electrical power failure at the treatment plant and/or sewage lift stations either by means of alternate power sources, standby generator, or retention of inadequately treated wastes. The Permittee shall maintain Reliability Class II (EPA 430-99-74-001) at the wastewater treatment plant, which requires primary sedimentation and disinfection.

E. Prevent Connection of Inflow

The Permittee shall strictly enforce their sewer ordinances and not allow the connection of inflow (roof drains, foundation drains, etc.) to the sanitary sewer system.

F. Bypass Procedures

The Permittee shall immediately notify the Department of any spill, overflow, or bypass from any portion of the collection or treatment system.

The bypass of wastes from any portion of the treatment system is prohibited unless one of the following conditions (1, 2, or 3) applies:

1. Unavoidable Bypass -- Bypass is unavoidable to prevent loss of life, personal injury, or severe property damage. "Severe property damage" means substantial physical damage to property, damage to the treatment facilities which would cause them to become inoperable, or substantial and permanent loss of natural resources which can reasonably be expected to occur in the absence of a bypass.

   If the resulting bypass from any portion of the treatment system results in noncompliance with this permit, the Permittee shall notify the Department in accordance with condition S3.E "Noncompliance Notification."

2. Anticipated Bypass That Has the Potential to Violate Permit Limits or Conditions -- Bypass is authorized by an administrative order issued by the Department. The Permittee shall apply to the Department for the administrative order at least 30 days before the planned date of bypass. The written submission shall contain: (1) a description of the bypass and its cause; (2) an analysis of all known alternatives which would eliminate, reduce, or mitigate the need for bypassing; (3) a cost-effectiveness analysis of alternatives including comparative resource damage assessment; (4) the minimum and maximum duration of bypass under each alternative; (5) a recommendation as to the preferred alternative for conducting the bypass; (6) the projected date of bypass initiation; (7) a statement of compliance with SEPA; (8) a request for a water quality modification, as provided for in WAC 173-201A-110, and (9) steps taken or planned to reduce, eliminate, and prevent reoccurrence of the bypass.

   For probable construction bypasses, the need to bypass is to be identified as early in the planning process as possible. The analysis required above shall be considered during preparation of the engineering report or facilities plan and plans and specifications and shall be included to the extent practical. In cases where the probable need to bypass is determined early, continued analysis is necessary up to and including the construction period in an effort to minimize or eliminate the bypass.

The Department will consider the following prior to issuing an administrative order:

a. If the bypass is necessary to perform construction or maintenance-related activities essential to meet the requirements of the permit.

b. If there are feasible alternatives to bypass, such as the use of auxiliary treatment facilities, retention of untreated wastes, maintenance during normal periods of equipment down time, or transport of untreated wastes to another treatment facility.

c. If the bypass is planned and scheduled to minimize adverse effects on the public and the environment.

After consideration of the above and the adverse effects of the proposed bypass and any other relevant factors, the Department will approve or deny the request. The public shall be notified and given an opportunity to comment on bypass incidents of significant duration, to the extent feasible. Approval of a request to bypass will be by administrative order issued by the Department under RCW 90.48.120.

3. Bypass For Essential Maintenance Without the Potential to Cause Violation of Permit Limits or Conditions -- Bypass is authorized if it is for essential maintenance and does not have the potential to cause violations of limitations or other conditions of the permit, or adversely impact public.

G. Operations and Maintenance Manual

The approved Operations and Maintenance Manual shall be kept available at the treatment plant and all operators shall follow the instructions and procedures of this Manual.

The O&M Manual shall include:

1. Emergency procedures for plant shutdown and cleanup in event of wastewater system upset or failure;

2. Plant maintenance procedures;

3. The treatment plant process control monitoring schedule.

S6. PRETREATMENT

A. General Requirements

The Permittee shall work cooperatively with the Department to ensure that all commercial and industrial users of the wastewater treatment system are in compliance with the pretreatment regulations promulgated in 40 CFR Part 403 and any additional pretreatment regulations that may be promulgated under Section 307(b) and reporting requirements under Section 308 of the Federal Clean Water Act.

B. Discharge Authorization Required

Significant industrial users (SIUs) shall not be allowed to discharge wastes to the Permittee's sewerage system until they have received prior authorization from the Department in accordance with Chapter 90.48 RCW and Chapter 173-216 WAC, as amended. The Permittee shall immediately notify the Department of any proposed new sources, as defined in 40 CFR 403.3(k), from significant commercial or industrial operations.

C. General Prohibitions

In accordance with 40 CFR 403.5(a), a nondomestic discharger may not introduce into the Permittee's sewerage system any pollutant(s) that cause pass through or interference.

D. Specific Prohibitions

In accordance with 40 CFR 403.5(b), the following nondomestic discharges shall not be discharged into the Permittee's sewerage treatment system.

1. Pollutants that create a fire or explosion hazard in the POTW (including, but not limited to waste streams with a closed cup flashpoint of less than 140 degrees Fahrenheit or 60 degrees Centigrade using the test methods specified in 40 CFR 261.21).

2. Pollutants that will cause corrosive structural damage to the Publicly Owned Treatment Works (POTW), but in no case discharges with pH lower than 5.0 standard units, unless the works are specifically designed to accommodate such discharges.

3. Solid or viscous pollutants in amounts that could cause obstruction to the flow in sewers or otherwise interfere with the operation of the POTW.

4. Any pollutant, including oxygen demanding pollutants (BOD, etc.), released in a discharge at a flow rate and/or pollutant concentration which will cause interference with the POTW.

5. Heat in amounts that will inhibit biological activity in the POTW resulting in interference, but in no case heat in such quantities such that the temperature at the POTW exceeds 40^{0}C (104^{0}F) unless the Department, upon request of the Permittee, approves, in writing, alternate temperature limits.

6. Petroleum oil, non-biodegradable cutting oil, or products of mineral origin in amounts that will cause interference or pass through.

7. Pollutants which result in the presence of toxic gases, vapors, or fumes within the POTW in a quantity which may cause acute worker health and safety problems.

8. Any trucked or hauled pollutants, except at discharge points designated by the Permittee.

E. Notification of Industrial User Violations

The Permittee shall notify the Department if any nondomestic user violates the prohibitions listed in S6.C and S6.D above.

F. Industrial User Survey

If required by the Department, the Permittee shall perform an industrial user survey, or other activities (e.g., sewer use ordinance and local limits development), which are necessary for the proper administration of the state pretreatment program.

S7. RESIDUAL SOLIDS

Residual solids include screenings, grit, scum, waste activated sludge and other solid waste. The Permittee shall store and handle all residual solids in such a manner so as to prevent their entry into state ground or surface waters. The Permittee shall not discharge leachate from residual solids to state surface or ground waters.

S8. ACUTE TOXICITY

A. Testing Requirements

The Permittee shall test final effluent once in the summer of 2003 and once in the winter of 2003, prior to submission of the application for permit renewal. The two species listed below shall be used on each sample and the results submitted to the Department as a part of the permit renewal application process. The Permittee shall conduct acute toxicity testing on a series of five concentrations of effluent and a control in order to be able to determine appropriate point estimates and an NOEC. The percent survival in 100% effluent shall also be reported.

Acute toxicity tests shall be conducted with the following species and protocols:

Freshwater Acute Toxicity Test Species		Method
Fathead minnow	*Pimephales promelas* (96 hour static-renewal test)	EPA/600/4-90/027F
Water flea	*Ceriodaphnia dubia*, *Daphnia pulex*, or *Daphnia magna* (48 hour static test, method)	EPA/600/4-90/027F

B. Sampling and Reporting Requirements

1. All reports for whole effluent toxicity tests shall be submitted in accordance with the most recent Department of Ecology specifications regarding format and content. Reports shall contain bench sheets and reference toxicant results for test methods. The effluent and reference toxicant test results shall also be submitted as electronic files on floppy disks in the Toxicity Standardized Electronic Reporting Format (TSERF) or other compatible format.

2. Testing shall be conducted on 24-hour composite effluent samples. Samples taken for toxicity testing shall be cooled to 4 degrees Celsius while being collected and shall be sent to the lab immediately upon completion. The lab shall begin the toxicity testing as soon as possible but no later than 36 hours after sampling was ended.

3. Permittees that potentially have ammonia and/or chlorine in the effluent shall measure total ammonia and/or chlorine from a sample collected for toxicity testing. All samples taken for toxicity testing shall have pH, total alkalinity, total hardness, dissolved oxygen, and conductivity or salinity measured prior to test initiation.

4. All toxicity tests shall meet quality assurance criteria in the most recent versions of the EPA manual listed in subsection A. and the Department of Ecology Publication #WQ-R-95-80, *Whole Effluent Toxicity Testing Regulatory Guidance and Test Review Criteria*. If test results are determined to be invalid or anomalous by the Department, testing shall be repeated with freshly collected effluent. If control performance does not meet protocol standards for acceptability, the test shall be repeated with freshly collected effluent.

5. Control water and dilution water shall be laboratory water or pristine natural water meeting the requirements of the EPA manual listed in subsection A. Dilution water for toxicity testing shall be of sufficient quality for good control performance.

6. The whole effluent toxicity tests shall be run on an unmodified sample of final effluent.

7. The Permittee may choose to conduct a full dilution series test in order to determine dose response. In this case, the series must have a minimum of five effluent concentrations and a control. The series must include the ACEC. The ACEC is 50% effluent.

8. All whole effluent toxicity tests that involve hypothesis testing and do not comply with the acute statistical power standard of 29% as defined in WAC 173-205-020 must be repeated on a fresh sample with an increased number of replicates to increase the power.

S9. CHRONIC TOXICITY

A. Effluent Limit for Chronic Toxicity

The effluent limit for chronic toxicity is no toxicity detected in a test concentration representing the chronic critical effluent concentration (CCEC).

The CCEC means the maximum concentration of effluent allowable at the boundary of the mixing zone assigned in Section S.1.C pursuant to WAC 173-201A-100. The CCEC equals 9.6% effluent.

In the event of failure to pass the test described in subsection B. of this section for compliance with the effluent limit for chronic toxicity, the Permittee is considered to be in compliance with all permit requirements for chronic whole effluent toxicity as long as the requirements in subsection C. are being met to the satisfaction of the Department.

B. Monitoring for Compliance With an Effluent Limit for Chronic Toxicity

The Permittee shall conduct monitoring to determine compliance with the effluent limit for chronic toxicity. The chronic toxicity tests shall be performed using at a minimum the CCEC, the ACEC, and a control. Chronic toxicity testing shall follow protocols, monitoring requirements, and quality assurance/quality control procedures specified in this Section. Testing shall begin within 60 days of the permit effective date. A written report shall be submitted to the Department within 60 days after the sample date. This written report shall contain the results of hypothesis testing conducted as described in this subsection using both the ACEC and CCEC versus the control.

Monitoring to determine compliance with the effluent limit shall be conducted **annually** using the following species and the most recent version of the following protocols:

Freshwater Chronic Toxicity Test Species		Method
Fathead minnow	*Pimephales promelas*	EPA/600/4-91/002
Water flea	*Ceriodaphnia dubia*	EPA/600/4-91/002

The Permittee is in violation of the effluent limit for chronic toxicity in subsection A. and shall immediately implement subsection C. if any chronic toxicity test conducted for compliance monitoring determines a statistically significant difference in response between the control and the CCEC using hypothesis testing at the 0.05 level of significance (Appendix H, EPA/600/4-89/001). If the difference in response between the control and the CCEC is less than 20%, the hypothesis test shall be conducted at the 0.01 level of significance.

In order to establish whether the chronic toxicity limit is eligible for removal from future permits, the Permittee shall also conduct this same hypothesis test (Appendix H, EPA/600/4-89/001) to determine if a statistically significant difference in response exists between the ACEC and the control.

C. Response to Noncompliance With an Effluent Limit for Chronic Toxicity

If a toxicity test conducted for compliance monitoring under subsection B. determines a statistically significant difference in response between the CCEC and the control, the Permittee shall begin additional compliance monitoring within one week from the time of receiving the test results. This additional monitoring shall be conducted monthly for three consecutive months using the same test and species as the failed compliance test. Testing shall be conducted using a series of at least five effluent concentrations and a control in order to be able to determine appropriate point estimates. One of these effluent concentrations shall equal the CCEC and be compared statistically to the nontoxic control in order to determine compliance with the effluent limit for chronic toxicity as described in subsection B. The discharger shall return to the original monitoring frequency in subsection B. after completion of the additional compliance monitoring.

If the Permittee believes that a test indicating noncompliance will be identified by the Department as an anomalous test result, the Permittee may notify the Department that the compliance test result might be anomalous and that the Permittee intends to take only one additional sample for toxicity testing and wait for notification from the Department before completing the additional monitoring required in this subsection. The notification to the Department shall accompany the report of the compliance test result and identify the reason for considering the compliance test result to be anomalous. The Permittee shall complete all of the additional monitoring required in this subsection as soon as possible after notification by the Department that the compliance test result was not anomalous. If the one additional sample fails to comply with the effluent limit for chronic toxicity, then the Permittee shall proceed without delay to complete all of the additional monitoring required in this subsection. The one additional test result shall replace the compliance test result upon determination by the Department that the compliance test result was anomalous.

If all of the additional compliance monitoring conducted in accordance with this subsection complies with the permit limit, the Permittee shall search all pertinent and recent facility records (operating records, monitoring results, inspection records, spill reports, weather records, production records, raw material purchases, pretreatment records, etc.) and submit a report to the Department on possible causes and preventive measures for the transient toxicity event which triggered the additional compliance monitoring.

If toxicity occurs in violation of the chronic toxicity limit during the additional compliance monitoring, the Permittee shall submit a Toxicity Identification/Reduction Evaluation (TI/RE) plan to the Department within 60 days after the sample date. The TI/RE plan shall be based on WAC 173-205-100(2) and shall be implemented in accordance with WAC 173-205-100(3).

D. Sampling and Reporting Requirements

1. All reports for effluent characterization or compliance monitoring shall be submitted in accordance with the most recent version of Department of Ecology Publication #WQ-R-95-80, *Laboratory Guidance and Whole Effluent Toxicity Test Review Criteria,* in regards to format and content. Reports shall contain bench sheets and reference toxicant results for test methods. If the lab provides the toxicity test data on floppy disk for electronic entry into the Department's database, then the Permittee shall send the disk to the Department along with the test report, bench sheets, and reference toxicant results.

2. Testing shall be conducted on 24-hour composite effluent samples. Samples taken for toxicity testing shall be cooled to 4 degrees Celsius while being collected and shall be sent to the lab immediately upon completion. The lab shall begin the toxicity testing as soon as possible but no later than 36 hours after sampling was ended.

3. All samples and test solutions for toxicity testing shall have water quality measurements as specified in Department of Ecology Publication #WQ-R-95-80, *Laboratory Guidance and Whole Effluent Toxicity Test Review Criteria,* or most recent version thereof.

4. All toxicity tests shall meet quality assurance criteria and test conditions in the most recent versions of the EPA manual listed in subsection A. and the Department of Ecology Publication #WQ-R-95-80, *Laboratory Guidance and Whole Effluent Toxicity Test Review Criteria*. If test results are determined to be invalid or anomalous by the Department, testing shall be repeated with freshly collected effluent.

5. Control water and dilution water shall be laboratory water meeting the requirements of the EPA manual listed in subsection A or pristine natural water of sufficient quality for good control performance.

6. The whole effluent toxicity tests shall be run on an unmodified sample of final effluent.

7. The Permittee may choose to conduct a full dilution series test during compliance monitoring in order to determine dose response. In this case, the series must have a minimum of five effluent concentrations and a control. The series of concentrations must include the CCEC of 9.6 % and the ACEC of 50%. The CCEC and the ACEC may either substitute for the effluent concentration that is closest to it in the dilution series or be an extra effluent concentration.

8. All whole effluent toxicity tests that involve hypothesis testing and do not comply with the chronic statistical power standard of 39% as defined in WAC 173-205-020 must be repeated on a fresh sample with an increased number of replicates to increase the power.

GENERAL CONDITIONS

G1. SIGNATORY REQUIREMENTS

All applications, reports, or information submitted to the Department shall be signed and certified.

A. All permit applications shall be signed by either a principal executive officer or a ranking elected official.

B. All reports required by this permit and other information requested by the Department shall be signed by a person described above or by a duly authorized representative of that person. A person is a duly authorized representative only if:

1. The authorization is made in writing by a person described above and submitted to the Department, and

2. The authorization specifies either an individual or a position having responsibility for the overall operation of the regulated facility, such as the position of plant manager, superintendent, position of equivalent responsibility, or an individual or position having overall responsibility for environmental matters. (A duly authorized representative may thus be either a named individual or any individual occupying a named position.)

C. Changes to authorization. If an authorization under paragraph B.2. above is no longer accurate because a different individual or position has responsibility for the overall operation of the facility, a new authorization satisfying the requirements of B.2. must be submitted to the Department prior to or together with any reports, information, or applications to be signed by an authorized representative.

D. Certification. Any person signing a document under this section shall make the following certification:

"I certify under penalty of law, that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gathered and evaluated the information submitted. Based on my inquiry of the person or persons who manage the system or those persons directly responsible for gathering information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations."

G2. RIGHT OF ENTRY

The Permittee shall allow an authorized representative of the Department, upon the presentation of credentials and such other documents as may be required by law:

A. To enter upon the premises where a discharge is located or where any records must be kept under the terms and conditions of this permit;

B. To have access to and copy at reasonable times any records that must be kept under the terms of the permit;

C. To inspect at reasonable times any monitoring equipment or method of monitoring required in the permit;

D. To inspect at reasonable times any collection, treatment, pollution management, or discharge facilities; and

E. To sample at reasonable times any discharge of pollutants.

G3. PERMIT ACTIONS

This permit shall be subject to modification, suspension, or termination, in whole or in part, by the Department for any of the following causes:

A. Violation of any permit term or condition;

B. Obtaining a permit by misrepresentation or failure to disclose all relevant facts;

C. A material change in quantity or type of waste disposal;

D. A material change in the condition of the waters of the state; or

E. Nonpayment of fees assessed pursuant to RCW 90.48.465.

The Department may also modify this permit, including the schedule of compliance or other conditions, if it determines good and valid cause exists, including promulgation or revisions of regulations or new information.

G4. REPORTING A CAUSE FOR MODIFICATION

The Permittee shall submit a new application, or a supplement to the previous application, along with required engineering plans and reports, whenever a material change in the quantity or type of discharge is anticipated which is not specifically authorized by this permit. This application shall be submitted at least 60 days prior to any proposed changes. Submission of this application does not relieve the Permittee of the duty to comply with the existing permit until it is modified or reissued.

G5. PLAN REVIEW REQUIRED

Prior to constructing or modifying any wastewater control facilities, an engineering report and detailed plans and specifications shall be submitted to the Department for approval in accordance with Chapter 173-240 WAC. Engineering reports, plans, and specifications should be submitted at least 180 days prior to the planned start of construction. Facilities shall be constructed and operated in accordance with the approved plans.

G6. COMPLIANCE WITH OTHER LAWS AND STATUTES

Nothing in the permit shall be construed as excusing the Permittee from compliance with any applicable federal, state, or local statutes, ordinances, or regulations.

G7. DUTY TO REAPPLY

The Permittee must apply for permit renewal at least 180 days prior to the specified expiration date of this permit.

G8. REMOVED SUBSTANCES

Collected screenings, grit, solids, sludges, filter backwash, or other pollutants removed in the course of treatment or control of wastewaters shall not be resuspended or reintroduced to the final effluent stream for discharge to state waters.

G9. TOXIC POLLUTANTS

If any applicable toxic effluent standard or prohibition (including any schedule of compliance specified in such effluent standard or prohibition) is established under Section 307(a) of the Clean Water Act for a toxic pollutant and that standard or prohibition is more stringent than any limitation upon such pollutant in the permit, the Department shall institute proceedings to modify or revoke and reissue the permit to conform to the new toxic effluent standard or prohibition.

G10. OTHER REQUIREMENTS OF 40 CFR

All other requirements of 40 CFR 122.41 and 122.42 are incorporated in this permit by reference.

G11. ADDITIONAL MONITORING

The Department may establish specific monitoring requirements in addition to those contained in this permit by administrative order or permit modification.

G12. PAYMENT OF FEES

The Permittee shall submit payment of fees associated with this permit as assessed by the Department. The Department may revoke this permit if the permit fees established under Chapter 173-224 WAC are not paid.

G13. PENALTIES FOR VIOLATING PERMIT CONDITIONS

Any person who is found guilty of willfully violating the terms and conditions of this permit shall be deemed guilty of a crime, and upon conviction thereof shall be punished by a fine of up to ten thousand dollars and costs of prosecution, or by imprisonment in the discretion of the court. Each day upon which a willful violation occurs may be deemed a separate and additional violation.

Any person who violates the terms and conditions of a waste discharge permit shall incur, in addition to any other penalty as provided by law, a civil penalty in the amount of up to ten thousand dollars for every such violation. Each and every such violation shall be a separate and distinct offense, and in case of a continuing violation, every day's continuance shall be and be deemed to be a separate and distinct violation.

FACT SHEET FOR NPDES PERMIT WA-002951-3
FACILITY NAME CITY OF DUVALL

SUMMARY

TABLE OF CONTENTS

INTRODUCTION

The Federal Clean Water Act (FCWA, 1972, and later modifications, 1977, 1981, and 1987) established water quality goals for the navigable (surface) waters of the United States. One of the mechanisms for achieving the goals of the Clean Water Act is the National Pollutant Discharge Elimination System of permits (NPDES permits), which is administered by the Environmental Protection Agency (EPA). The EPA has delegated responsibility to administer the NPDES permit program to the State of Washington on the basis of Chapter 90.48 RCW which defines the Department of Ecology's authority and obligations in administering the wastewater discharge permit program.

The regulations adopted by the State include procedures for issuing permits (Chapter 173-220 WAC), technical criteria for discharges from municipal wastewater treatment facilities (Chapter 173-221 WAC), water quality criteria for surface and ground waters (Chapters 173-201A and 200 WAC), and sediment management standards (Chapter 173-204 WAC). These regulations require that a permit be issued before discharge of wastewater to waters of the state is allowed. The regulations also establish the basis for effluent limitations and other requirements which are to be included in the permit. One of the requirements (WAC 173-220-060) for issuing a permit under the NPDES permit program is the preparation of a draft permit and an accompanying fact sheet. Public notice of the availability of the draft permit is required at least thirty days before the permit is issued (WAC 173-220-050). The fact sheet and draft permit are available for review (see Appendix A--Public Involvement of the fact sheet for more detail on the Public Notice procedures).

The fact sheet and draft permit have been reviewed by the Permittee. Errors and omissions identified in this review have been corrected before going to public notice. After the public comment period has closed, the Department will summarize the substantive comments and the response to each comment. The summary and response to comments will become part of the file on the permit and parties submitting comments will receive a copy of the Department's response. The fact sheet will not be revised. Comments and the resultant changes to the permit will be summarized in Appendix D--Response to Comments.

GENERAL INFORMATION	
Applicant	City of Duvall
Facility Name and Address	Duvall WWTP 14525 Main Street Duvall, Washington 98019
Type of Treatment	Oxidation Ditch
Discharge Location	Snoqualmie River Latitude: 47° 43' 20" N Longitude: 121° 59' 37" W
Water Body ID Number	WA-07-1100

BACKGROUND INFORMATION

DESCRIPTION OF THE FACILITY

The primary source of wastewater tributary to this facility is domestic sewage from residential and light commercial activities in the city. The existing sewer system consists of 24,000 linear feet of 6-inch side sewers, 62,000 linear feet of 8-inch collection lines, 861 feet of 10-inch interception line, and 1,729 linear feet of 12-inch interceptor.

COLLECTION SYSTEM STATUS

The collection system was initially installed in the mid-1970's when the initial oxidation ditch was constructed. The system has been plagued by infiltration and inflow since its inception. The resulting influent to the WWTP is of a dilute nature. The city has instituted an on-going correction program and provides the Department with annual reports of their efforts.

TREATMENT PROCESSES

The treatment facilities include influent flow measurement, mechanical barscreen/grinder, selector basin, three oxidation ditch basins (only the large one is currently being used), secondary clarification, and disinfection utilizing U-V radiation.

DISCHARGE OUTFALL

Secondary treated and disinfected effluent is discharged from the facility via a bankside diffuser into the Snoqualmie River.

RESIDUAL SOLIDS

The treatment facilities remove solids during the treatment of the wastewater at the headworks (grit and screenings), and at the secondary clarifiers, in addition to incidental solids (rags, scum, and other debris) removed as part of the routine maintenance of the equipment. Grit, rags, scum and screenings are drained and disposed of as solid waste at the local landfill. Sludge removed from the secondary clarifiers is held in a 16-foot diameter thickener/decanter and then dewatered in a Somat screw press. Dewatered solids are transported to the City of Monroe Compost facility located at the Twin Rivers Correction Complex. This composting operation is regulated by the Snohomish Health District.

PERMIT STATUS

The previous permit for this facility was issued on October 9, 1992. The previous permit placed effluent limitations on 5-day Biochemical Oxygen Demand (BOD_5), Total Suspended Solids (TSS), pH, Fecal Coliform bacteria, Ammonia, Chlorine, Copper, Mercury, Silver, and Zinc.

An application for permit renewal was submitted to the Department on January 31, 1997, and accepted by the Department on March 27, 1997. An extension letter was issued administratively extending the permit to allow issuance with other permits in the Snohomish River Basin.

SUMMARY OF COMPLIANCE WITH THE PREVIOUS PERMIT

The facility received its last inspection on May 5, 1996, a compliance inspection with sampling.

During the history of the previous permit, the Permittee has had violations of copper, silver, and ammonia. The ammonia violation was a single daily maximum and the facility remained in compliance the rest of the time period.

WASTEWATER CHARACTERIZATION

The concentration of pollutants in the discharge was reported in the NPDES application and in discharge monitoring reports. The effluent is characterized as follows:

Table 1: Wastewater Characterization

Parameter	Concentration
BOD_5	8 mg/L
TSS	13.4 mg/L
COPPER	<2-360 ug/L
MERCURY	<0.2 ug/L
SILVER	<0.1-4.1 ug/L
ZINC	<2-98 ug/L
AMMONIA	0.12- 0.72 mg/L

PROPOSED PERMIT LIMITATIONS

Federal and State regulations require that effluent limitations set forth in a NPDES permit must be either technology- or water quality-based. Technology-based limitations for municipal discharges are set by regulation (40 CFR 133 and Chapters 173-220 and 173-221 WAC). Water quality-based limitations are based upon compliance with the Surface Water Quality Standards (Chapter 173-201A WAC), Ground Water Standards (Chapter 173-200 WAC), Sediment Quality Standards (Chapter 173-204 WAC) or the National Toxics Rule (Federal Register, Volume 57, No. 246, Tuesday, December 22, 1992.) The most stringent of these types of limits must be chosen for each of the parameters of concern. Each of these types of limits is described in more detail below.

The limits in this permit are based in part on information received in the application. The effluent constituents in the application were evaluated on a technology- and water quality-basis. The limits necessary to meet the rules and regulations of the State of Washington were determined and included in this permit. Ecology does not develop effluent limits for all pollutants that may be reported on the application as present in the effluent. Some pollutants are not treatable at the concentrations reported, are not controllable at the source, are not listed in regulation, and do not have a reasonable potential to cause a water quality violation. If significant changes occur in any constituent, as described in 40 CFR 122.42(a), the Permittee is required to notify the Department of Ecology.

DESIGN CRITERIA

In accordance with WAC 173-220-150 (1)(g), flows or waste loadings shall not exceed approved design criteria.

The design criteria for this treatment facility are taken from 3-6-91 engineering report prepared by Howard Edde, Inc., and are as follows:

Table 2: Design Standards for Duvall WWTP

Parameter	Design Quantity
Monthly average flow (max. month)	0.9 MGD
Monthly average dry weather flow (max. month)	0.75 MGD
BOD_5 influent loading	900 lb./day
TSS influent loading	1200 lb./day

TECHNOLOGY-BASED EFFLUENT LIMITATIONS

Municipal wastewater treatment plants are a category of discharger for which technology-based effluent limits have been promulgated by federal and state regulations. These effluent limitations are given in the Code of Federal Regulations (CFR) 40 CFR Part 133 (federal) and in Chapter 00173-221 WAC (state). These regulations are performance standards that constitute all known available and reasonable methods of prevention, control, and treatment for municipal wastewater. Percentage removal adjustment due to dilute influent 40 CFR 133.103 (d) is incorporated into this permit

The following technology-based limits for pH, fecal coliform, $CBOD_5$, and TSS are taken from Chapter 173-221 WAC are:

Table 3: Technology-based Limits

Parameter	Limit
pH	shall be within the range of 6 to 9 standard units
Fecal Coliform Bacteria	Monthly Geometric Mean = 200 organisms/100 mL Weekly Geometric Mean = 400 organisms/100 mL
$CBOD_5$ (concentration)	Average Monthly Limit is the most stringent of the following: - 25 mg/L - may not exceed twenty five percent (25%) of the average influent concentration (% removal modified due to dilute influent) Average Weekly Limit = 40 mg/L

Parameter	Limit
TSS (concentration)	Average Monthly Limit is the most stringent of the following: - 30 mg/L - may not exceed nineteen percent (19 %) of the average influent concentration (% removal modified due to dilute influent) Average Weekly Limit = 45 mg/L

The existing permit had a chlorine limit of 65 ug/L monthly average with a 169 ug/L daily maximum. The facility complied with interim effluent limits until installation of a U-V disinfection system. The proposed permit eliminates the chlorine limit.

The following technology-based mass limits are based on WAC 173-220-130(3)(b) and 173-221-030(11)(b). These technology-based limits will apply in the high flow season of **November through July.**

Monthly effluent mass loadings (lbs./day) were calculated as the maximum monthly design flow (0.9 MGD) x Concentration limit (25 mg/L) x 8.34 (conversion factor) = mass limit 188 lb./day of CBOD5.

The weekly average effluent mass loading is calculated as the maximum monthly design flow (0.9 MGD) x Concentration limit (40 mg/L) x 8.34 (conversion factor) = mass limit 300 lb./day of CBOD5.

Monthly effluent mass loadings (lbs./day) were calculated as the maximum monthly design flow (0.9 MGD) x Concentration limit (30 mg/L) x 8.34 (conversion factor) = mass limit 225 lb./day of TSS.

The weekly average effluent mass loading is calculated as the maximum monthly design flow (0.9 MGD) x Concentration limit (45 mg/L) x 8.34 (conversion factor) = mass limit 338 lb./day of TSS.

SURFACE WATER QUALITY-BASED EFFLUENT LIMITATIONS

In order to protect existing water quality and preserve the designated beneficial uses of Washington's surface waters, WAC 173-201A-060 states that waste discharge permits shall be conditioned such that the discharge will meet established Surface Water Quality Standards. The Washington State Surface Water Quality Standards (Chapter 173-201A WAC) is a state regulation designed to protect the beneficial uses of the surface waters of the state. Water quality-based effluent limitations may be based on an individual waste load allocation (WLA) or on a WLA developed during a basin-wide total maximum daily loading study (TMDL).

On July 3, 1996, the Snoqualmie River TMDL was approved by the Environmental Protection Agency. This TMDL limits ammonia nitrogen, fecal coliform bacteria, and BOD_5 in the Snoqualmie River in the vicinity of the Duvall WWTP and downstream through the mainstem Snoqualmie to its confluence with the Skykomish River. Although the TMDL evaluated options which included discharges at Fall City and Carnation for purposes of this permit cycle the TMDL water quality based limits will utilize the option with only three municipal discharges in the river system. The net effect of this is to allow higher loads than can be accommodated if all municipalities are discharging. The City of Duvall TMDL for $CBOD_5$ is 94 lbs./day and the TMDL for ammonia is 43.8 lbs./day. Compliance with the technology-based standards for fecal coliform will meet the requirements of the TMDL.

NUMERICAL CRITERIA FOR THE PROTECTION OF AQUATIC LIFE

"Numerical" water quality criteria are numerical values set forth in the State of Washington's Water Quality Standards for Surface Waters (Chapter 173-201A WAC). They specify the levels of pollutants allowed in a receiving water while remaining protective of aquatic life. Numerical criteria set forth in the Water Quality Standards are used along with chemical and physical data for the wastewater and receiving water to derive the effluent limits in the discharge permit. When surface water quality-based limits are more stringent or potentially more stringent than technology-based limitations, they must be used in a permit.

NUMERICAL CRITERIA FOR THE PROTECTION OF HUMAN HEALTH

The state was issued 91 numeric water quality criteria for the protection of human health by the U.S. EPA (EPA 1992). These criteria are designed to protect humans from cancer and other disease and are primarily applicable to fish and shellfish consumption and drinking water from surface waters.

NARRATIVE CRITERIA

In addition to numerical criteria, "narrative" water quality criteria (WAC 173-201A-030) limit toxic, radioactive, or deleterious material concentrations below those which have the potential to adversely affect characteristic water uses, cause acute or chronic toxicity to biota, impair aesthetic values, or adversely affect human health. Narrative criteria protect the specific beneficial uses of all fresh (WAC 173-201A-130) and marine (WAC 173-201A-140) waters in the State of Washington.

ANTIDEGRADATION

The State of Washington's Antidegradation Policy requires that discharges into a receiving water shall not further degrade the existing water quality of the water body. In cases where the natural conditions of a receiving water are of lower quality than the criteria assigned, the natural conditions shall constitute the water quality criteria. Similarly, when the natural conditions of a receiving water are of higher quality than the criteria assigned, the natural conditions shall constitute the water quality criteria. More information on the State Antidegradation Policy can be obtained by referring to WAC 173-201A-070.

CRITICAL CONDITIONS

Surface water quality-based limits are derived for the waterbody's critical condition, which represents the receiving water and waste discharge condition with the highest potential for adverse impact on the aquatic biota, human health, and existing or characteristic water body uses.

MIXING ZONES

The Water Quality Standards allow the Department of Ecology to authorize mixing zones around a point of discharge in establishing surface water quality-based effluent limits. Both "acute" and "chronic" mixing zones may be authorized for pollutants that can have a toxic effect on the aquatic environment near the point of discharge. The concentration of pollutants at the boundary of these mixing zones may not exceed the numerical criteria for that type of zone. Mixing zones can only be authorized for discharges that are receiving all known, available, and reasonable methods of prevention, control and treatment (AKART) and in accordance with other mixing zone requirements of WAC 173-201A-100.

The National Toxics Rule (EPA, 1992) allows the mixing zone to be used to meet human health criteria.

DESCRIPTION OF THE RECEIVING WATER

The facility discharges to the Snoqualmie River, which is designated as a Class A freshwater receiving water in the vicinity of the outfall. Other nearby point source outfalls include the city of North Bend, the city of Snoqualmie, Weyerhaeuser Snoqualmie Mill, and Tokul Creek Hatchery Significant nearby non-point sources of pollutants include silvicultural and agricultural activities. Characteristic uses include the following:

> water supply (domestic, industrial, agricultural); stock watering; fish migration; fish rearing, spawning and harvesting; wildlife habitat; primary contact recreation; sport fishing; boating and aesthetic enjoyment; commerce and navigation

Water quality of this class shall meet or exceed the requirements for all or substantially all uses.

SURFACE WATER QUALITY CRITERIA

Applicable criteria are defined in Chapter 173-201A WAC for aquatic biota. In addition, U.S. EPA has promulgated human health criteria for toxic pollutants (EPA 1992). Criteria for this discharge are summarized below:

Fecal Coliforms	100 organisms/100 mL maximum geometric mean
Dissolved Oxygen	8 mg/L minimum
Temperature	18 degrees Celsius maximum or incremental increases above background
pH	6.5 to 8.5 standard units
Turbidity	less than 5 NTUs above background
Toxics	No toxics in toxic amounts (see Appendix C for numeric criteria for toxics of concern for this discharge)

CONSIDERATION OF SURFACE WATER QUALITY-BASED LIMITS FOR NUMERIC CRITERIA

Pollutant concentrations in the proposed discharge exceed water quality criteria with technology-based controls which the Department has determined to be AKART. A mixing zone is authorized in accordance with the geometric configuration, flow restriction, and other restrictions for mixing zones in Chapter 173-201A WAC and are defined as follows:

The dilution factors of effluent to receiving water that occur within these zones have been determined at the critical condition by the use of the UM3 Model, a dye study performed in the vicinity of the outfall, and the geometric and flow restrictions imposed by WAC 173-201A. The dilution factors have been determined to be:

	Acute	Chronic
Aquatic Life	2.0	10.4

Pollutants in an effluent may affect the aquatic environment near the point of discharge (near field) or at a considerable distance from the point of discharge (far field). Toxic pollutants, for example, are near-field pollutants--their adverse effects diminish rapidly with mixing in the receiving water. Conversely, a pollutant such as BOD is a far-field pollutant whose adverse effect occurs away from the discharge even after dilution has occurred. Thus, the method of calculating water quality-based effluent limits varies with the point at which the pollutant has its maximum effect.

The derivation of water quality-based limits also takes into account the variability of the pollutant concentrations in both the effluent and the receiving water.

The critical condition for the Snoqualmie River is the seven day average low river flow with a recurrence interval of 20 years (7Q20). Ambient data at critical conditions in the vicinity of the Duvall outfall was taken from the TMDL study. This study considered both historical data and intensive in-river monitoring together with comprehensive sampling of the point source discharges along the river. The initial low flow study was conducted during July - September of 1989. Additional confirmation sampling was conducted during September 1991 to verify the QUAL2E model developed for the TMDL. The Snoqualmie River Total Maximum Daily Load was approved by the Environmental Protection Agency on July 3, 1996.

In May 1999 the city of Duvall submitted a report entitled *Mixing Zone Study and TMDL Alternatives Analysis* (May 1999) prepared by Cosmopolitan Engineers and a request for alternative effluent limits which would be compliant with the TMDL. The exchange of lower ammonia limits for higher $CBOD_5$ limits was evaluated with the QUAL2E model and found to be protective of the dissolved oxygen standard. The City's request has been incorporated into the proposed permit.

Table 4: Ambient Data at critical conditions in the vicinity of the outfall

Parameter	Value used
7Q20 low flow	465 cfs
Temperature	20.3° C
pH (high)	7.8
Dissolved Oxygen	8.0 mg/L
Total Ammonia-N	0.04 mg/L
Fecal Coliform	41/100 mL dry weather (>100/100 mL storm related)
Hardness	25 mg/L as CaCO3

$CBOD_5$--Under critical conditions there was a prediction of a violation of the dissolved oxygen criterion for the receiving water with $CBOD_5$ mass discharge set at the technology-based levels and the historical ammonia discharge levels. A $CBOD_5$ effluent limit of 172 lbs./day and an ammonia limit of 12.5 lbs./day NH3-N was found to be protective of the dissolved oxygen criterion and therefore was imposed instead of the technology-based limitation.

Temperature and pH--Under critical conditions there is no predicted violation of the Water Quality Standards for Surface Waters. Therefore, the technology-based effluent limitations for pH was placed in the permit and temperature was not limited.

Fecal coliform--The numbers of fecal coliform were modeled by simple mixing analysis using the technology-based limit of 400 organisms per 100 ml and a dilution factor of DFc=10.4.

Under critical conditions there is no predicted violation of the Water Quality Standards for Surface Waters with the technology-based limit. Therefore, the technology-based effluent limitation for fecal coliform bacteria was placed in the proposed permit.

Toxic Pollutants--Federal regulations (40 CFR 122.44) require NPDES permits to contain effluent limits for toxic chemicals in an effluent whenever there is a reasonable potential for those chemicals to exceed the surface water quality criteria. This process occurs concurrently with the derivation of technology-based effluent limits. Facilities with technology-based effluent limits defined in regulation are not exempted from meeting the Water Quality Standards for Surface Waters or from having surface water quality-based effluent limits.

The following toxics were determined to be present in the discharge: ammonia, copper, mercury, silver, and zinc. A reasonable potential analysis (See Appendix C) was conducted on these parameters to determine whether or not effluent limitations would be required in this permit.

The determination of the reasonable potential for ammonia, copper, mercury, silver, and zinc to exceed the water quality criteria was evaluated with procedures given in EPA, 1991 (Appendix C) at the critical condition. The critical condition in this case occurs the low flow period of August through October. The parameters used in the critical condition modeling are as follows: acute dilution factor DF_a=2.0, chronic dilution factor DF_c=10.4, and receiving water temperature 20.3°C, and hardness = 25mg/L as $CaCO_3$.

Effluent limits were derived for copper, mercury, silver, and zinc, which were determined to have a reasonable potential to cause a violation of the Water Quality Standards. Effluent limits were calculated using methods from EPA, 1991 as shown in Appendix C.

The resultant effluent limits are as follows:

Parameter	Average Monthly	Maximum Daily
Copper	4.6 ug/L (0.029 lbs./day)	9.3 ug/L
Mercury	0.1 ug/L (0.0006 lbs./day)	0.2 ug/L
Silver	0.4 ug/L (0.002 lbs./day)	0.8 ug/L
Zinc	35.4 ug/L (0.221 lbs./day)	71 ug/L

Water quality criteria for metals in Chapter 173-201A WAC are based on the dissolved fraction of the metal.

The Permittee may provide data clearly demonstrating the seasonal partitioning of the dissolved metal in the ambient water in relation to an effluent discharge. Metals criteria may be adjusted on a site-specific basis when data is available clearly demonstrating the seasonal partitioning in the ambient water in relation to an effluent discharge.

Metals criteria may also be adjusted using the water effects ratio approach established by USEPA, as generally guided by the procedures in USEPA Water Quality Standards Handbook, December 1983, as supplemented or replaced.

WHOLE EFFLUENT TOXICITY

The Water Quality Standards for Surface Waters require that the effluent not cause toxic effects in the receiving waters. Many toxic pollutants cannot be detected by commonly available detection methods. However, toxicity can be measured directly by exposing living organisms to the wastewater in laboratory tests and measuring the response of the organisms. Toxicity tests measure the aggregate toxicity of the whole effluent, and therefore this approach is called whole effluent toxicity (WET) testing. Some WET tests measure acute toxicity and other WET tests measure chronic toxicity.

Acute toxicity tests measure mortality as the significant response to the toxicity of the effluent. Dischargers who monitor their wastewater with acute toxicity tests are providing an indication of the potential lethal effect of the effluent to organisms in the receiving environment.

Chronic toxicity tests measure various sublethal toxic responses such as retarded growth or reduced reproduction. Chronic toxicity tests often involve either a complete life cycle test of an organism with an extremely short life cycle or a partial life cycle test on a critical stage of one of a test organism's life cycles. Organism survival is also measured in some chronic toxicity tests.

Accredited WET testing laboratories have the proper WET testing protocols, data requirements, and reporting format. Accredited laboratories are knowledgeable about WET testing and capable of calculating an NOEC, LC_{50}, EC_{50}, IC_{25}, etc. All accredited labs have been provided the most recent version of the Department of Ecology Publication #WQ-R-95-80, *Laboratory Guidance and Whole Effluent Toxicity Test Review Criteria*, which is referenced in the permit. Any Permittee interested in receiving a copy of this publication may call the Ecology Publications Distribution Center 360-407-7472 for a copy. Ecology recommends that Permittees send a copy of the acute or chronic toxicity sections(s) of their permits to their laboratory of choice.

The WET tests during effluent characterization indicate that no reasonable potential exists to cause receiving water acute toxicity, and the Permittee will not be given an acute WET limit and will only be required to retest the effluent prior to application for permit renewal in order to demonstrate that acute toxicity has not increased in the effluent.

If the Permittee makes process or material changes which, in the Department's opinion, results in an increased potential for effluent toxicity, then the Department may require additional effluent characterization in a regulatory order, by permit modification, or in the permit renewal. Toxicity is assumed to have increased if WET testing conducted for submission with a permit application fails to meet the performance standards in WAC 173-205-020, "whole effluent toxicity performance standard." The Permittee may demonstrate to the Department that changes have not increased effluent toxicity by performing additional WET testing after the time the process or material changes have been made.

Chronic toxicity was also measured during effluent characterization in the previous permit term. This toxicity was found to be at levels that, in accordance with WAC 173-205-050(2)(a), have a reasonable potential to cause receiving water toxicity. **A chronic toxicity limit is therefore required**. The chronic toxicity limit is no statistically significant difference in test organism response between the chronic critical effluent concentration (CCEC), 9.6% of the effluent and the control.

The chronic toxicity limit is set relative to the mixing zone established in accordance with WAC 173-201A-100. The chronic critical effluent concentration (CCEC) is the concentration of effluent existing at the boundary of the mixing zone during critical conditions.

Monitoring for compliance with a chronic toxicity limit is accomplished by conducting a chronic toxicity test using a sample of effluent diluted to equal the CCEC and comparing test organism response in the CCEC to organism response in nontoxic control water. The Permittee is in compliance with the chronic toxicity limit if there is no statistically significant difference in test organism response between the CCEC and the control.

HUMAN HEALTH

Washington's water quality standards now include 91 numeric health-based criteria that must be considered in NPDES permits. These criteria were promulgated for the state by the U.S. EPA in its National Toxics Rule (Federal Register, Volume 57, No. 246, Tuesday, December 22, 1992).

The Department has determined that the applicant's discharge is unlikely to contain chemicals regulated for human health. The discharge may be re-evaluated for impacts to human health at the next permit reissuance.

SEDIMENT QUALITY

The Department has promulgated aquatic sediment standards (Chapter 173-204 WAC) to protect aquatic biota and human health. These standards state that the Department may require Permittees to evaluate the potential for the discharge to cause a violation of applicable standards (WAC 173-204-400). No freshwater sediment standards have been promulgated, therefore no evaluation is necessary for this facility.

GROUND WATER QUALITY LIMITATIONS

The Department has promulgated Ground Water Quality Standards (Chapter 173-200 WAC) to protect uses of ground water. Permits issued by the Department shall be conditioned in such a manner so as not to allow violations of those standards (WAC 173-200-100).

This Permittee has no discharge to ground and therefore no limitations are required based on potential effects to ground water.

COMPARISON OF EFFLUENT LIMITS WITH THE EXISTING PERMIT ISSUED 10-9-92

	BASIS OF LIMITA-TION	PREVIOUS EFFLUENT LIMITATIONS: OUTFALL #001		PROPOSED EFFLUENT LIMITATIONS: OUTFALL #001 (LOW FLOW)	
Parameter		**Average Monthly**	**Average Weekly**	**Average Monthly**	**Average Weekly**
Flow		0.9 MGD, (Condtion S4.)		0.75 MGD, (Condition S4.)	
Biochemical Oxygen Demand[b] (5 day)	Technology	30 mg/L, (225 lbs./day)	45 mg/L, (338 lbs./day)		
Carbonaceous Biochemical Oxygen Demand[b] (5 day)	TMDL			18.3 mg/L, (114 lbs./day)	27.5 mg/L, (172 lbs./day)
Total Suspended Solids[b]	Technology	30 mg/L, (225 lbs./day)	45 mg/L, (338 lbs./day)	30 mg/L, (188 lbs./day)	45 mg/L, (281 lbs./day)
Fecal Coliform Bacteria	Technology	200/100 mL	400/100 mL	200/100 mL	400/100 mL
pH	Technology	shall not be outside the range 6.0 to 9.0		shall not be outside the range 6.0 to 9.0	
Parameter		**Average Monthly**	**Maximum Daily**	**Average Monthly**	**Maximum Daily**
Ammonia NH_3-N	Technology	5 mg/L, (37.5 lbs./day)	8 mg/L	No limit	No limit
	Aquatic-Life	No limit	No limit	No limit	No limit
	TMDL	No limit	No limit	1.2 mg/L, (7.5 lbs./day)	2.0 mg/L, (12.5 lbs./day)
Total Residual Chlorine	Aquatic Life	65 ug/L, (0.49 lbs./day)	169 ug/L	No limit	No limit
Copper	Aquatic Life	29 ug/L, (0.22 lbs./day)	43 ug/L	4.6 ug/L, (0.029 lbs./day)	9.3 ug/L
Mercury	Aquatic Life	1.08 ug/L, (0.008 lbs./day)	1.58 ug/L	0.1 ug/L, (0.0006 lbs./day)	0.2 ug/L
Silver	Aquatic Life	2.29 ug/L, (0.003 lbs./day)	3.34 ug/L	0.4 ug/L, (0.002 lbs./day)	0.8 ug/L
Zinc	Aquatic Life	221 ug/L, (0.286 lbs./day)	322 ug/L	35.4 ug/L, (0.221 lbs./day)	71 ug/L

MONITORING REQUIREMENTS

Monitoring, recording, and reporting are required (WAC 173-220-210 and 40 CFR 122.41) to verify that the treatment process is functioning correctly and the effluent limitations are being achieved.

The monitoring schedule is detailed in the proposed permit under Condition S.2. Specified monitoring frequencies take into account the quantity and variability of discharge, the treatment method, past compliance, significance of pollutants, and cost of monitoring. The required monitoring frequency is consistent with agency guidance given in the current version of Ecology's *Permit Writer's Manual* (July 1994) for an oxidation ditch.

EFFLUENT LIMITS BELOW QUANTITATION

The Quantitation Level is the level at which concentrations can be reliably reported with a specified level of error. For maximum daily effluent limits, if the measured effluent concentration is below the Quantitation Level, the Permittee reports NQ for non-quantifiable. For average monthly effluent limits, all effluent concentrations below the Quantitation Level but above the Method Detection Level are used as reported for calculating the average monthly value.

EFFLUENT LIMITS BELOW DETECTION

The Method Detection Level (MDL) is the minimum concentration of an analyte that can be measured and reported with a 99 percent confidence that its concentration is greater than zero as determined by a specific laboratory method. For maximum daily limits, if the concentrations are below the MDL the Permittee reports ND for non-detectable. For average monthly limits, all values above the MDL are used as reported and all values below the MDL are calculated as zero.

LAB ACCREDITATION

With the exception of certain parameters the permit requires all monitoring data to be prepared by a laboratory registered or accredited under the provisions of Chapter 173-50 WAC, *Accreditation of Environmental Laboratories*. The laboratory at this facility is accredited for General Chemistry and Microbiology.

OTHER PERMIT CONDITIONS

REPORTING AND RECORDKEEPING

The conditions of S3. are based on the authority to specify any appropriate reporting and recordkeeping requirements to prevent and control waste discharges (WAC 273-220-210).

PREVENTION OF FACILITY OVERLOADING

Overloading of the treatment plant is a violation of the terms and conditions of the permit. To prevent this from occurring, RCW 90.48.110 and WAC 173-220-150 require the Permittee to take the actions detailed in proposed permit requirement S.4. to plan expansions or modifications before existing capacity is reached and to report and correct conditions that could result in new or increased discharges of pollutants. Condition S.4. restricts the amount of flow. Also included within this condition is a requirement to perform an annual infiltration and inflow evaluation. This is a requirement in granting the reduced percent concentration removal allowed in the effluent limits.

INFILTRATION - INFLOW ANALYSIS

In accordance with WAC 173-221-050 the City of Duvall has been granted a variance from the percentage removal requirement due to dilute influent. The city has an on-going evaluation and correction program in place. The proposed permit incorporates a requirement S.4.D to continue evaluation of Infiltration and Inflow with a goal of achieving the technology based percentage removal requirements of WAC 173-221-040.

OPERATION AND MAINTENANCE (O&M)

The proposed permit contains condition S.5. as authorized under RCW 90.48.110, WAC 173-220-150, Chapter 173-230 WAC, and WAC 173-240-080. It is included to ensure proper operation and regular maintenance of equipment, and to ensure that adequate safeguards are taken so that constructed facilities are used to their optimum potential in terms of pollutant capture and treatment.

RESIDUAL SOLIDS HANDLING

To prevent water quality problems, the Permittee is required in permit condition S7. to store and handle all residual solids (grit, screenings, scum, sludge, and other solid waste) in accordance with the requirements of RCW 90.48.080 and State Water Quality Standards.

The final use and disposal of sewage sludge from this facility is regulated by U.S. EPA under 40 CFR 503 and by the Department of Ecology under WAC 173-308.

PRETREATMENT

Federal and State Pretreatment Program Requirements

Under the terms of the addendum to the "Memorandum of Understanding between Washington Department of Ecology and the United States Environmental Protection Agency, Region 10" (1986), the Department of Ecology (Department) has been delegated authority to administer the Pretreatment Program [i.e., act as the Approval Authority for oversight of delegated Publicly Owned Treatment Works (POTWs)]. Under this delegation of authority, the Department has exercised the option of issuing wastewater discharge permits for significant industrial users discharging to POTWs which have not been delegated authority to issue wastewater discharge permits.

There are a number of functions required by the Pretreatment Program which the Department is delegating to such POTWs because they are in a better position to implement the requirements (e.g., tracking the number and general nature of industrial dischargers to the sewerage system). The requirements for a Pretreatment Program are contained in Title 40, [40 CFR 403.8(f)(1)(iii)], the Department is required to approve, condition, or deny new discharges or a significant increase in the discharge for existing significant industrial users (SIUs) [40 CFR 403.8(f)(1)(i)].

The Department is responsible for issuing State Waste Discharge Permits to SIUs and other industrial users of the Permittee's sewer system. Industrial dischargers must obtain these permits from the Department prior to the Permittee accepting the discharge [WAC 173-216-110(5)]. (Industries discharging wastewater that is similar in character to domestic wastewater are not required to obtain a permit. Such dischargers should contact the Department to determine if a permit is required.) Industrial dischargers need to apply for a State Waste Discharge Permit sixty days prior to commencing discharge. The conditions contained in the permits will include any applicable conditions for categorical discharges, loading limitations included in contracts with the POTW, and other conditions necessary to assure compliance with State water quality standards and biosolids standards.

The Department requires this POTW to fulfill some of the functions required for the Pretreatment Program in the NPDES permit (e.g., tracking the number and general nature of industrial dischargers to the sewage system). The POTW's NPDES permit will require that all SIUs currently discharging to the POTW be identified and notified of the requirement to apply for a wastewater discharge permit from the Department. None of the obligations imposed on the POTW relieve an industrial or commercial discharger of its primary responsibility for obtaining a wastewater discharge permit (if required), including submittal of engineering reports prior to construction or modification of facilities [40 CFR 403.12(j) and WAC 173-216-070 and WAC 173-240-110, et seq.].

Wastewater Permit Required

RCW 90.48 and WAC 173-216-040 require SIUs to obtain a permit prior to discharge of industrial waste to the Permittee's sewerage system. This provision prohibits the POTW from accepting industrial wastewater from any such dischargers without authorization from the Department.

Requirements for Routine Identification and Reporting of Industrial Users

The NPDES permit requires non-delegated POTWs to " take continuous, routine measures to identify all existing, new, and proposed SIUs and potential significant industrial users (PSIUs) discharging to the Permittee's sewerage system." Examples of such routine measures include regular review of business tax licenses for existing businesses and review of water billing records and existing connection authorization records. System maintenance personnel can also be diligent during performance of their jobs in identifying and reporting as-yet unidentified industrial dischargers. Local newspapers, telephone directories, and word-of-mouth can also be important sources of information regarding new or existing discharges. The POTW is required to notify an industrial discharger, in writing, of their responsibilities regarding application for a State waste discharge permit and to send a copy of the written notification to the Department. The Department will then take steps to solicit a State waste discharge permit application.

Duty to Enforce Discharge Prohibitions

This provision prohibits the POTW from authorizing or permitting an industrial discharger to discharge certain types of waste into the sanitary sewer. The first portion of the provision prohibits acceptance of pollutants, which cause pass through or interference. The definitions of pass through and interference are in Appendix B of the fact sheet.

The second portion of this provision prohibits the POTW from accepting certain specific types of wastes, namely those which are explosive, flammable, excessively acidic, basic, otherwise corrosive, or obstructive to the system. In addition wastes with excessive BOD, petroleum-based oils, or which result in toxic gases are prohibited to be discharged. The regulatory basis for these prohibitions is 40 CFR Part 403, with the exception of the pH provisions which are based on WAC 173-216-060.

The third portion of this provision prohibits certain types of discharges unless the POTW receives prior authorization from the Department. The discharges include cooling water in significant volumes, stormwater and other direct inflow sources, and wastewaters significantly affecting system hydraulic loading, which do not require treatment.

WHOLE EFFLUENT TOXICITY CHARACTERIZATION

The Permittee will be required to characterize the discharge for acute whole effluent toxicity as a part of the permit renewal process. All municipal discharges greater than 1 MGD are required by regulation to include whole effluent toxicity characterization as a part of their permit renewal application. Although the Duvall WWTP is below this flow threshold level, the effluent contains toxics requiring water quality based effluent limits. The re-characterization will provide valuable information on the overall toxicity of the effluent.

GENERAL CONDITIONS

General Conditions are based directly on state and federal law and regulations and have been standardized for all individual municipal NPDES permits issued by the Department.

Condition G1 requires responsible officials or their designated representatives to sign submittals to the Department. Condition G2 requires the Permittee to allow the Department to access the treatment system, production facility, and records related to the permit. Condition G3 specifies conditions for modifying, suspending or terminating the permit. Condition G4 requires the Permittee to apply to the Department prior to increasing or varying the discharge from the levels stated in the permit application. Condition G5 requires the Permittee to construct, modify, and operate the permitted facility in accordance with approved engineering documents. Condition G6 prohibits the Permittee from using the permit as a basis for violating any laws, statutes or regulations. Conditions G7 relates to permit renewal. Condition G8 prohibits the reintroduction of removed substances back into the effluent. Condition G9 states that the Department will modify or revoke and reissue the permit to conform to more stringent toxic effluent standards or prohibitions. Condition G10 incorporates by reference all other requirements of 40 CFR 122.41 and 122.42. Condition G11 notifies the Permittee that additional monitoring requirements may be established by the Department. Condition G12 requires the payment of permit fees. Condition G13 describes the penalties for violating permit conditions.

PERMIT ISSUANCE PROCEDURES

PERMIT MODIFICATIONS

The Department may modify this permit to impose numerical limitations, if necessary, to meet Water Quality Standards, Sediment Quality Standards, or Ground Water Standards, based on new information obtained from sources such as inspections, effluent monitoring, outfall studies, and effluent mixing studies.

The Department may also modify this permit as a result of new or amended state or federal regulations.

RECOMMENDATION FOR PERMIT ISSUANCE

This proposed permit meets all statutory requirements for authorizing a wastewater discharge, including those limitations and conditions believed necessary to protect human health, aquatic life, and the beneficial uses of waters of the State of Washington. The Department proposes that this permit be issued to expire June 30, 2004.

REFERENCES FOR TEXT AND APPENDICES

Cosmopolitan Engineering Group. 1999. City of Duvall Mixing Zone Study and TMDL Alternatives Analysis-May 1999

Environmental Protection Agency (EPA)

1992. National Toxics Rule. Federal Register, V. 57, No. 246, Tuesday, December 22, 1992.

1991. Technical Support Document for Water Quality-based Toxics Control. EPA/505/2-90-001.

1988. Technical Guidance on Supplementary Stream Design Conditions for Steady State Modeling. USEPA Office of Water, Washington, D.C.

1985. Water Quality Assessment: A Screening Procedure for Toxic and Conventional Pollutants in Surface and Ground Water. EPA/600/6-85/002a.

1983. Water Quality Standards Handbook. USEPA Office of Water, Washington, D.C.

Joy, J., 1994, Snoqualmie River Total Maximum Daily Load Study. Ecology Report No. 94-71. Washington State Department of Ecology, Environmental Investigations and Laboratory Services Program, Olympia, Washington.

Metcalf and Eddy.

1991. Wastewater Engineering, Treatment, Disposal, and Reuse. Third Edition.

Tsivoglou, E.C., and J.R. Wallace.

1972. Characterization of Stream Reaeration Capacity. EPA-R3-72-012. (Cited in EPA 1985 op.cit.)

Washington State Department of Ecology.

1996. Total Maximum Daily Load Development Guidelines. Publication No. 97-315

1994. Permit Writer's Manual. Publication Number 92-109

APPENDIX A--PUBLIC INVOLVEMENT INFORMATION

The Department has tentatively determined to reissue a permit to the applicant listed on page one of this fact sheet. The permit contains conditions and effluent limitations which are described in the rest of this fact sheet.

Public notice of application was published on April 16, 1998, and April 23, 1998, in *The Valley Record* to inform the public that an application had been submitted and to invite comment on the reissuance of this permit.

The Department published a Public Notice of Draft (PNOD) on September 23, 1999, in *The Valley Record* to inform the public that a draft permit and fact sheet were available for review. Interested persons were invited to submit written comments regarding the draft permit. The draft permit, fact sheet, and related documents were available for inspection and copying between the hours of 8:00 a.m. and 5:00 p.m. weekdays, by appointment, at the regional office listed below. Written comments should be mailed to:

Water Quality Permit Coordinator
Department of Ecology
Northwest Regional Office
3190 160th Avenue SE
Bellevue, WA 98008

Any interested party may comment on the draft permit or request a public hearing on this draft permit within the thirty (30) day comment period to the address above. The request for a hearing shall indicate the interest of the party and the reasons why the hearing is warranted. The Department will hold a hearing if it determines there is a significant public interest in the draft permit (WAC 173-220-090). Public notice regarding any hearing will be circulated at least thirty (30) days in advance of the hearing. People expressing an interest in this permit will be mailed an individual notice of hearing (WAC 173-220-100).

The Department will consider all comments received within thirty (30) days from the date of public notice of draft indicated above, in formulating a final determination to issue, revise, or deny the permit. The Department's response to all significant comments is available upon request and will be mailed directly to people expressing an interest in this permit.

Further information may be obtained from the Department by telephone, 425.649.7201, or by writing to the address listed above.

APPENDIX B--GLOSSARY

Acute Toxicity--The lethal effect of a compound on an organism that occurs in a short period of time, usually 48 to 96 hours.

AKART--An acronym for "all known, available, and reasonable methods of treatment."

Ambient Water Quality--The existing environmental condition of the water in a receiving water body.

Ammonia--Ammonia is produced by the breakdown of nitrogenous materials in wastewater. Ammonia is toxic to aquatic organisms, exerts an oxygen demand, and contributes to eutrophication. It also increases the amount of chlorine needed to disinfect wastewater.

Average Monthly Discharge Limitation--The average of the measured values obtained over a calendar month's time.

Average Weekly Discharge Limitation--The highest allowable average of daily discharges over a calendar week, calculated as the sum of all daily discharges measured during a calendar week divided by the number of daily discharges measured during that week. The daily discharge is calculated as the average measurement of the pollutant over the day.

Best Management Practices (BMPs)--Schedules of activities, prohibitions of practices, maintenance procedures, and other physical, structural and/or managerial practices to prevent or reduce the pollution of waters of the State. BMPs include treatment systems, operating procedures, and practices to control: plant site runoff, spillage or leaks, sludge or waste disposal, or drainage from raw material storage. BMPs may be further categorized as operational, source control, erosion and sediment control, and treatment BMPs.

BOD_5--Determining the Biochemical Oxygen Demand of an effluent is an indirect way of measuring the quantity of organic material present in an effluent that is utilized by bacteria. The BOD_5 is used in modeling to measure the reduction of dissolved oxygen in a receiving water after effluent is discharged. Stress caused by reduced dissolved oxygen levels makes organisms less competitive and less able to sustain their species in the aquatic environment. Although BOD is not a specific compound, it is defined as a conventional pollutant under the federal Clean Water Act.

Bypass--The intentional diversion of waste streams from any portion of a treatment facility.

Chlorine--Chlorine is used to disinfect wastewaters of pathogens harmful to human health. It is also extremely toxic to aquatic life.

Chronic Toxicity--The effect of a compound on an organism over a relatively long time, often 1/10 of an organism's lifespan or more. Chronic toxicity can measure survival, reproduction or growth rates, or other parameters to measure the toxic effects of a compound or combination of compounds.

Clean Water Act (CWA)--The Federal Water Pollution Control Act enacted by Public Law 92-500, as amended by Public Laws 95-217, 95-576, 96-483, 97-117; USC 1251 et seq.

Combined Sewer Overflow (CSO)--The event during which excess combined sewage flow caused by inflow is discharged from a combined sewer, rather than conveyed to the sewage treatment plant because either the capacity of the treatment plant or the combined sewer is exceeded.

Compliance Inspection - Without Sampling--A site visit for the purpose of determining the compliance of a facility with the terms and conditions of its permit or with applicable statutes and regulations.

Compliance Inspection - With Sampling--A site visit to accomplish the purpose of a Compliance Inspection - Without Sampling and as a minimum, sampling and analysis for all parameters with limits in the permit to ascertain compliance with those limits; and, for municipal facilities, sampling of influent to ascertain compliance with the 85 percent removal requirement. Additional sampling may be conducted.

Composite Sample--A mixture of grab samples collected at the same sampling point at different times, formed either by continuous sampling or by mixing discrete samples. May be "time-composite" (collected at constant time intervals) or "flow-proportional" (collected either as a constant sample volume at time intervals proportional to stream flow, or collected by increasing the volume of each aliquot as the flow increased while maintaining a constant time interval between the aliquots.)

Construction Activity--Clearing, grading, excavation and any other activity which disturbs the surface of the land. Such activities may include road building, construction of residential houses, office buildings, or industrial buildings, and demolition activity.

Critical Condition--The time during which the combination of receiving water and waste discharge conditions have the highest potential for causing toxicity in the receiving water environment. This situation usually occurs when the flow within a water body is low, thus, its ability to dilute effluent is reduced.

Dilution Factor--A measure of the amount of mixing of effluent and receiving water that occurs at the boundary of the mixing zone. Expressed as the inverse of the effluent fraction, e.g., a dilution factor of 10 means the effluent comprises 10% by volume and the receiving water 90%.

Engineering Report--A document which thoroughly examines the engineering and administrative aspects of a particular domestic or industrial wastewater facility. The report shall contain the appropriate information required in WAC 173-240-060 or 173-240-130.

Fecal Coliform Bacteria--Fecal coliform bacteria are used as indicators of pathogenic bacteria in the effluent that are harmful to humans. Pathogenic bacteria in wastewater discharges are controlled by disinfecting the wastewater. The presence of high numbers of fecal coliform bacteria in a water body can indicate the recent release of untreated wastewater and/or the presence of animal feces.

Grab Sample--A single sample or measurement taken at a specific time or over as short period of time as is feasible.

Industrial User--A discharger of wastewater to the sanitary sewer which is not sanitary wastewater or is not equivalent to sanitary wastewater in character.

Industrial Wastewater--Water or liquid-carried waste from industrial or commercial processes, as distinct from domestic wastewater. These wastes may result from any process or activity of industry, manufacture, trade or business, from the development of any natural resource, or from animal operations such as feed lots, poultry houses, or dairies. The term includes contaminated stormwater and, also, leachate from solid waste facilities.

Infiltration and Inflow (I/I)--"Infiltration" means the addition of ground water into a sewer through joints, the sewer pipe material, cracks, and other defects. "Inflow" means the addition of rainfall-caused surface water drainage from roof drains, yard drains, basement drains, street catch basins, etc., into a sewer.

Interference--A discharge which, alone or in conjunction with a discharge or discharges from other sources, both:

Inhibits or disrupts the POTW, its treatment processes or operations, or its sludge processes, use or disposal; and

Therefore is a cause of a violation of any requirement of the POTW's NPDES permit (including an increase in the magnitude or duration of a violation) or of the prevention of sewage sludge use or disposal in compliance with the following statutory provisions and regulations or permits issued thereunder (or more stringent State or local regulations): Section 405 of the Clean Water Act, the Solid Waste Disposal Act (SWDA) [including title II, more commonly referred to as the Resource Conservation and Recovery Act (RCRA), and including State regulations contained in any State sludge management plan prepared pursuant to subtitle D of the SWDA], sludge regulations appearing in 40 CFR Part 507, the Clean Air Act, the Toxic Substances Control Act, and the Marine Protection, Research and Sanctuaries Act.

Major Facility--A facility discharging to surface water with an EPA rating score of >80 points based on such factors as flow volume, toxic pollutant potential, and public health impact.

Maximum Daily Discharge Limitation--The highest allowable daily discharge of a pollutant measured during a calendar day or any 24-hour period that reasonably represents the calendar day for purposes of sampling. The daily discharge is calculated as the average measurement of the pollutant over the day.

Method Detection Level (MDL)--The minimum concentration of a substance that can be measured and reported with 99% confidence that the analyte concentration is above zero and is determined from analysis of a sample in a given matrix containing the analyte.

Minor Facility--A facility discharging to surface water with an EPA rating score of <80 points based on such factors as flow volume, toxic pollutant potential, and public health impact.

Mixing Zone--An area that surrounds an effluent discharge within which water quality criteria may be exceeded. The area of the authorized mixing zone is specified in a facility's permit and follows procedures outlined in state regulations (Chapter 173-201A WAC).

National Pollutant Discharge Elimination System (NPDES)--The NPDES (Section 402 of the Clean Water Act) is the Federal wastewater permitting system for discharges to navigable waters of the United States. Many states, including the State of Washington, have been delegated the authority to issue these permits. NPDES permits issued by Washington State permit writers are joint NPDES/State permits issued under both State and Federal laws.

Pass through--A discharge which exits the POTW into waters of the-State in quantities or concentrations which, alone or in conjunction with a discharge or discharges from other sources, is a cause of a violation of any requirement of the POTW's NPDES permit (including an increase in the magnitude or duration of a violation), or which is a cause of a violation of State water quality standards.

pH--The pH of a liquid measures its acidity or alkalinity. A pH of 7 is defined as neutral, and large variations above or below this value are considered harmful to most aquatic life.

Quantitation Level (QL)--A calculated value five times the MDL (method detection level).

Significant Industrial User (SIU)--

1) All industrial users subject to Categorical Pretreatment Standards under 40 CFR 403.6 and 40 CFR Chapter I, Subchapter N; and

2) Any other industrial user that: discharges an average of 25,000 gallons per day or more of process wastewater to the POTW (excluding sanitary, non-contact cooling, and boiler blow-down wastewater); contributes a process wastestream that makes up 5 percent or more of the average dry weather hydraulic or organic capacity of the POTW treatment plant; or is designated as such by the Control Authority* on the basis that the industrial user has a reasonable potential for adversely affecting the POTW's operation or for violating any pretreatment standard or requirement [in accordance with 40 CFR 403.8(f)(6)].

   Upon finding that the industrial user meeting the criteria in paragraph 2, above, has no reasonable potential for adversely affecting the POTW's operation or for violating any pretreatment standard or requirement, the Control Authority* may at any time, on its own initiative or in response to a petition received from an industrial user or POTW, and in accordance with 40 CFR 403.8(f)(6), determine that such industrial user is not a significant industrial user.

   *The term "Control Authority" refers to the Washington State Department of Ecology in the case of non-delegated POTWs or to the POTW in the case of delegated POTWs.

State Waters--Lakes, rivers, ponds, streams, inland waters, underground waters, salt waters, and all other surface waters and watercourses within the jurisdiction of the state of Washington.

Stormwater--That portion of precipitation that does not naturally percolate into the ground or evaporate, but flows via overland flow, interflow, pipes, and other features of a stormwater drainage system into a defined surface water body, or a constructed infiltration facility.

Technology-based Effluent Limit--A permit limit that is based on the ability of a treatment method to reduce the pollutant.

Total Suspended Solids (TSS)--Total suspended solids is the particulate material in an effluent. Large quantities of TSS discharged to a receiving water may result in solids accumulation. Apart from any toxic effects attributable to substances leached out by water, suspended solids may kill fish, shellfish, and other aquatic organisms by causing abrasive injuries and by clogging the gills and respiratory passages of various aquatic fauna. Indirectly, suspended solids can screen out light and can promote and maintain the development of noxious conditions through oxygen depletion.

Upset--An exceptional incident in which there is unintentional and temporary noncompliance with technology-based permit effluent limitations because of factors beyond the reasonable control of the Permittee. An upset does not include noncompliance to the extent caused by operational error, improperly designed treatment facilities, lack of preventative maintenance, or careless or improper operation.

Water Quality-based Effluent Limit--A limit on the concentration of an effluent parameter that is intended to prevent the concentration of that parameter from exceeding its water quality criterion after it is discharged into a receiving water.

APPENDIX C--TECHNICAL CALCULATIONS

Several of the Excel® spreadsheet tools used to evaluate a discharger's ability to meet Washington State water quality standards can be found on the Department's homepage at http.www:wa.gov.ecology.

Table 5: Calculation of Reasonable Potential to Exceed Water Quality Criteria

Parameter	Metal Criteria Translator as decimal Acute	Metal Criteria Translator as decimal Chronic	Ambient Concentration (metals as dissolved) ug/L	Acute ug/L	Chronic ug/L	Acute Mixing Zone ug/L	Chronic Mixing Zone ug/L	LIMIT REQ'D?
AMMONIA				7600.0000	1230.0000	3490.9 9	671.35	NO
COPPER	1.00	1.00		4.6100	3.4700	149.02	28.66	YES
MERCURY	0.85			2.1000	0.0120	0.08	0.02	YES
SILVER	0.85			0.3200	#######	1.74	0.39	YES
ZINC	1.00	1.00		35.3600	32.2900	48.68	9.36	YES

Effluent percentile value	Pn	Max effluent conc. measured (metals as total recoverable) ug/L	Coeff Variation CV	s	# of samples n	Multiplier	Acuta Dil'n Factor	Chronic Dil'n Factor	COMMENTS
0.95	0.950	7000.00	0.60	0.55	59	1.00	2	10	
0.95	0.950	300.00	0.60	0.55	59	1.00	2	10	Summer condition
0.95	0.950	0.20	0.60	0.55	59	1.00	2	10	Side Bank Discharge
0.95	0.950	4.10	0.60	0.55	59	1.00	2	10	
0.95	0.950	98.00	0.60	0.55	59	1.00	2	10	

Table 6: Permit Limit Calculation for Listed Pollutants

Permit Limit Calculation Summary

PARAMETER	Acute Dil'n Factor	Chronic Dil'n Factor	Metal Criteria Translator Acute	Metal Criteria Translator Chronic	Ambient Concentration ug/L	Water Quality Standard Acute ug/L	Water Quality Standard Chronic ug/L	Average Monthly Limit (AML) ug/L	Maximum Daily Limit (MDL) ug/L	Comments
COPPER	2.0	10.40	1.00	1.00		4.6100	3.4700	**4.6**	**9.3**	
MERCURY	2.0	10.40	0.85			2.10	0.01	**0.1**	**0.2**	
SILVER	2.0	10.40	0.85			0.32	[redacted]	**0.4**	**0.8**	**No chronic standard**
ZINC	2.0	10.40	1.00	1.00		35.36	32.29	**35.4**	**71.0**	

Waste Load Allocation (WLA) and Long Term Average (LTA) Calculations							Statistical variables for permit limit calculation				
WLA Acute *ug/L*	WLA Chronic *ug/L*	LTA Acute *ug/L*	LTA Chronic *ug/L*	LTA Coeff. Var. (CV) *decimal*	LTA Prob'y Basis *decimal*	Limiting LTA *ug/L*	Coeff. Var. (CV) *decimal*	AML Prob'y Basis *decimal*	MDL Prob'y Basis *decimal*	# of Samples per Month *n*	
9	36.09	3.0	19.0	0.60	0.99	3.0	0.60	0.95	0.99	4.00	1.00
4	0.12	1.3	0.1	0.60	0.99	0.1	0.60	0.95	0.99	4.00	1.00
1	######	0.2	548530.6	0.60	0.99	0.2	0.60	0.95	0.99	4.00	0.85
71	335.82	22.7	177.1	0.60	0.99	22.7	0.60	0.95	0.99	4.00	1.00

Table 7. Calculation of Low Flow TMDL Water Quality-Based Effluent Limits

1. The Daily Waste Load Allocation (WLA)=Maximum Daily Limit=MDL=2 mg/L NH3-N

2. Calculate the long term average (LTA) which will comply with this wasteload allocation

$$MDL = LTA x\, e^{(z\sigma - 0.5\sigma^2)}$$

where:

$\sigma^2 = \ln[CV^2 + 1]$=0.137925

z = 2.326 (99th percentile occurrence

CV = coefficient of variation = std. dev./mean = 0.384564

LTA = long term average = 0.89128 mg/L NH3-N

3. Calculate the monthly average effluent limit

$$AML = LTA x\, e^{(z\sigma_n - 0.5\sigma_n^2)}$$

where:

$\sigma^2 = \ln[(CV^2 \div n) + 1]$ = .036305

n = number of samples/month = 4

z = 1.645 (95th percentile occurrence probability)

CV = coefficient of variation = std. dev. /mean = 0.384564

Average Monthly Limit = AML = 1.2 mg/L NH3-N

APPENDIX D--RESPONSE TO COMMENTS

The only comments received on this permit and fact sheet were from the City of Duvall. The comments and responses are listed below:

City of Duvall Comments:

1. Comment: The effluent limitation for ammonia was expressed as a mass limit only. The limit should also be expressed as a concentration limit.
   Response: The effluent limit for ammonia is derived from the Snoqualmie River TMDL and is a daily maximum mass loading. The City may meet this mass limit without the restrictions of a concentration limit.

2. Comment: A compliance schedule of 2-3 years is necessary to meet the final metals limits. The City cannot reliably meet the metals limits without a new center of the river outfall. It is suggested that metals limits from the previous permit be retained.
   Response: Effluent monitoring data from the previous 5 year permit indicate a reasonable potential to exceed the aquatic life criteria standards for metals. A water quality-based permit limit is required in the permit. In the previous permit the effluent limits were based upon the center of the river outfall which was to be installed by October 1994 in accordance with PCHB91-67 Stipulations and Order of Dismissal. This time frame was extended to October 1, 1996. The outfall was not constructed during the term of the permit. A new outfall evaluation was completed in May of 1999. This information was utilized to develop the dilution factors and subsequent effluent limits. It is not appropriate to utilize the previous effluent limits for this permit.

3. Comment: Both the average and maximum daily limits for mercury should have footnotes stating that comparison to the quantitation limit is actually used for assessment of compliance with the effluent limit as stated on page 8 (of the permit).
   Response: No footnote was added. Special Condition S.1.D. was developed specifically to describe the sample measurement procedures and the way compliance would be calculated for metals.

4. Comment: A compliance schedule of 2-3 years with interim effluent limits should be included in the permit for the high river flow period. The City cannot reliably meet the metals limits. It is suggested that metals limits from the previous permit be retained for the interim period.
   Response: See discussion to comment number 2. Concurrent with the issuance of this permit, the Department will issue a letter extending the compliance period for completion of the new outfall under discretion granted in PCHB 91-67 to July 31, 2004.

5. Comment: Same as comment #3 but for the high flow period.
   Response: See response #3.

6. Comment: Numerous typographical errors or format changes.
   Response: These errors were corrected in the permit.

7. Comment: The sampling frequency for metals should change to once per month (which was the sampling frequency in the previous permit). Instituting weekly sampling for metals would import a significant financial and operational burden on the City.
   Response: Sampling conducted during the term of the last permit confirmed the presence and substantial variation in the concentration of the metals regulated by the permit. Both the EPA Technical Support Document (TSD) 1991 and the Ecology Permit Writing Manual acknowledge that 10 or more samples per month provide greatest statistical likelihood that the average of the various monthly averages will approach the true monthly Long Term Average. Given the sample variance and minimal available dilution, once per week sampling for the four metals with effluent limits is reasonable and no reduction in sampling was made to the permit.

8. Comment: Permit Condition S8. Acute Toxicity, B. Sampling and Reporting Requirements had an internal conflict on the definition of the ACEC. On page 19 it was indicated to be 10% effluent and on page 22 the ACEC was indicated to be 50% effluent.
   Response: The ACEC concentration for the permit is 50% effluent. This correction was made on page 19 of the permit.

9. Comment: The source of the concentrations listed for BOD_5 and TSS in Table 1 should be clarified. For instance, were they derived by averaging concentrations reported in Discharge Monitoring Reports or were they reported in the NPDES application?
   Response: Table 1 on page 3 of the Fact Sheet represents information included in both the permit application and the discharge monitoring reports. Work on reissuance of the permit was delayed to bring the permit cycle into the watershed analyses cycle. Additional information from the DMRs was utilized to base the permit on the most current analytical data.

10. Comment: The parameter (i.e., CBOD and TSS) for which monthly and weekly effluent mass loading limits were calculated on the center of the page should be stated.
    Response: The purpose of the calculations shown in the middle of page 5 of the Fact Sheet was to show how the mass limits for technology-based effluent limits for $CBOD_5$ and TSS were derived. The parameters and units are specifically identified in the calculations.

APPENDIX G

Engineering Report Amendment for the Wastewater Treatment Plant Outfall – January 2001

STATE OF WASHINGTON
DEPARTMENT OF ECOLOGY
Northwest Regional Office • 3190 160th Avenue SE • Bellevue, Washington 98008-5452 • (425) 649-7000

RECEIVED
FEB - 9 2001
Parametrix, inc.
File #

February 1, 2001

Ms. Elizabeth Goode, P.E., Director of Public Works
City of Duvall
PO Box 1300
Duvall, WA 98019

Dear Ms. Goode:

RE: Wastewater Treatment Plant Outfall Improvements – Engineering Report Amendment

The *Wastewater Treatment Plant Outfall Improvements – Engineering Report Amendment, City of Duvall, Washington,* Parametrix, Inc., January 2001 has been reviewed.

On June 12, 2000, the Department of Ecology approved the *Wastewater Treatment Plant Outfall Improvements – Engineering Report, City of Duvall, Washington,* Parametrix, Inc., April 2000. The purposes of this Engineering Report Amendment are to:

- Evaluate the wastewater treatment plant effluent's "reasonable potential to exceed" for the upstream port and the downstream port based on "clean sampling" data; and
- Evaluate critical dilution factors based on "plume hardness" and on the 2½% utilization limitation for acute mixing and the 25% utilization limitation for chronic mixing.

Presented in the following table are the resultant critical dilution factors for the proposed City of Duvall Wastewater Treatment Plant's two-port outfall.

Critical Dilution Factors for Duvall Wastewater Treatment Plant

Critical Season	Acute[1]		Chronic[2]
	Upstream Port	Downstream Port	Combined
Annual Basis	3.7	4.7	41.9
Wet Season	5.2	6.2	64.2
Dry Season	11.8	12.8	71.2

Note: 1 For acute dilution, the 2½% utilization limitation applies to each individual port
2 For chronic dilution, the 25% utilization limitation applies to the combined flow

In accordance with RCW 90.48.110, Chapter 173-240 WAC and Title 40-Code of Federal Regulations, and on behalf of the Department of Ecology and the Environmental Protection Agency (EPA), the subject document is hereby **APPROVED.** A copy of the approved document is enclosed.

This office is to be notified immediately of any proposed changes or revisions to the approved documents. Any such changes or revisions must be issued in the form of addenda, technical appendices, or supplemental reports to the original, approved documents and must be approved in writing by the Department of Ecology.

The Department of Ecology's review and approval of these documents is only to assure compliance and consistency with the appropriate rules, regulations, guidelines, planning, and design criteria, and/or other similar documents and is not to be construed as a quality control check. The owner and the owner's engineer are responsible for the adequacy, accuracy, and completeness of these documents. Nothing in this approval shall be construed as satisfying other applicable federal, state or local statutes, ordinances or regulations. This approval does not relieve you, or your engineer, from any responsibilities or liabilities that result from noncompliance with water pollution laws and regulations during the operation of the treatment facility.

If you have any questions or need any additional information, please contact Laura Fricke, at (425) 649-7062 or me at (425) 649-7033.

Sincerely,

Pam Elardo, P.E.
Interim Water Quality Manager
Northwest Regional Office

JHG:CKY:ct

Enclosure

cc: Allan Maas, Parametrix, Inc. ✓
Pam Elardo Reading File
NWRO Central Files NPDES

Parametrix, Inc. *Consultants in Engineering and Environmental Sciences*

1231 Fryar Avenue P.O. Box 460 Sumner, WA 98390-1516
253-863-5128 • Fax: 253-863-0946 • www.parametrix.com

January 29, 2001
PMX# 216-3240-001 (03/03)

Mr. Chung K. Yee, P.E.
Senior Water Quality Engineer
Northwest Regional Office
Washington State Department of Ecology
3190 160th Avenue SE
Bellevue, WA 98008-5452

Re: Engineering Report Amendment on the City of Duvall Wastewater Treatment Plant Outfall Improvements

Dear Mr. Lee:

On behalf of the City of Duvall, Parametrix, Inc. is submitting the accompanying *Engineering Report Amendment on the City of Duvall Wastewater Treatment Plant Outfall Improvements* for your review. This *Amendment*, including revised tables and permit limit calculations, is to be incorporated into the April 2000 *Wastewater Treatment Plant Outfall Improvement Engineering Report.* The City of Duvall is currently under a moratorium for new connections because the wastewater treatment plant is in violation of the metal limits in the current NPDES permit. The current limits are based on the existing outfall. The City has sought and received approval of a new 2-port outfall configuration, as provided in the April 2000 *Engineering Report,* which would allow the moratorium to be lifted. This *Amendment* addresses the following changes from the Ecology-approved *Engineering Report*:

- Recalculation of reasonable potential to exceed water quality standards for metals using 37 twenty-four-hour composite metal samples collected from April 5, 2000 to December 26, 2000. These metals samples were collected using clean sampling techniques.

- Recalculation of the two-port outfall upstream and downstream port acute mixing ratios based on the $2^1/_2$-percent rule (WAC 173-201A).

- Greater consideration of the impacts of the upstream outfall port on the downstream port in the water quality evaluation.

- Calculation of metals water quality standards based on the effluent to receiving water "plume hardness" at acute and chronic mixing zone boundaries.

Based on revised metals and ammonia analyses, the proposed two-port outfall with 20-year planning horizon effluent design flows does not show a reasonable potential to exceed water quality standards. Metals no longer show a reasonable potential to exceed water quality standards primarily as a result of the lower measured total effluent copper, silver, zinc, and mercury concentrations in the clean technique samples collected as recommended in previous studies.

This *Amendment* demonstrates that the new 2-port outfall eliminates the need for metals limits. The City is requesting that Ecology modify the NPDES permit as soon as possible to include both the existing unchanged permit limits and the new 2-port outfall permit limits so that the revised permit can be placed in effect the first day the new outfall is operational.

It is recognized that water quality benefits will be realized by construction of the new outfall as soon as practical. The new outfall will be constructed in the "fish window" from July 15 to September 15 this summer, and become operational by the end of 2001. The City of Duvall is also requesting the Department of Ecology to issue an Administrative Order so that copper effluent limits could be increased from the April 1, 2000, NPDES permit limits for an interim period by while the new outfall is being installed. This request will be made under a separate letter.

If you have any questions regarding the contents of this report, please contact me or Mike Ollivant in our Sumner office at (253) 863-5128.

Sincerely,

PARAMETRIX, INC.

David J. McBride

David J. McBride, P.E.

DJM:pw

Enclosure

cc: Elizabeth Goode, P.E., Director of Public Works – City of Duvall
Michael Ollivant, P.E. – Parametrix, Inc.
Allan Maas, P.E. – Parametrix, Inc.

Engineering Report Amendment

The City of Duvall Wastewater Treatment Plant Outfall Improvements

Prepared for

City of Duvall
14525 Main Street, NE
Duvall, Washington 98019

Prepared by

Parametrix, Inc.
1231 Fryar Avenue
Sumner, Washington 98390-1516
www.parametrix.com

January 2001
Project No. 216-3240-001

CERTIFICATE OF ENGINEER

The technical material and data contained in this document were prepared under the supervision and direction of the undersigned, whose seal, as a professional engineer licensed to practice as such, is affixed below.

DAVID JOSEPH McBRIDE
STATE OF WASHINGTON
33220
REGISTERED PROFESSIONAL ENGINEER
EXPIRES: 1/05/03

1/26/01

Prepared by David J. McBride, P.E.

Checked by Allan Maas, P.E.

Approved by Michael T. Ollivant, P.E.

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APPENDICES

ACRONYMS

AKART	All Known, Available, and Reasonable Methods of Treatment
BOD	biochemical deoxygenation
CBOD	carbonaceous biochemical deoxygenation
CV	coefficient of variation
DF	Dilution Factor
DO	dissolved oxygen
EAP	Environmental Assessment Program
Ecology	Washington State Department of Ecology
EPA	Environmental Protection Agency
IDOD	immediate DO demand
MDL	maximum daily load
mgd	million gallons per day
NBOD	nitrogenous biochemical deoxygenation
NPDES	National Pollutant Discharge Elimination System
QL	quantitation limit
TMDL	total maximum daily load
TSS	total suspended solids
VSW	very shallow water
WER	water effects ratio
WQS	Water Quality Standards
WWTP	Wastewater Treatment Plant

CHAPTER 1. INTRODUCTION/PURPOSE

On April 25, 2000, the City of Duvall submitted to the Washington State Department of Ecology an *Engineering Report on the City of Duvall Wastewater Treatment Plant Outfall Improvements*. This engineering report partially fulfilled the requirements of WAC 173-240-060 pertaining to the preparation of engineering reports for proposed wastewater treatment and disposal facilities construction. A separate engineering report for the City of Duvall wastewater treatment plant upgrade will be submitted at a later date to fulfill the remaining WAC 173-240-060 requirements. Both the City and Ecology agree that water quality benefits will be realized by construction of the recommended outfall improvements prior to the remainder of the plant upgrade.

Ecology has issued water-quality based effluent limits for the treatment plant based upon the City's current bankside outfall. The plant with the current outfall cannot meet the requirements contained within the existing NPDES discharge permit (WA-002951-3, issued on April 1, 2000).

The *Engineering Report* was approved by Ecology (John H. Glynn, Water Quality Manager Northwest Regional Office to Elizabeth Goode, City of Duvall Director of Public Works, June 12, 2000). One of the recommendations of the *Engineering Report* was that "clean sampling" metals data be obtained to eliminate suspected sources of sample contamination. The purpose of this *Amendment to the Engineering Report on the City of Duvall Wastewater Treatment Plant Outfall Improvements* is to incorporate clean sampling data collected following approval of the April 2000 *Engineering Report* and to address recent Ecology questions regarding the proposed two-port outfall configuration as follows:

- Use of 37 twenty-four-hour composite metals samples (April 5, 2000 to December 26, 2000) collected using clean sampling techniques in the recalculation of reasonable potential to exceed water quality standards for metals.
- Recalculation of the two-port outfall upstream and downstream port acute mixing ratios based on the $2^1/_2$-percent rule (WAC 173-201A).
- Greater consideration of the impacts of the upstream outfall port on the downstream port in the water quality evaluation.
- Calculation of metals water quality standards based on the effluent to receiving water "plume hardness" at acute and chronic mixing zone boundaries.

The City proposes to construct the outfall improvements in the "fish window" from July 15 to September 15 in the summer of 2001. The new outfall would be operational by the end of 2001. Prior to the new outfall being placed into operation, the NPDES permit would be revised for toxicants to reflect the new dilution ratios, clean sampling data, and reanalysis of reasonable potential for toxicants as contained in the *Engineering Report* and this *Amendment*. It is desired that the new NPDES permit issuance and comment period be completed as soon as possible following approval of this *Amendment* so that the new limits may take effect as soon as the new outfall becomes operational.

CHAPTER 2. REVISIONS TO APRIL 2000 ENGINEERING REPORT

This *Amendment* will review the April 2000 *Engineering Report* section by section, highlighting new information to be incorporated, deletions, and changed conditions. Supporting calculations are provided as applicable. Any revisions contained herein will augment, clarify and/or supercede the information contained in the April 2000 *Engineering Report.* Section numbers referenced herein refer to the *Engineering Report* sections. Chapter numbers referenced herein refer to this *Amendment.* The *Amendment* appendices continue in sequence from the *Engineering Report* appendices.

SECTION 1 INTRODUCTION

No revisions other than discussed in Chapter 1 of this *Amendment.*

SECTION 2 EXISTING OUTFALL DESCRIPTION

No revisions.

SECTION 3 RECEIVING WATER CHARACTERISTICS

Section 3.2 Ambient River Water Quality

Remove:

> "A hardness value of 25 mg/l as $CaCO_3$ was adopted to estimate the metals water quality criteria (related to hardness) that are used to determine the reasonable potential to exceed water quality standards."

Add:

> The Ecology Environmental Assessment Program (EAP) has calculated an average low river flow season hardness of 25.7 mg/l for Duvall. This value is based on three hardness values collected by Ecology in 1989 near Duvall. Sample measurements are as follows (Chung, Y. to Maas A., November 27, 2000):

August 15, 1989	21 mg/l as $CaCO_3$
September 5, 1989	26 mg/l as $CaCO_3$
September 30, 1989	30 mg/l as $CaCO_3$

> Based on the data provided by Ecology, an ambient hardness value of 25.7 mg/l as $CaCO_3$ is used in this *Amendment* for calculation of metals water quality criteria (related to hardness).

Change in Table 3-1:

> Receiving water hardness from 25 mg/l to 25.7 mg/l. Other Table 3-1 revisions are discussed elsewhere in this *Amendment.*

SECTION 4 EFFLUENT CHARACTERISTICS

Section 4.2 Effluent Quality

Add:

Based on the recommendation of the *Engineering Report*, the City began a program to collect "clean sampling" metals data to eliminate suspected sources of contamination. Since April 5, once a week, 24-hour composite samples for total copper, mercury, silver, and zinc have been collected in accordance with NPDES Permit Condition S2. The "clean sampling" procedures is as follows (Mike Marty, Duvall WWTP Operator, January 24, 2001):

All sampling equipment, including bottles, hose/sample tubing, composite sampler pump, and carboy are:

- washed with citranox soap and water
- rinsed with deionized water
- rinsed with 10 percent nitric acid solution
- rinsed again with deionized water

Bottles and carboy are then capped; sample hose and pump are sealed with sterile bags. When equipment is put in place for sampling, seals are removed and hoses connected.

Sample bottles provided by AmTest Laboratories (Redmond, Washington) are cleaned and sealed with the same technique. Sample bottles are shipped with a Nitric acid preservative in the bottles. The WWTP operator transfers the composite samples from the carboy to the Amtest bottles using sterile techniques.

Samples are analyzed in the AmTest Laboratories using the following U.S. EPA approved test methods:

Metals	Test Method	Detection Limit
Copper	ICP 200.7	1 ppb
Mercury	ICP 245.1	0.2 ppb
Silver	ICP 200.9	0.1 ppb
Zinc	ICP 200.7	1 ppb

Results of the clean metals sampling analysis are contained in Appendix G of this *Amendment*. Statistical measures computed from the samples include seasonal 95th percentiles, maximums, means, and coefficients of variation. Statistical measures are used in the reasonable potential analysis and permit limit derivation procedures (Ecology *Permit Writer's Manual* 1999).

Add:

Grab effluent hardness samples were collected in the summer of 1999. These measurements are as follows:

June 1999	47 mg/l
July 1999	52 mg/l
August 1999	61 mg/l
September 1999	64 mg/l

The lowest effluent hardness of 47 mg/l as $CaCO_3$ is used in conjunction with the critical receiving water hardness value of 25.7 mg/l in computing "plume" hardness for purposes of deriving hardness based acute and chronic metals water quality standards.

SECTION 5 RIVER SURVEY

No revisions.

SECTION 6 PROPOSED OUTFALL CONFIGURATION

No revisions.

SECTION 7 DILUTION MODELING

Section 7.1 Regulatory Considerations

Revise Table 7-1 as follows for the two-port outfall:

Table 7-1. Limiting Dilution Factors for Acute and Chronic Mixing Zones – Duvall WWTP Outfall

Dilution Factor, DF = (Qa + Qe)/Qe		
	Qa = Fraction*7Q20 or 7Q10	
	Acute	Chronic
7Q10 Annual Basis (286.4 mgd)	0.025	0.25
7Q20 Wet Season (442.1 mgd)	0.025	0.25
7Q20 Dry Season (294.8 mgd)	0.025	0.25
	Qe = Design Flow (mgd)	
	Max Day	Max Month
Annual Basis	5.25	1.75
Wet Season	5.25	1.75
Dry Season	1.37	1.05

Table 7-1. Limiting Dilution Factors for Acute and Chronic Mixing Zones – Duvall WWTP Outfall

Dilution Factor, DF = (Qa + Qe)/Qe			
	Maximum Allowable Dilution Factors, Single Port Outfall		
	Acute		Chronic
Annual Basis	2.4		41.9
Wet Season	3.1		64.2
Dry Season	6.4		71.2
	Maximum Allowable Dilution Factors, Two-Port Outfall		
	Acute		Chronic
	Upstream Port	Downstream Port	
Annual Basis	3.7	4.7	41.9
Wet Season	5.2	6.2	64.2
Dry Season	11.8	12.8	71.2

Add immediately following Table 7-1:

> Regulatory dilution factors for the two-port outfall are computed in Appendix H in the *Amendment*. In the two-port outfall configuration, Ecology has determined that both upstream and downstream diffuser ports should be evaluated separately in determining the reasonable potential to exceed water quality standards (Yee, C. January 24, 2001). In the revised Table 7-1; using the $2^1/_2$-percent rule, the upstream port dilution factor is lower than the downstream port dilution factor because only one-half of the total effluent flow is credited in the numerator of the dilution factor calculation, whereas the full effluent flow is credited in the numerator of the downstream port dilution factor calculation.

Section 7.2 Dilution Model Selection and Input Considerations

Clarification:

> In Table 7-2 of the *Engineering Report*, a single-port outfall scenario is modeled using RIVPLUM5. It should also be noted that the regulatory limiting dilution factors from Table 7-1 will govern for the two-port outfall at both acute and chronic mixing zone boundaries. However, actual mixing with the two-port outfall will be greater than the regulatory limitations, creating a large safety margin for compliance with water quality standards. Actual dilution factors at acute mixing zone boundaries using the RIVPLUM5 model are as follows:

Dry Season (Aug-Oct):	82.1
Wet Season (Nov-Jul):	40.0
Annual:	21.1

> Actual chronic dilution factors are as presented in Table 7-1.

Section 7.4 PLUMES Very Shallow Water (VSW) Two-Port Outfall Analysis

Clarification:

The mixing analysis in Section 7.4 is for the two-port outfall using PLUMES VSW. The purpose of this analysis was to help illustrate the need for the two-port outfall and to show the water quality benefits that may be obtained with a two-port outfall. This analysis is based on an example using non-clean sampling technique copper data. The example is not updated since the point is illustrated regardless of the copper data used.

Delete page 7-5, last paragraph. Add new Section 7.5 as follows:

Section 7.5 Effect of Upstream Port on Downstream Port (New Section)

One of the purposes of this *Amendment* is to determine the impact of the upstream port on the downstream port in the reasonable potential and permit limit calculations for toxicants. Therefore it is necessary to calculate the maximum expected concentration of toxicants in the plume of the upstream port at the location of the downstream port to be used as a background concentration in the downstream port reasonable potential and permit limit derivation analysis.

Appendix H of this *Amendment* contains RIVPLUM5 dilution factors at a distance of 65 feet from the upstream port (i.e., the spacing between upstream and downstream ports, see Figure 5-1) for each combination of acute and chronic effluent flow conditions and annual, dry season, and wet season receiving water conditions. The resulting dilution factors are provided in Appendix H. These dilution factors were then inserted in the *Downstream Port Background Calculation Worksheet for the City of Duvall Two-Port Outfall* contained in Appendix I, which computes the acute and chronic background concentrations for each season using the following equation:

$$Cp = (1/DF)*(Ce) + (DF-1)/(DF)*(Ca) \qquad \text{Equation 1}$$

Where:

Cp = Centerline concentration of toxicant in plume 65 feet downstream of upstream port

Ca = Ambient concentration of toxicant upstream of upstream port

Ce = Maximum expected effluent concentration (95^{th} percentile values from clean samples for metals, from Table 3-1 for ammonia).

DF = Acute and chronic dilution factors from RIVPLUM5 for one-half total plant flow under each seasonal receiving water condition.

SECTION 8 REASONABLE POTENTIAL ANALYSIS AND PERMIT LIMIT DERIVATION

Replace entire Section with following:

Section 8.1 Aquatic Life Criteria for Toxicants

Aquatic life criteria for toxicants were derived using the formulas contained in *WAC 173-201A*, guidance from the *Permit Writer's Manual* (Ecology 1999), and personal communication with Ecology (i.e. regarding application of "plume" hardness). Derived metals water quality standards are shown in Table 8-1. Derived ammonia water quality standards are shown in Table 8-2. Seasonal ammonia water quality criteria were derived using Ecology's TSDCALC7.XLW spreadsheet. Seasonal critical values of receiving water temperature and pH are provided in Table 3-1. Total ammonia water quality criteria calculations are provided in Appendix B.

Metals water quality criteria in Table 8-1 are expressed as both a total dissolved concentration and a total recoverable concentration. The derived metals water quality standards are based on "plume" hardness as provided in Table 8-1. The "plume hardness" is the effluent to receiving water mixed hardness computed at acute mixing zone boundaries in both wet and dry seasons. Plume hardness was also computed for both upstream and downstream ports. The downstream port plume hardness calculation uses the upstream port mixed hardness at 65 feet downstream for the ambient hardness concentration used in the downstream port mixing calculation. Because acute criteria were found to govern allowable effluent limits, a "plume hardness" was not calculated at the chronic mixing zone boundary. The slight increase in hardness above ambient would provide very small relief in the chronic water quality criteria. In general, a higher plume hardness provides a less stringent water quality standard.

Metal criteria translators in Table 8-1 are based on relationships presented in Table VI-A1 of the *Permit Writer's Manual – Recommended Estimates of 90th and 95th Percentiles of Ambient Dissolved Fractions (df) of Cd, Cu, Pb, and Zn Based on Data from Rivers in Washington* (Ecology 1999). Average seasonal concentrations of receiving water total suspended solids (TSS) were estimated to be 11.0, 12.6, and 5.5 mg/L for annual, wet and dry seasons, respectively (see Table 3-1). TSS data were obtained from Ecology's database for water quality monitoring Station 07D070. In Table 8-1, metal criteria translators are less than one in the wet season when river TSS is higher. A translator value of less than one increases the allowable total metal concentration because the receiving water dissolved fraction of the metal is reduced (i.e., adsorbed to suspended solids).

Section 8.2 Reasonable Potential Analysis for Toxicants

Appendix J contains a reasonable potential analysis for toxicants based on the procedures contained in the *Permit Writer's Manual* (Ecology 1999). The Ecology spreadsheet REASPOT.XLS was used for the reasonable potential analysis. A reasonable potential analysis was performed for both a single port outfall and the recommended two-port outfall. Moreover, because of the differing acute mixing ratios and plume overlap effects, the two-port outfall reasonable potential analysis was performed for both upstream and downstream ports.

Table 8-1. Metals Water Quality Standards

Parameter	Acute				Chronic	
	Upstream Port		Downstream Port		Upstream and Downstream Ports	
	Dry Season	Wet Season	Dry Season	Wet Season	Dry Season	Wet Season
Plume Hardness (mg/ℓ as $CaCO_3$)	27.4	29.1	27.5	29.5	25.7	25.7
Ambient Critical TSS (mg/ℓ)	5.5	12.6	5.5	12.6	5.5	12.6
Copper						
Translator[a]	1.00	0.81	1.00	0.81	1.00	0.81
Dissolved WQS (µg/ℓ)	5.02	5.32	5.05	5.38	3.55	3.55
Total Recoverable WQS (µg/ℓ)	5.02	6.61	5.05	6.68	3.55	4.41
Silver						
Translator[a]	0.85	0.85	0.85	0.85	NA[b]	NA
Dissolved WQS (µg/ℓ)	0.37	0.41	0.37	0.42	NA	NA
Total Recoverable WQS (µg/ℓ)	0.44	0.48	0.44	0.49	NA	NA
Zinc						
Translator[a]	0.97	0.80	0.97	0.80	0.97	0.80
Dissolved WQS (µg/ℓ)	38.21	40.21	38.33	40.68	33.05	33.05
Total Recoverable WQS (µg/ℓ)	39.39	50.26	39.52	50.85	34.07	41.31

(a) Based on Table VI-AI of PWM (Ecology 1999) using ambient TSS concentration.

(b) NA = Not applicable.

Table 8-2. Ammonia Water Quality Standards

Annual Series	Acute WQS (mg/ℓ-N)	Chronic WQS (mg/ℓ-N)
Wet Season	11.60	2.12
Dry Season	10.70	1.64
Annual	11.00	1.86

Using the clean sample data with a single port outfall, copper shows a reasonable potential to exceed water quality standards (in the wet season). With a two-port outfall, no toxicants show a reasonable potential to exceed water quality standards. A two-port outfall is therefore recommended to eliminate the reasonable potential for copper to exceed water quality standards. A general result of the reasonable potential analysis is that acute mixing zone concentrations will govern allowable effluent metals concentrations.

For mercury, the current April 1, 2000 NPDES permit states that because the maximum daily effluent limit is below the quantitation limit (i.e. 5 x MDL), the quantitation limit (QL) of 1 ug/l will be used for assessment of compliance with the effluent limit. In all 37 clean sample technique data measurements, mercury was non-detect (ND) at a concentration of 0.2 ug/l. In light of the manner in which mercury permit compliance is determined and the lack of detection of mercury in the effluent, mercury is not included in the reasonable potential analysis.

Parameters used in the reasonable potential evaluations include the following:

- Seasonal metals and ammonia water quality standards from Tables 8-1 and 8-2.
- Seasonal/individual port acute and chronic dilution factors from Table 7-1.
- Seasonal downstream port background concentrations from Appendix I.
- Seasonal acute and chronic metals translators from Table 8-1.
- Seasonal maximum expected effluent concentrations from Table 3-1 and Appendix G (note: ammonia maximum expected effluent concentration as provided in *Engineering Report*).
- Number of effluent sample measurements from Table 3-1 (ammonia) and Appendix G (metals).
- Coefficient of variation (CV) of seasonal data sets from Appendix G.

Section 8.3 TMDL Loading Limitations for CBOD and Ammonia

As per Section 8.6 of the *April 2000 Engineering Report.*

Section 8.4 Conventional Water Quality Parameters

As per Section 8.7 of the *April 2000 Engineering Report.*

Section 8.5 Potential Effluent Limits

Table 8-3 provides potential seasonal effluent limits and identifies the basis of limitation relative to water quality based criteria, TMDL recommendations, or AKART based criteria. Chlorine is not included in Table 8-3. The plant upgrade will expand the UV disinfection system installed in 1995.

Although there is no reasonable potential to exceed water quality standards for total ammonia, copper, mercury, silver, or zinc based on available clean samples collected to date, permit limits have been calculated to provide a current perspective into possible effluent limitations. Permit limit derivation calculations for the recommended two-port outfall are contained in Appendix J. The permit limit derivations procedures are contained in the *Permit Writer's Manual* (Ecology 1999) and the *Technical Support Document for Water Quality Based Toxics Control* (USEPA 1991). The Ecology spreadsheet LIMIT.XLS was used to determined the permit limitations.

The permit limit derivation analysis shows that the upstream port results in more stringent permit limits, primarily due to a lower acute mixing ratio in both wet and dry season periods. In general, protection of acute criteria governs the allowable effluent limits. Table 8-3 shows the more restrictive upstream port permit limitations. Parameters used in the permit limit derivation are the same as those previously described under the reasonable potential analysis.

The recommended combined CBOD/ammonia limit as an inverse numerical relationship. If the ammonia concentration increases the CBOD concentration must decrease to comply to the TMDL and vice-versa. Table 8-3 TMDL limitations are therefore in the form of an equation reflecting the allowable equivalent TMDL CBOD load of 203.5 lbs/day.

Table 8-3. Potential Effluent Limitations for Year 2020 Proposed Wastewater Treatment Plant Design Discharge

Water Quantity and Quality Parameters, Units	Basis of Limitation	High Flow (wet) Season November 1 through July 31		Low Flow (dry) Season August 1 through October 31	
Conventional Parameters		Average Monthly	Average Weekly	Average Monthly	Average Weekly
Flow[a], mgd		1.75	5.25	1.05	1.37
Carbonaceous biochemical oxygen demand (5 day), mg/ℓ	AKART	25[c]	40[c]	25[c]	40[c]
	TMDL[b]			No Limit	[d]
Total suspended solids, mg/ℓ	AKART	30	45	30	45
Fecal coliform, number/100 mℓ	AKART	200	400	200	400
pH, standard units	AKART	Shall not be outside the range of 6.0 to 9.0		Shall not be outside the range of 6.0 to 9.0	
Toxic Parameters		Average Monthly	Maximum Daily	Average Monthly	Maximum Daily
Ammonia, mg/ℓ	Aquatic life based standards[b]	24.9	58.8	61.7	123.8
	TMDL			No Limit	[d]
Copper, µg/ℓ	Aquatic life based standards[b]	23.3 (0.340 lbs/day)	34.4	44.2 (0.387 lbs/day)	59.2
Silver, µg/ℓ	Aquatic life based standards[b]	0.9	2.5	2.2	5.1
Zinc, µg/ℓ	Aquatic life based standards[b]	173	261	586	763

(a) Based on forecast for end of planning period year 2020

(b) Based on two-port outfall configuration

(c) Based on current April 1, 2000 NPDES permit limits

(d) Daily limit equivalent CBOD not to exceed 203.5 lbs/day:

Allowable ammonia portion of combined CBOD not to exceed: $\frac{203.5\ \text{lbs/day} - \text{CBOD(lbs/day)}}{2.5}$

Where:
- 203.5 lbs/day is total allowable combined equivalent TMDL CBOD loading (Joy, J. 1994)
- CBOD (lbs/day) is concurrent daily composite sample result
- 2.5 is QUAL2E modeled CBOD/NBOD exchange ratio (Cosmopolitan 1999)

APPENDIX A – DILUTION MODELING INPUT AND RESULTS

No revisions.

APPENDIX B – WATER QUALITY CRITERIA WORKSHEETS

Revision:

> Metals criteria have been revised using "plume hardness". Acute and chronic water quality standards are summarized in Tables 8-1 and 8-2.

APPENDIX C – WATER QUALITY-BASED EFFLUENT PERMIT LIMITS WORKSHEETS

Delete worksheet:

> Superceded by Appendix J

APPENDIX D – HEC-RAS RIVER MODEL OUTPUT

No revisions.

APPENDIX E – POPULATION AND FLOW PROJECTIONS

No revisions.

APPENDIX F – EXTENSION OF TIME FOR OUTFALL RELOCATION AND APRIL 1, 2000 NPDES PERMIT

No revisions.

CHAPTER 3. CONCLUSIONS AND RECOMMENDATIONS

- Ecology has issued water-quality based effluent limits for the City of Duvall based upon the City's existing bankside outfall. The plant cannot meet the requirements contained within the current NPDES discharge permit with the existing outfall (issued April 1, 2000).

- The City of Duvall is currently under a moratorium for new connections because the wastewater treatment plant is in violation of the metals limits in the current NPDES permit.

- The City has sought and received approval of a new two-port outfall configuration, as provided in the *April 2000 Engineering Report*, which would allow the moratorium to be lifted.

- The City has been collecting metals samples using "clean techniques" as recommended in previous studies. Clean metals data collected since April 5, 2000, shows significantly lower maximum expected metals concentrations in the effluent compared to previous NPDES sampling results.

- The updated water-quality analysis in this *Amendment* shows no reasonable potential for exceedance of water-quality based standards for total ammonia, copper, mercury, silver, and zinc once the two-port outfall is installed.

- Dilution factors have been recomputed in light of new information in this *Amendment*. Regulatory dilution factors are more restrictive than actual dilutions, therefore making the reasonable potential analysis conservative.

- This *Amendment* demonstrates that the new two-port outfall eliminates the need for metals limits. The City is requesting that Ecology modify the NPDES permit as soon as possible to include both the existing unchanged permit limits and the new two-port outfall permit limits so that the revised permit can be placed in effect the first day the new outfall is operational.

- The City requests that Ecology considers removing metals permit limitations in the revised NPDES permit for the two-port outfall. If permit limits for metals are included in the revised NPDES permit, they should be the limits proposed in Table 8-3.

- It is recommended the City request interim limitation for metals until the new two-port outfall is placed in operation.

- It is recommended the City continue to collect clean metals data to build a yearlong database of measurements. It is further recommended that effluent hardness measurements be collected along with the metals samples for future use in establishing a "plume hardness." Once a year-long series of measurements is available, removal of metals sampling requirements from the NPDES permit should be considered by Ecology.

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APPENDICES A–F

(Located in the City of Duvall Wastewater Treatment Plant Outfall Improvements Report)

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APPENDIX G

Clean Sampling Techniques Metal Data Summary

DUVALL CLEAN SAMPLING TECHNIQUES METALS DATA

	Total Copper			**Total Zinc**			**Total Silver**		
	Detection Limit = 1 ppb			**Detection Limit = 1 ppb**			**Detection Limit = 0.1 ppb**		
Sample Date	Annual Series (ug/l)	Dry Season (ug/l)	Wet Season (ug/l)	Annual Series (ug/l)	Dry Season (ug/l)	Wet Season (ug/l)	Annual Series (ug/l)	Dry Season (ug/l)	Wet Season (ug/l)
5-Apr-00	19		19	25		25	0		0
10-Apr-00	12		12	29		29	0.4		0.4
17-Apr-00	16		16	35		35	0		0
24-Apr-00	19		19	42		42	0.1		0.1
1-May-00	18		18	40		40	0.7		0.7
8-May-00	14		14	42		42	0.4		0.4
15-May-00	9		9	39		39	0.3		0.3
22-May-00	15		15	47		47	0		0
30-May-00	10		10	38		38	0.1		0.1
5-Jun-00	14		14	38		38	0.2		0.2
12-Jun-00	12		12	61		61	0.3		0.3
20-Jun-00	12		12	43		43	0.3		0.3
3-Jul-00	15		15	48		48	0		0
10-Jul-00	17		17	41		41	0		0
17-Jul-00	20		20	55		55	0.3		0.3
24-Jul-00	20		20	66		66	0.4		0.4
2-Aug-00	14	14		45	45		0.5	0.5	
7-Aug-00	16	16		64	64		0.4	0.4	
14-Aug-00	20	20		69	69		0.7	0.7	
21-Aug-00	14	14		51	51		0.5	0.5	
28-Aug-00	10	10		50	50		0.4	0.4	
7-Sep-00	12	12		63	63		0.1	0.1	
11-Sep-00	12	12		44	44		0	0	
19-Sep-00	14	14		48	48		0	0	
25-Sep-00	13	13		48	48		0.4	0.4	
2-Oct-00	14	14		42	42		0	0	
9-Oct-00	15	15		44	44		0.3	0.3	
23-Oct-00	10	10		41	41		0.2	0.2	
30-Oct-01	10	10		42	42		0	0	
6-Nov-01	11		11	34		34	0		0
13-Nov-01	15		15	44		44	0		0
20-Nov-01	12		12	36		36	0		0
1-Dec-01	6		6	17		17	0.3		0.3
4-Dec-01	8		8	22		22	0		0
10-Dec-01	9		9	23		23	0		0
18-Dec-01	13		13	41		41	0		0
26-Dec-01	11		11	24		24	0		0
Count	37	13	24	37	13	24	37	13	24
Max	20	20	20	69	69	66	0.7	0.7	0.7
Mean	14	13	14	43	50	39	0.2	0.3	0.2
std dev	3.517	2.785	3.910	12.253	9.314	11.946	0.214	0.236	0.195
CV	0.260	0.208	0.287	0.287	0.186	0.308	1.085	0.876	1.234
95th %	20	18	20	64	66	60	0.5	0.6	0.4

Notes:

All ND-Non Detect Silver Samples Counted as Zero
Of 37 Mercury Samples Collected on Each Date, All ND-Non Detect at Detection Limit of 0.2 ppb

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APPENDIX H

Mixing Spreadsheets

Regulatory Dilution Factors
DUVALL WWTP Two-Port Outfall

DF= (Qa+Qe)/Qe

Qa=fraction*7Q20

	7Q20 Flow (cfs)	7Q20 Flow (mgd)	River Fraction Allowed Acute	Chronic
Wet Season	684	442.1	0.025	0.25
Dry Season	456	294.8	0.025	0.25
Annual	443	286.4	0.025	0.25

Qe= maximum month or day

	Max Day (mgd)	Max Month (mgd)
Wet Season	5.25	1.75
Dry Season	1.37	1.05
Annual	5.25	1.75

DF = Chronic Maximum Dilution Factors Allowable (25% Rule)

Wet Season	64.2
Dry Season	71.2
Annual	41.9

DF = Acute Maximum Dilution Factors Allowable (2-1/2% Rule)

	Upstream Port	Downstream Port
Wet Season	5.2	6.2
Dry Season	11.8	12.8
Annual	3.7	4.7

Spread of a plume from a point source in a river with boundary effects from the shoreline based on the method of Fischer *et al.* (1979) with correction for the effective origin of effluent.

DUVALL 2 PORT OUTFALL - MIXING RATIO AT DOWNSTREAM PORT TO BE USED IN BACKGROUND CALCULATIONS

Revised 22-Feb-96

	Wet Season Analysis		Dry Season Analysis		Annual Analysis	
	Acute	Chronic	Acute	Chronic	Acute	Chronic
INPUT						
Snoqualmie River Flow (cfs)	684	684	456	456	443	443
1. Effluent Discharge Rate (cfs):	4.06	1.35	1.06	0.81	4.06	1.35
2. Receiving Water Characteristics Downstream From Waste Input						
Stream Depth (ft):	11.10	11.10	10.00	10.00	9.90	9.90
Stream Velocity (fps):	0.80	0.80	0.50	0.50	0.50	0.50
Channel Width (ft):	110.00	110.00	110.00	110.00	110.00	110.00
Stream Slope (ft/ft) or Manning roughness "n":	0.05	0.05	0.05	0.05	0.05	0.05
0 if slope or 1 if Manning "n" in previous cell:	1	1	1	1	1	1
3. Discharge Distance From Nearest Shoreline (ft):	15	15	15	15	15	15
4. Location of Point of Interest to Estimate Dilution						
Distance Downstream to Point of Interest (ft):	65	65	65	65	65	65
Distance From Nearest Shoreline (ft):	15	15	15	15	15	15
5. Transverse Mixing Coefficient Constant (usually 0.6):	0.6	0.6	0.6	0.6	0.6	0.6
6. Original Fischer Method (enter 0) or *Effective Origin* Modification (enter 1)	0	0	0	0	0	0
OUTPUT						
1. Source Conservative Mass Input Rate						
Concentration of Conservative Substance (%):	100.00	100.00	100.00	100.00	100.00	100.00
Source Conservative Mass Input Rate (cfs*%):	406.10	135.40	106.00	81.20	406.10	135.40
2. Shear Velocity						
Shear Velocity based on slope (ft/sec):	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
Shear Velocity based on Manning "n": using Prasuhn equations 8-26 and 8-54 assuming hydraulic radius equals depth for wide channel						
Darcy-Weisbach friction factor "f":	0.130	0.130	0.135	0.135	0.135	0.135
Shear Velocity from Darcy-Weisbach "f" (ft/sec):	0.102	0.102	0.065	0.065	0.065	0.065
Selected Shear Velocity for next step (ft/sec):	0.102	0.102	0.065	0.065	0.065	0.065
3. Transverse Mixing Coefficient (ft2/sec):	0.679	0.679	0.389	0.389	0.386	0.386
4. Plume Characteristics Accounting for Shoreline Effect (Fischer *et al.*, 1979)						
Co	4.16E-01	1.39E-01	1.93E-01	1.48E-01	7.46E-01	2.49E-01
x'	4.56E-03	4.56E-03	4.18E-03	4.18E-03	4.15E-03	4.15E-03
y'o	1.36E-01	1.36E-01	1.36E-01	1.36E-01	1.36E-01	1.36E-01
y' at point of interest	1.36E-01	1.36E-01	1.36E-01	1.36E-01	1.36E-01	1.36E-01
Solution using superposition equation (Fischer eqn 5.9)						
Term for n= -2	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Term for n= -1	6.14E-96	6.14E-96	1.37E-104	1.37E-104	1.84E-105	1.84E-105
Term for n= 0	1.02E+00	1.02E+00	1.01E+00	1.01E+00	1.01E+00	1.01E+00
Term for n= 1	9.65E-72	9.65E-72	3.40E-78	3.40E-78	7.60E-79	7.60E-79
Term for n= 2	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Upstream Distance from Outfall to *Effective Origin* of Effluent Source (ft)	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
Effective Distance Downstream from Effluent to Point of Interest (ft)	65.00	65.00	65.00	65.00	65.00	65.00
x' Adjusted for *Effective Origin*	4.56E-03	4.56E-03	4.18E-03	4.18E-03	4.15E-03	4.15E-03
C/Co (dimensionless)	4.25E+00	4.25E+00	4.41E+00	4.41E+00	4.43E+00	4.43E+00
Concentration at Point of Interest (Fischer Eqn 5.9)	1.77E+00	5.89E-01	8.51E-01	6.52E-01	3.30E+00	1.10E+00
Unbounded Plume Width at Point of Interest (ft)	42.026	42.026	40.237	40.237	40.069	40.069
Unbounded Plume half-width (ft)	21.013	21.013	20.119	20.119	20.035	20.035
Distance from near shore to discharge point (ft)	15.00	15.00	15.00	15.00	15.00	15.00
Distance from far shore to discharge point (ft)	95.00	95.00	95.00	95.00	95.00	95.00
Plume width bounded by shoreline (ft)	36.01	36.01	35.12	35.12	35.03	35.03
Approximate Downstream Distance to Complete Mix (ft):	4,251	4,251	4,638	4,638	4,677	4,677
Theoretical Dilution Factor at Complete Mix:	240.53	721.42	518.87	677.34	134.08	402.14
Calculated Flux-Average Dilution Factor Across Entire Plume Width:	78.75	236.18	165.65	216.25	42.70	128.08
Calculated Dilution Factor at Point of Interest:	56.63	169.84	117.56	153.47	30.26	90.77

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APPENDIX I

Downstream Port Background Concentrations Calculations

DOWNSTREAM PORT BACKGROUND CONCENTRATIONS CALCULATION WORKSHEET FOR CITY OF DUVALL TWO PORT OUTFALL

		Wet Season						Dry Season						Annual Analysis					
Parameter	Units	Upstream Ambient	Maximum Effluent Concent.	At 65 Feet Dilution Factor for Acute	At 65 Feet Dilution Factor for Chronic	Background Acute Calculated	Background Chronic Calculated	Upstream Ambient	Maximum Effluent Concent.	At 65 Feet Dilution Factor for Acute	At 65 Feet Dilution Factor for Chronic	Background Acute Calculated	Background Chronic Calculated	Upstream Ambient	Maximum Effluent Concent.	At 65 Feet Dilution Factor for Acute	At 65 Feet Dilution Factor for Chronic	Background Acute Calculated	Background Chronic Calculated
Ammonia	mg/l	0.038	0.74	56.6	170	0.05	0.04	0.033	0.97	117.6	153.5	0.04	0.04	0.037	0.36	30.3	90.8	0.05	0.04
Total Cu	ug/l	0	20	56.6	170	0.35	0.12	0	18	117.6	153.5	0.15	0.12	0	20	30.3	90.8	0.66	0.22
Total Ag	ug/l	0	0.40	56.6	170	0.01	0.00	0	0.60	117.6	153.5	0.01	0.00	0	0.50	30.3	90.8	0.02	0.01
Total Zn	ug/l	0	60	56.6	170	1.06	0.35	0	66	117.6	153.5	0.56	0.43	0	64	30.3	90.8	2.11	0.70

Notes:

Actual Dilution Factors Used at 65 feet downstream of upstream port per RIVPLUM5.XLS

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APPENDIX J

Reasonable Potential and Permit Limit Calculations

REASONABLE POTENTIAL CALCULATION
FOR DUVALL WASTEWATER TREATMENT PLANT OUTFALL IMPROVEMENTS
ENGINEERING REPORT AMENDMENT

NPDES Permit No.

This spreadsheet calculates the reasonable potential to exceed state water quality standards for a small number of samples. The procedure and calculations are done per the procedure in Technical Support Document for Water Quality-based Toxics Control, U.S. EPA, March, 1991 (EPA/505/2-90-001) on page 56. User input columns are shown with red headings. Corrected formulas in col G and H on 5/98 (GB)

CALCULATIONS

Parameter	Metal Criteria Translator as decimal Acute	Metal Criteria Translator as decimal Chronic	Ambient Concentration (metals as dissolved) ug/L	State Water Quality Standard Acute ug/L	State Water Quality Standard Chronic ug/L	Max concentration at edge of... Acute Mixing Zone ug/L	Max concentration at edge of... Chronic Mixing Zone ug/L	LIMIT REQ'D?	Effluent percentile value	Pn	Max effluent conc. measured (metals as total recoverable) ug/L	Coeff Variation CV	s	# of samples n	Multiplier	Acute Dil'n Factor	Chronic Dil'n Factor	COMMENTS
SINGLE PORT OUTFALL																		
ANNUAL																		
Ammonia			37	11000	1860	171.58	44.71	NO	0.95	0.867	360	0.84	0.73	21	1.00	2.4	41.9	
Copper	1.00	1.00		4.61	3.47	8.83	0.51	YES	0.95	0.922	20	0.26	0.26	37	1.06	2.4	41.9	Shows RP Acute
Silver	0.85	1.00		0.32	10000.00	0.30	0.02	NO	0.95	0.922	0.70	1.09	0.88	37	1.22	2.4	41.9	
Zinc	1.00	1.00		35.36	32.02	30.63	1.75	NO	0.95	0.922	69	0.29	0.28	37	1.07	2.4	41.9	
WET SEASON																		
Ammonia			38	11340	2120	264.45	48.93	NO	0.95	0.794	740	0.86	0.74	13	1.00	3.1	64.2	
Copper	0.81	0.81		4.61	3.47	5.91	0.29	YES	0.95	0.883	20	0.29	0.28	24	1.14	3.1	64.2	Shows RP Acute
Silver	0.85	1.00		0.32	10000.00	0.30	0.02	NO	0.95	0.883	0.70	1.23	0.96	24	1.55	3.1	64.2	
Zinc	0.80	0.80		35.36	32.02	19.54	0.94	NO	0.95	0.883	66	0.31	0.30	24	1.15	3.1	64.2	
DRY SEASON																		
Ammonia			33	10520	1590	179.41	46.16	NO	0.95	0.688	970	0.60	0.55	8	1.00	6.4	71.2	
Copper	1.00	1.00		4.61	3.47	3.70	0.33	NO	0.95	0.794	20	0.21	0.21	13	1.18	6.4	71.2	
Silver	0.85	1.00		0.32	10000.00	0.17	0.02	NO	0.95	0.794	0.70	0.88	0.75	13	1.86	6.4	71.2	
Zinc	0.97	0.97		35.36	32.02	12.17	1.09	NO	0.95	0.794	69	0.19	0.18	13	1.16	6.4	71.2	
DOUBLE PORT OUTFALL (UPSTREAM PORT)																		
WET SEASON																		
Ammonia	-	-	38	11340	2120	173.00	48.93	NO	0.95	0.794	740	0.86	0.74	13	1.00	5.2	64.2	
Copper	0.81	0.81		5.32	3.55	3.52	0.29	NO	0.95	0.883	20	0.29	0.28	24	1.14	5.2	64.2	
Silver	0.85	1.00		0.41	10000.00	0.18	0.02	NO	0.95	0.883	0.70	1.23	0.96	24	1.55	5.2	64.2	
Zinc	0.80	0.80		40.21	33.05	11.65	0.94	NO	0.95	0.883	66	0.31	0.30	24	1.15	5.2	64.2	
DRY SEASON																		
Ammonia	-	-	33	10520	1590	112.41	46.16	NO	0.95	0.688	970	0.60	0.55	8	1.00	11.8	71.2	
Copper	1.00	1.00		5.02	3.55	2.01	0.33	NO	0.95	0.794	20	0.21	0.21	13	1.18	11.8	71.2	
Silver	0.85	1.00		0.37	10000.00	0.09	0.02	NO	0.95	0.794	0.70	0.88	0.75	13	1.86	11.8	71.2	
Zinc	0.97	0.97		38.21	33.05	6.60	1.09	NO	0.95	0.794	69	0.19	0.18	13	1.16	11.8	71.2	
DOUBLE PORT OUTFALL (DOWNSTREAM PORT, ACUTE AMBIENT CONCENTRATIONS)																		
WET SEASON																		
Ammonia	-	-	50	11340	2120	161.29	60.75	NO	0.95	0.794	740	0.86	0.74	13	1.00	6.2	64.2	Uses "Plume"
Copper	0.81	0.81	0.28	5.38	3.55	3.19	0.56	NO	0.95	0.883	20	0.29	0.28	24	1.14	6.2	64.2	Hardness for
Silver	0.85	1.00	0.01	0.42	10000.00	0.16	0.03	NO	0.95	0.883	0.70	1.23	0.96	24	1.55	6.2	64.2	Metals WQS
Zinc	0.80	0.80	0.85	40.68	33.05	10.48	1.78	NO	0.95	0.883	66	0.31	0.30	24	1.15	6.2	64.2	
DRY SEASON																		
Ammonia	-	-	40	10520	1590	112.66	53.06	NO	0.95	0.688	970	0.60	0.55	8	1.00	12.8	71.2	
Copper	1.00	1.00	0.15	5.05	3.55	1.99	0.48	NO	0.95	0.794	20	0.21	0.21	13	1.18	12.8	71.2	
Silver	0.85	1.00	0.01	0.37	10000.00	0.10	0.03	NO	0.95	0.794	0.70	0.88	0.75	13	1.86	12.8	71.2	
Zinc	0.97	0.97	0.54	38.33	33.05	6.59	1.63	NO	0.95	0.794	69	0.19	0.18	13	1.16	12.8	71.2	

Notes:

Ambient background concentrations at 65 feet downstream of upstream port in double port outfall results

WATER QUALITY BASED
PERMIT LIMIT CALCULATIONS FOR DUVALL WASTEWATER TREATMENT PLANT OUTFALL IMPROVEMENTS ENGINEERING REPORT AMENDMENT

Dilution (Dil'n) factor is the inverse of the percent effluent concentration at the edge of the acute or chronic mixing zone.

	Permit Limit Calculation Summary										Waste Load Allocation (WLA) and Long Term Average (LTA) Calculations							Statistical variables for permit limit calculation				
DUVALL WWTP PROPOSED CENTER CHANNEL OUTFALL PARAMETER	Acute Dil'n Factor	Chronic Dil'n Factor	Metal Criteria Translator Acute	Metal Criteria Translator Chronic	Ambient Concentration ug/L	Water Quality Standard Acute ug/L	Water Quality Standard Chronic ug/L	Average Monthly Limit (AML) ug/L	Maximum Daily Limit (MDL) ug/L	Comments	WLA Acute ug/L	WLA Chronic ug/L	LTA Acute ug/L	LTA Chronic ug/L	LTA Coeff. Var. (CV) decimal	LTA Prob'y Basis decimal	Limiting LTA ug/L	Coeff. Var. (CV) decimal	AML Prob'y Basis decimal	MDL Prob'y Basis decimal	# of Samples per Month n	Translator
DOUBLE PORT (UPSTREAM PORT)																						
WET SEASON											970		970.0									
Ammonia	5.2	64.2			38	11340	2120	**24869**	**58808**		58808	133702	13755.4	55880.7	0.86	0.99	13755.4	0.86	0.95	0.99	4.00	1.00
Copper	5.2	64.2	0.81	0.81		5.32	3.55	**23.3**	**34.4**		28	227.91	15.0	165.2	0.29	0.99	15.0	0.29	0.95	0.99	4.00	0.81
Silver	5.2	64.2	0.85	1.00		0.41	10000.00	**0.9**	**2.5**		2	########	0.4	#######	1.23	0.99	0.4	1.23	0.95	0.99	4.00	0.85
Zinc	5.2	64.2	0.80	0.80		40.21	33.05	**172.6**	**261.4**		209	2121.81	108.6	1503.6	0.31	0.99	108.6	0.31	0.95	0.99	4.00	0.80
DRY SEASON																						
Ammonia	11.8	71.2			33	10520	1590	**51699**	**123780**		123780	110891	39743.6	58487.8	0.60	0.99	39743.6	0.60	0.95	0.99	4.00	1.00
Copper	11.8	71.2	1.00	1.00		5.02	3.55	**44.2**	**59.2**		59	252.76	37.5	199.6	0.21	0.99	37.5	0.21	0.95	0.99	4.00	1.00
Silver	11.8	71.2	0.85	1.00		0.37	10000.00	**2.2**	**5.1**		4	########	1.0	#######	0.88	0.99	1.0	0.88	0.95	0,99	4.00	0.85
Zinc	11.8	71.2	0.97	0.97		38.21	33.05	**586.1**	**762.9**		740	2353.16	490.1	1904.5	0.19	0.99	490.1	0.19	0.95	0.99	4.00	0.97
DOUBLE PORT (DOWNSTREAM PORT, ACUTE BACKGROUND CONCENTRATIONS)																						
WET SEASON											970		970.0									
Ammonia	6.2	64.2			50	11340	2120	**29622**	70048	**Metals WQS Uses**	70048	132944	16384.4	55563.7	0.86	0.99	16384.4	0.86	0.95	0.99	4.00	1.00
Copper	6.2	64.2	0.81	0.81	0.35	5.38	3.55	**26.5**	**39.2**	**Plume Hardness**	32	205.79	17.1	149.2	0.29	0.99	17.1	0.29	0.95	0.99	4.00	0.81
Silver	6.2	64.2	0.85	1.00	0.01	0.42	10000.00	**1.1**	**3.0**		3	########	0.4	#######	1.23	0.99	0.4	1.23	0.95	0.99	4.00	0.85
Zinc	6.2	64.2	0.80	0.80	1.06	40.68	33.05	**203.7**	**308.4**		247	2054.82	128.2	1456.2	0.31	0.99	128.2	0.31	0.95	0.99	4.00	0.80
DRY SEASON																						
Ammonia	12.8	71.2			40	10520	1590	**66885**	**134184**		134184	110400	43084.2	58228.7	0.60	0.99	43084 2	0.60	0.95	0.99	4.00	1.00
Copper	12.8	71.2	1.00	1.00	0.15	5.05	3.55	**46.9**	**62.9**		63	242.23	39.8	191.3	0.21	0.99	39.8	0.21	0.95	0.99	4.00	1.00
Silver	12.8	71.2	0.85	1.00	0.01	0.37	10000.00	**2.3**	**5.4**		5	########	1.1	#######	0.88	0.99	1.1	0.88	0.95	0.99	4.00	0.85
Zinc	12.8	71.2	0.97	0.97	0.56	38.33	33.05	**586.1**	**762.9**		740	2313.85	490.1	1872.7	0.19	0.99	490.1	0.19	0.95	0.99	4.00	0.97

Note:
Acute Backgrounds Used Since Chronic Criteria Does Not Drive Permit Limits
Metals translators based on receiving water TSS

This spreadsheet calculates water quality based permit limits based on the two value steady state model using the State Water Quality standards contained in WAC 173-201A. The procedure and calculations are done per the procedure in Technical Support Document for Water Quality-based Toxics Control, U.S. EPA, March, 1991 (EPA/505/2-90-001) on page 99. Last revision date 9/98. Written by G. Shervey

APPENDIX H

Wastewater Treatment Plant Capacity Analysis

CHAPTER 6

FEASIBILITY EVALUATION FOR REUSE OF RECLAIMED PLANT EFFLUENT

INTRODUCTION

The potential for reuse of effluent from the Duvall WWTP was evaluated in a *Technical Memorandum - Wastewater Reclamation Evaluation* (Sverdrup Civil, Inc. with H.R. Esvelt Engineering and Fujiki & Associates, Inc.) produced in 1995 (included here as Appendix H). The report considered irrigation of parks, residential areas, and flushing of the storm system. Cost for a 0.15 MGD treatment system, transmission main, storage tank, and distribution network for Class A reclaimed water was roughly estimated to be $1,070,000. In the memorandum, it is estimated that, based on assumed values for irrigation (14 in./ year), dust control (32,900 gal./day) and other uses, essentially all of the 0.9 MGD design flow (0.862 MGD) of wastewater could be beneficially reused. However, the costs provided were for modular treatment, conveyance and storage systems capable of handling only 0.15 MGD.

The memorandum did not evaluate costs for a system to treat the entire 0.9 MGD design flow; nor did it evaluate life cycle costs, phased development of the reclaimed water treatment plant, or environmental impacts, including the reduction of the discharge to the river. The memorandum recommended that these additional issues be addressed in a detailed report to verify the technical, regulatory and financial feasibility.

REGULATIONS CONCERNING REUSE

"Reclaimed water" is defined in RCW 90.46.010 as "effluent derived in any part from sewage from a wastewater treatment system that has been adequately and reliably treated, so that as a result of that treatment, it is suitable for a beneficial use or a controlled use that would not otherwise occur and is no longer considered wastewater."

Use of reclaimed water is an alternative to effluent disposal. In the State of Washington, any type of direct beneficial reuse of municipal wastewater is defined as water reuse or reclamation. Water Reuse and Reclamation Standards have been issued jointly by the Departments of Health and Ecology. This discussion is based on the current standards dated September 1997, which are adopted by reference in RCW Chapter 90.46, Reclaimed Water Use.

Reuse standards for the State of Washington are based on similar standards used in the State of California where reuse of municipal wastewater has been underway for many years. The State of Washington reuse standards for municipal wastewater can be broken down into the four following areas:

- Treatment Standards
- Permitted Uses of Reclaimed Water
- Use Area Requirements
- Operational and Reliability Requirements

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

Groundwater Quality Standards

One alternative considered for effluent reuse in many areas is groundwater recharge. State groundwater quality regulations are contained in WAC 173-200. The State's groundwater quality regulations apply to all groundwaters of the State that occur in the saturated zone beneath the land surface. These standards do not apply to contaminant concentrations found in saturated soils where such contaminants have been applied at agronomic rates or for agricultural purposes or under approved methods of land treatment as long as those contaminants do not cause groundwater pollution below the root zone.

While groundwater may support a number of beneficial uses, the overriding basis for the State's groundwater standards is to protect potential drinking water sources. Accordingly, the numeric groundwater standards in WAC 173-200 are human health based standards which, for many parameters, are similar to the State Department of Health (DOH) Drinking Water Standards.

The key to protecting groundwater quality from any adverse impacts of a wastewater discharge is found in the language of the State groundwater regulation. The wastewater must be applied in a manner that "will not cause pollution of any ground waters below the root zone."

It is the policy of the State of Washington that groundwater quality will not be degraded beyond existing background conditions. In accordance with WAC 173-200-030, degradation above background levels can be allowed on a case-by-case basis when "an overriding consideration of the public interest will be served" and "all contaminants have been provided with all known available and reasonable methods of prevention, control and treatment (AKART) prior to entry."

Groundwater recharge with reclaimed water has been given special consideration under RCW 90.46 (Reclaimed Water Use) as a case where the groundwater antidegradation policy need not apply. When recharging groundwater with reclaimed water, RCW 90.46 only requires maintenance of primary drinking water standards in the aquifer that is recharged. (This is a particularly noteworthy issue when considering that the drinking water standard for nitrate is 10 mg/L, whereas background nitrate levels in a relatively pristine aquifer are typical less than 1 mg/L.)

Treatment Standards

The State of Washington's standards for municipal wastewater reuse, Table 6-1, have four classifications based on the type of treatment provided.

TABLE 6-1

State of Washington Reclaimed Water Treatment Standards

Reuse Class	Continuously Oxidized [a]	Continuously Coagulated [b]	Continuously Filtered [c]	Disinfection (Total Coliform Density)[d]	
				7-Day Median Value	Single Sample
D	YES	NO	NO	≤240/100ml	no standard
C	YES	NO	NO	≤23/100ml	240/100ml
B	YES	NO	NO	≤2.2/100ml	23/100ml
A	YES	YES	YES	≤2.2/100ml	23/100ml

a Oxidized wastewater is defined as wastewater in which organic matter has been stabilized such that the biochemical oxygen demand (BOD) does not exceed 30 mg/L and the total suspended solids (TSS) do not exceed 30 mg/L (monthly average basis), is non-putrescable (does not have a foul smell) and contains dissolved oxygen.

b Coagulated wastewater is defined as an oxidized wastewater in which colloidal and finely divided suspended matter have been destabilized and agglomerated prior to filtration by the addition of chemicals or an equally effective method.

c Filtered wastewater is defined as an oxidized, coagulated wastewater that has been passed through natural undisturbed soils or filter media, such as sand or anthracite, so that the turbidity as determined by an approved laboratory method does not exceed an average operating turbidity of 2 nephelometric turbidity units (NTU), determined monthly, and does not exceed 5 NTU at any time.

d Disinfection is a process which destroys pathogenic organisms by physical, chemical or biological means. The disinfection standards use coliform density as the measure of pathogen destruction. DOH recommends that a chlorine residual of 0.5 mg/L be maintained during conveyance from the reclamation plant to the use area to avoid biological growth in the pipeline and sprinkler heads.

PERMITTED USES OF RECLAIMED MUNICIPAL WASTEWATER

Allowable water reuse methods are presented in Table 6-2. Most of these methods provide limited potential due to the relatively small quantities and seasonal nature of the reuse method. Two reuse methods that offer the potential for 100 percent reuse on a year-round basis are groundwater recharge and streamflow augmentation. A more detailed discussion of groundwater recharge and streamflow augmentation is provided below.

Groundwater Recharge

Groundwater recharge using reclaimed water is permitted under the water reuse standards. Three categories of groundwater recharge are covered in the water reuse standards: (1)

direct injection to a drinking water aquifer, (2) direct injection to a non-drinking water aquifer and (3) surface percolation.

Direct injection of reclaimed water to a drinking water aquifer must meet the water quality standards for primary contaminants (except nitrate), secondary contaminants, radionuclides and carcinogens contained in Table 1 of WAC 173-200 as well as maximum contaminant limits (MCLs) contained in the State drinking water standards WAC 246-290.

Additionally, for direct injection to a drinking water aquifer, pre-injection treatment must include the following:

(1) reverse osmosis treatment
(2) turbidity ≤ 0.1 NTU (average) and ≤ 0.5 (maximum)
(3) total organic carbon levels ≤ 1.0 mg/L
(4) total nitrogen ≤ 10 mg/L as N

Direct injection of reclaimed water to a non-drinking water aquifer must meet Class A reclaimed water treatment standards as well as the following additional criteria:

(1) BOD5 ≤ 5 mg/L
(2) TSS ≤ 5 mg/L
(3) any additional criteria deemed necessary by DOH or Ecology

Groundwater recharge using surface percolation must be at least Class A reclaimed water unless a lesser level is allowed under a pilot project status by DOH and Ecology. In addition to secondary treatment to provide oxidized wastewater, the process must include a "step to reduce nitrogen prior to final discharge to groundwater".

TABLE 6-2
Allowable Uses of Reclaimed Water

Use	Class of Reclaimed Water Allowed Class A	Class B	Class C	Class D
Irrigation of Non-Food Crops				
Trees and fodder, fiber, and seed crops	YES	YES	YES	YES
Sod, ornamental plants for commercial use, pasture to which milking cows or goats have access	YES	YES	YES	NO
Irrigation of Food Crops				
Spray Irrigation:				
All food crops	YES	NO	NO	NO
Food crops which undergo physical or chemical processing sufficient to destroy all pathogenic agents	YES	YES	YES	YES
Surface Irrigation:				
Food crops where there is no reclaimed water contact with edible portion of crop	YES	YES	NO	NO
Root crops	YES	NO	NO	NO
Orchards and vineyards	YES	YES	YES	YES
Food crops which undergo physical or chemical processing sufficient to destroy all pathogenic agents	YES	YES	YES	YES
Landscape Irrigation				
Restricted access areas (e.g. cemetaries, freeway landscaping)	YES	YES	YES	NO
Open access areas (e.g. golf courses, parks, playgrounds, etc.)	YES	NO	NO	NO
Impoundments				
Landscape impoundments	YES	YES	YES	NO
Restricted recreational impoundments	YES	YES	NO	NO
Nonrestricted recreational impoundments	YES	NO	NO	NO
Fish Hatchery Basins	YES	YES	NO	NO
Decorative Fountains	YES	NO	NO	NO
Flushing of Sanitary Sewers	YES	YES	YES	YES
Street Cleaning				
Street sweeping, brush dampening	YES	YES	YES	NO
Street washing, spray	YES	NO	NO	NO
Washing of Corporation Yards, Lots, and Sidewalks	YES	YES	NO	NO
Dust Control (Dampening Unpaved Roads, Other Surfaces)	YES	YES	YES	NO
Dampening of Soil for Compaction (Construction, Landfills, etc)	YES	YES	YES	NO
Water Jetting for Consolidation of Backfill Around Pipelines				
Pipelines for reclaimed water, sewage, storm drainage, gas, electrical	YES	YES	YES	NO
Fire Fighting and Protection				
Dumping from aircraft	YES	YES	YES	NO
Hydrants or sprinkler systems in buildings	YES	NO	NO	NO
Toilet and Urinal Flushing	YES	NO	NO	NO
Ship Ballast	YES	YES	YES	NO
Washing Aggregate and Making Concrete	YES	YES	YES	NO
Industrial Boiler Feed	YES	YES	YES	NO
Industrial Cooling				
Aerosols or other mist not created	YES	YES	YES	NO
Aerosols or other mist created (e.g. cooling towers, spraying)	YES	NO	NO	NO
Industrial Process				
Without exposure of workers	YES	YES	YES	NO
With exposure of workers	YES	NO	NO	NO

Streamflow Augmentation

For small streams where fish habitat has been degraded due to low instream flows, streamflow augmentation is an alternative that is allowed under the water reuse regulations and standards. This reuse method still requires an NPDES permit and adherence to the surface water quality standards (WAC 173-201A). However, the key difference between streamflow augmentation and surface water disposal is that a determination of beneficial use has been established based on a need to increase flows to the stream. To make this determination requires concurrence from Department of Wildlife that the need exists for additional instream flows.

Other Uses

The water reuse standards allow for a number of other uses which are not discussed here. However, the general basis for the reuse criteria is that when unlimited public access to the reclaimed water is involved (as is the case for most of the reuse scenarios envisioned for the City of Duvall) the criteria will require Class A reclaimed water. Essentially, this means that for a water reclamation project to have any degree of flexibility as well as a potential for relatively unrestricted use, the reclaimed water should meet the Class A reuse standard.

The use of reclaimed water for agricultural purposes is allowed under the water reuse standards including food crops. The Class A reuse standard is not applied for non-food crop irrigation as long as proper setback distances are employed. These setback distances are discussed in the next section.

USE AREA REQUIREMENTS

The water reuse standards establish criteria for siting and identifying water reclamation projects and their facilities. Water reclamation storage facilities, valves and piping must be clearly labeled and no cross connections between potable water and reclaimed water lines is allowed. A key area requirement for a water reclamation project is setback distance. Table 6-3 summarizes setback requirements for water reclamation facilities.

OPERATIONAL AND RELIABILITY REQUIREMENTS

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

- Minimum Class III Operator
- Critical equipment and process failures must be signaled by an alarm
- Emergency storage/disposal in event of plant failure or the intermittent production of effluent that does not meet the reclaimed water standards. It is possible that approval would be granted to dispose of effluent that does

not meet specifications directly to the Snoqualmie River. If such approval is not granted, the City would likely need to purchase additional land to construct a tank to store the out-of-specification effluent.

- Operating records provided to DOH as well as Ecology.
- No bypass reuse areas of untreated or partially treated water.
- A stand-by power supply or long term disposal or storage facilities

TABLE 6-3

Setback Distances for Reclaimed Water in the State of Washington

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

STATE WASTE DISCHARGE PERMIT

The City of Duvall does not presently discharge treated municipal wastewater to land. Should the City elect to discharge treated effluent to land in the future (including reclaimed water) the City would be required to obtain a State Waste Discharge Permit for this discharge.

ECONOMIC FEASIBILITY OF REUSE

The feasibility of reuse can be evaluated based on information in the 1995 Technical Memorandum - Wastewater Reclamation Evaluation (included here as Appendix H), the 1994 Comprehensive Water System Plan produced by Hammond, Collier & Wade – Livingstone Associates, Inc, and costs for construction of water reclamation facilities in the State, including those at Sequim, Ephrata, and Tieton. As mentioned, the technical memorandum estimated approximately 0.9 MGD of demand for reclaimed water by the year 2015. The vast majority of this demand (80-90%) was estimated for residential areas. However, in this State, residential areas are generally not watered with reclaimed water due to cost, permitting and public acceptance concerns. For the purposes of this feasibility evaluation, watering residential lawns was not considered to be practical. Removal of residential lawns from the irrigation component leaves about 0.12 – 0.17 MGD in projected demand for reclaimed water. An average flow of 0.15 MGD will be used for this report. This assumes irrigation of schoolyards and parkland at about 14 inches per year, and a small amount of use for industries, dust control and storm sewer flushing.

The capital cost estimated in the technical memorandum for a 0.15 MGD, expandable modular water reclamation and distribution system generating Class A reclaimed water was about $1,070,000. For the purposes of this report, this cost estimate was updated, including a net present worth evaluation including capital and operating costs. Capital and operating cost estimates for the 0.15 MGD water reclamation facility are shown in Tables 6-4 and 6-5.

TABLE 6-4

Capital Cost Estimate
0.15 MGD Water Reclamation Facility and Distribution System

Item	Description	Quantity	Amount
1	Mobilization / Demobilization	1 LS	$440,000
2	UV Disinfection System Upgrade	1 LS	$100,000
3	Upflow Sand Filter	1 LS	$200,000
4	Coagulation & Flocculation Systems	1 LS	$35,000
5	Electrical (power, alarms, sensors, PLCs)	1 LS	$100,000
6	Transmission Main	1 LS	$800,000
7	Storage Tank	1 LS	$350,000
8	Piping and Valves	1 LS	$75,000
9	Equipment Building	1 LS	$100,000
10	Pump Station	1 LS	$50,000
11	Distribution Network	1 LS	$660,000
	SUBTOTAL		**$2,910,000**
	SALES TAX, CONTINGENCY, & ENGINEERING		$1,020,000
	TOTAL		**$3,930,000**

The capital cost estimate includes many of the same items as mentioned in the technical memorandum. The water reclamation system would provide continuous oxidation, coagulation, and filtration, as previously described. The system would include the required safeguards, including redundancies and alarms. For reuse, the UV system must be upgraded to provide roughly triple the UV dose per gallon treated than it presently delivers. The operating cost estimate includes only the additional new annual costs that would be caused by the operation and maintenance of the water reclamation facility that are above and beyond the costs for operating the present secondary treatment facility. These costs include one extra operator, extra power to run the upgraded UV system, and additional expenses. The total net present value calculation includes both operating and capital costs.

TABLE 6-5

Annual Operating Cost and Net Present Value Estimates
0.15 MGD Water Reclamation Facility and Distribution System

Item	Description	Quantity	Amount
1	Labor	1 LS	$50,000
2	Supplies	1 LS	$6,000
3	Repair and Maintenance	1 LS	$5,000
4	Power	1 LS	$4,000
5	Miscellaneous	1 LS	$5,000
	TOTAL ANNUAL OPERATING COSTS		$70,000
	NET PRESENT VALUE OPERATING COSTS[1]		$810,000
	CAPITAL COST ESTIMATE		$3,930,000
	TOTAL NET PRESENT VALUE		**$4,740,000**

1. (i=0.06, n=20, P/A = 11.47)

Assuming the water reclamation facility treats an average of 0.15 MGD over the 20 year plant life, this facility could treat about 1,100 million gallons (or 150 million cubic feet) over the 20 year period. The total net present value cost for the water reclamation facility is $4,740,000; the total net present value per cubic foot treated is thus $0.032 or 3.2 cents per cubic foot. Per the water system plan, the monthly service charge for water is $2.10 per 100 cubic feet or 2.1 cents per cubic foot. Thus, reuse of reclaimed water does not appear to be economically feasible, as long as the City does not incur additional costs for effluent disposal to surface waters.

Technical Memorandum

Wastewater Reclamation Evaluation

for the

City of Duvall

Prepared as part of the

Seattle Water Department

Water Reuse Technical Assessment Program

by:

Sverdrup Civil, Inc.
H. R. Esvelt Engineering
Fujiki & Associates, Inc.

April 24, 1995

APPENDIX H

WATER RECLAMATION EVALUATION

TECHNICAL MEMORANDUM

Introduction

The City of Duvall receives potable water from the Seattle Water Department and distributes and supplies water to the residences and businesses within its water service area. The City also owns and operates the sanitary sewer system that collects and treats wastewater from these same customers. The sewer system includes a recently upgraded secondary wastewater treatment plant (WWTP) that discharges treated effluent to the Snoqualmie River.

In recent years the City of Duvall has experienced a rapid rate of population growth. From 830 in 1980, the City's population grew to 3,200 by 1993. The population is expected to continue to grow. Based on current forecasts, the population may increase to 6,000 within 10 years and to the land use limit of 9,000 in 15 to 20 years. As the population grows the demands on the water and sewer systems also increase. Additionally, the requirements for discharge of effluent into the river are becoming increasingly stringent. For these reasons the City of Duvall is interested in the feasibility of reclaiming and reusing treated effluent from their WWTP. It is a stated goal in Duvall's Comprehensive Plan to investigate the alternative methods of treatment, including tertiary systems. The Seattle Water Department, as the wholesale supplier of water to Duvall, is also interested in analyzing this project's feasibility as a way to minimize increasing demands on their water supply system.

The Duvall WWTP is currently treating an annual average flow of 0.19 million gallons per day (mgd) with a maximum daily flow of 0.67 mdg. Maximum and minimum monthly average flows are 0.38 and 0.10 mgd, respectively. The dry weather (May through October) average flow is 0.12 mgd. Effluent total suspended solids (TSS) averaged 12.3 mg/l for 1994, with a dry weather maximum monthly average TSS of 14 mg/l and a maximum day of 19 mg/l. (See Appendix A.)

As the City's population increases to the 9,000 cap, the maximum monthly wastewater flows are expected to approach the 0.9 mgd capacity of the WWTP.

Reclaimed Water Guidelines

Publication 93-21 of the Washington State Departments of Health and Ecology, entitled "Water Reclamation and Reuse Interim Standards" dated February 1993, establishes treatment levels for reclaimed water. It defines four types of reclaimed water ranging from Class D up to Class A with increasing levels of treatment required. This standard also defines the quality levels required for various uses of reclaimed water. The proposed uses for reclaimed water from the Duvall WWTP include irrigation of open access areas (school playfields, residential landscaping, parks, etc.), dust control, storm sewer flushing, industrial heating and cooling, and, possibly, fire fighting and toilet flushing in the future. Class A water as defined by the DOH & DOE standard is suitable for all these purposes. As such, the use of Class A water forms the basis for design of this project. Many of the process design requirements have not been established in the State of Washington and regulators are relying on guidelines from the State of California.

Process Sizing Criteria

Water use within the City of Duvall's water service limits is predominantly residential. Sixty-six percent of the current water use is by single-family residences. An additional 20% is used by multiple-family residences and trailer parks. Commercial/industrial use makes up 10% of the demand. The remaining 4% is made up of public and institutional use. These percentages are likely to remain relatively constant in the future based on the projected future land uses.

Initially, potential uses for reclaimed water are irrigation of the high school and elementary school playfields, irrigation of the "Dorrity" park, dust control on the City's roads, and flushing of the storm sewer system. The proposed system is shown in Figure 1. The main potential use in the future is residential irrigation. As new housing tracts are developed reclaimed water pipelines can be laid and fixed irrigation systems installed. These would be entirely in-the-ground systems without hose bibbs. The sprinkler systems would have timers to allow them to operate at night.

Irrigation of parks and some commercial/industrial uses may also develop in the future. Projected reclaimed water usage rates within the City's urban growth boundary are shown in Table 1. These estimates are shown in 5-year increments based on estimated growth rates. Detailed calculations supporting these estimates are provided in Appendix B. Also included in Appendix B is a map of the land use planning units showing the phased development.

Based on these projected usage rates a design flow rate of 100 gpm (0.14 mgd) was selected for the initial phase of the reclaimed water treatment plant. This rate is roughly in balance with the current average WWTP flow rates during the dry weather months when the reclaimed water will be used. Future expansions of the reclaimed water treatment systems would be in 100 or 200 gpm modules up to an expected maximum of 600 gpm (0.86 mgd).

Reclaimed Water Treatment Process

The preliminary reclaimed water treatment system (Reuse Treatment Process, RTP) for the Duvall WWTP is diagrammed in Figure 2. The process description is as follows:

1. Flow of effluent transfer to RTP will be by pumping at constant a 100 gpm. This will allow all flows below 100 gpm to be transferred. When a major alarm occurs flow to the RTP will be shut off. Control will be an on/off float switch in a wet well. Overflow will be sent to the UV disinfection and river discharge. Turbidity and oxygen reduction potential (ORP) alarms will indicate if treatment to Class A requirements has been compromised and will shutdown the feed pump.

2. Flow measurement, with totalization, will be by propeller meter.

3. A turbidity analyzer, with recorder, will pace coagulant feed rate.

4. Coagulant (probably cationic polymer) variable rate feed system will be based on filter influent turbidity. (An alternate strategy for controlling the polymer feed is based on filter effluent turbidity with manually-adjustable, constant volume polymer pump turned on at 2.0 NTU and off at 1.6 NTU).

5. The Class A reclaimed water filter is recommended to be Aqua-Aerobic auto-backwash filter, 4 feet by 14 feet surface area, 56 square feet surface area with an application rate at 100 gpm of 1.9 gallons per minute per square foot (with backwash area out of service).

   The reason for recommending a specific filter is the uncertainty of design guidelines in Washington. DOH has indicated that sizing criteria approved in California for specific filters will be followed in Washington, until such time as criteria for specific equipment is implemented in Washington. The unit specified has been successfully used at Gualala, California with effluent irrigated onto a golf course. This unit was established as the most cost effective filter for a small installation.

6. Effluent turbidity will be recorded. A major alarm at 5 NTU will shutdown flow to the filter. A pre-alarm will alert the operator when the turbidity goes over 2.0 NTU.

7. Disinfection with chlorine will use the existing manually adjusted feed system, since flow will be constant at 100 gpm. The ultraviolet light (UV) system currently being installed at the Duvall WWTP is not approved for reclaimed water treatment in the State of California. (To date only low intensity horizontal tube UV is approved for Title 22 reuse disinfection.) The Washington DOH also requires a minimum chlorine residual of 0.5 mg/l at the point of use.

8. An oxygen reduction potential (ORP) meter will measure and record residual chlorine. ORP alarms will alert the operator at high and low levels. The feed pump will be shutoff at low-low levels.

9. Effluent pumping to storage reservoir will be by level control in a sump. (It may be possible to use the existing washdown water pumps.) High water level in the sump will be alarmed.

10. Refrigerated composite sampler will sample from the effluent sump (may be able to use existing composite sampler).

11. The storage reservoir will be sized to provide storage for a 24 hours period to meet demand during the irrigation cycle. This will usually be between the hours

11 p.m. and 4 a.m. to leave adequate time for the water to be absorbed and all standing water to percolate into the soil.

12. Distribution/irrigation pumps will pump water into the distribution system. The pumps will be sized based on peak demand. High and low level alarms will be telemetered back to the WWTP.

13. Chlorine feed will provide the DOH required minimum chlorine residual of 0.5 mg/l at the point of use.

Cost Estimate

Preliminary cost estimates for the major elements of the reclaimed water treatment system are given below.

Item	Estimated Cost
Treatment System	$357,600
Transmission Main (6", 8,500 ft)	198,100
Storage Tank (300,000 gal) (includes $150,000 for acquisition of a 3/4 acre site)	353,000
Distribution Network	160,000
Total	$1,068,700

Some portions of the distribution system will be downsized or installed in stages, if possible.

Recommendations

The potential for reclaimed water use within the City of Duvall's water service area is such that further investigation is warranted to verify the technical and financial feasibility. Specific activities to be performed in the detailed report phase of this project are:

1. Better definition of the phased development of the reclaimed water treatment plant and distribution system
    - Specific elements included in each phase
    - Possible alternates or variations to the basic plan
    - Cursory evaluation of uses and users within reasonable proximity to the WWTP, but outside the Duvall water service limits

2. Refinement of the cost estimates based on the above development scenarios
    - Phased capital cost estimates
    - Operating and maintenance costs, including labor, power and chemicals
    - Replacement costs for worn out equipment
3. Life cycle cost evaluation
    - Summation of discounted capital and O&M costs into a net present value
    - Estimated cash flows from potential revenue sources, also discounted to NPV (e.g., reclaimed water sales, development fees, reduction in water purchases)
    - Quantification, to the extent possible, of other costs and benefits for reclaimed water
4. Evaluation and weighting of non-economic factors
    - Reduction in the discharge to the river
    - Energy savings from industrial/commercial uses
    - Stretching of existing water supplies
    - Favorable environmental and PR benefits

The final report will compile the above information and make recommendations on how to proceed with the project. This report will serve as a guide for future development.

FIGURE 1


PARK
ELEMENTARY SCHOOL
DISTRIBUTION PIPELINES
HIGH SCHOOL
STORAGE TANK
SUPPLY PIPELINE
SUPPLY PUMP
N
0 250' 500'
SNOQUALMIE
TAYLOR PARK
HORIZON VIEW ESTATES
CAMERON PARK
DUVALL SUNSET HEIGHTS

Appendix A

City of Duvall

Discharge Monitoring Reports for 1994

Month	Flow (mgd)		BOD5 (mg/l)		TSS (mg/l)	
	Average	Maximum	Average	Maximum	Average	Maximum
Jan.	0.257	0.337	8	12	7	12
Feb.	0.229	0.472	5	16	4	13
March	0.274	0.385	6	8	7	9
April	0.185	0.303	9	10	14	16
May	0.134	0.197	11	14	16	19
June	0.124	0.155	14	17	9	10
July	0.105	0.140	12	15	8	8
August	0.102	0.137	12	16	10	13
Sept.	0.120	0.164	10	13	14	18
Oct.	0.117	0.152	15	18	14	18
Nov.	0.197	0.276	14	17	25	36
Dec.	0.379	0.664	12	15	20	32
Average	0.185		10.7		12.3	
Weighted Ave. (by flow)			10.1		12.7	

Appendix B

Calculations of Potential Reclaimed Water Usage Rates

Calculation Assumptions:

Irrigation Requirements	14.0 in/yr	(used over irrigation months)
Months of irrigation per year	5.0 mo/yr	
Residential Irrigation Reqmts	60%	(of irrigation above)
Average Daily Rate	=	Irrigation reqmts x acreage / days of irrigation per year
Roadway Dust Control	0.10 in/day	(applied during the irrigation months)
Roadway Width	20 ft	
Roadway length	5.0 mi	
	=	32,900 gal/day
Pipeline flushing	4.0 mi	of 12" storm pipe requiring flushing
	=	62,000 gal / twice per year

Commercial/Industrial

Irrigated area is estimated at 20% of total surface area

Water used for cooling is est'd at 300 tons/5ac. @ 2 gpm/ton with a 50% use factor for 10 hrs/day for 5 mos./year. The water savings is the avoided cooling tower blowdown at 2% of the average flow.

Land Use Planning Unit No.	Developable Area (acres)	Land Use	Reclaimed Water Use	Estimated Years till Use	Average Daily Rate (gpd)	Peak Daily Rate (gpd)	Annual Usage (ccf)
48	8.0	High School	Irrigation	Now	20,300	40,600	4,100
11	2.0	Elem. School	Irrigation	Now	5,100	10,200	1,000
9	30	Park	Irrigation (1/2)	Now	38,000	76,000	15,200
10	12.3	Residential	Irrigation	5 yrs	31,200	62,400	6,300
21	12.5	Commercial	Irr. & Cooling	5 yrs	15,300	30,600	3,100
25	4.0	Residential	Irrigation	5 yrs	10,100	20,200	2,000
32	34.1	Residential	Irrigation	5 yrs	86,400	172,800	17,300
37	52.5	Residential	Irrigation	5 yrs	133,000	266,000	26,700
38	18.6	Residential	Irrigation	5 yrs	47,100	94,200	9,500
39	20.1	Residential	Irrigation	5 yrs	50,900	101,800	10,200
40	17.9	Residential	Irrigation	5 yrs	45,400	90,800	9,100
43	31.2	Residential	Irrigation	5 yrs	79,100	158,200	15,900
18	7.4	Residential	Irrigation	10 yrs	11,300	22,600	2,300
20	6.0	Residential	Irrigation	10 yrs	9,100	18,200	1,800
21	25.1	Residential	Irrigation	10 yrs	38,200	76,400	7,700
22	16.8	Commercial	Irr. & Cooling	10 yrs	20,600	41,200	4,100
24	10.5	Residential	Irrigation	10 yrs	16,000	32,000	3,200
26	24.0	Residential	Irrigation	10 yrs	36,500	73,000	7,300
29	3.0	Residential	Irrigation	10 yrs	4,600	9,200	900
30	25.0	Residential	Irrigation	10 yrs	38,000	76,000	7,600
31	22.4	Residential	Irrigation	10 yrs	34,100	68,200	6,800
33	13.0	Residential	Irrigation	10 yrs	19,800	39,600	4,000
34	13.8	Residential	Irrigation	10 yrs	21,000	42,000	4,200
35	32.2	Residential	Irrigation	10 yrs	49,000	98,000	9,800
42	7.4	Residential	Irrigation	10 yrs	11,300	22,600	2,300
44	35.3	Residential	Irrigation	10 yrs	53,700	107,400	10,800
45	17.7	Residential	Irrigation	10 yrs	26,900	53,800	5,400
46	10.5	Residential	Irrigation	10 yrs	16,000	32,000	3,200
23	40.4	Commercial	Irr. & Cooling	15 yrs	49,600	99,200	9,900
36	53.6	Residential	Irrigation	15 yrs	81,500	163,000	16,300
47	26.0	Residential	Irrigation	15 yrs	39,500	79,000	7,900
49	33.0	Residential	Irrigation	15 yrs	50,200	100,400	10,100
50	64.0	Residential	Irrigation	15 yrs	97,300	194,600	19,500
51	54.0	Residential	Irrigation	15 yrs	82,100	164,200	16,500
52	36.0	Residential	Irrigation	20 yrs	54,700	109,400	11,000
53	32.0	Residential	Irrigation	20 yrs	48,700	97,400	9,800
54	144.0	Residential	Irrigation	20 yrs	219,000	438,000	43,900
			Subtotals		1,690,600	3,381,200	346,700
			Dust control & flushing		32,900	32,900	6,763
			Totals		1,723,500	3,414,100	353,463

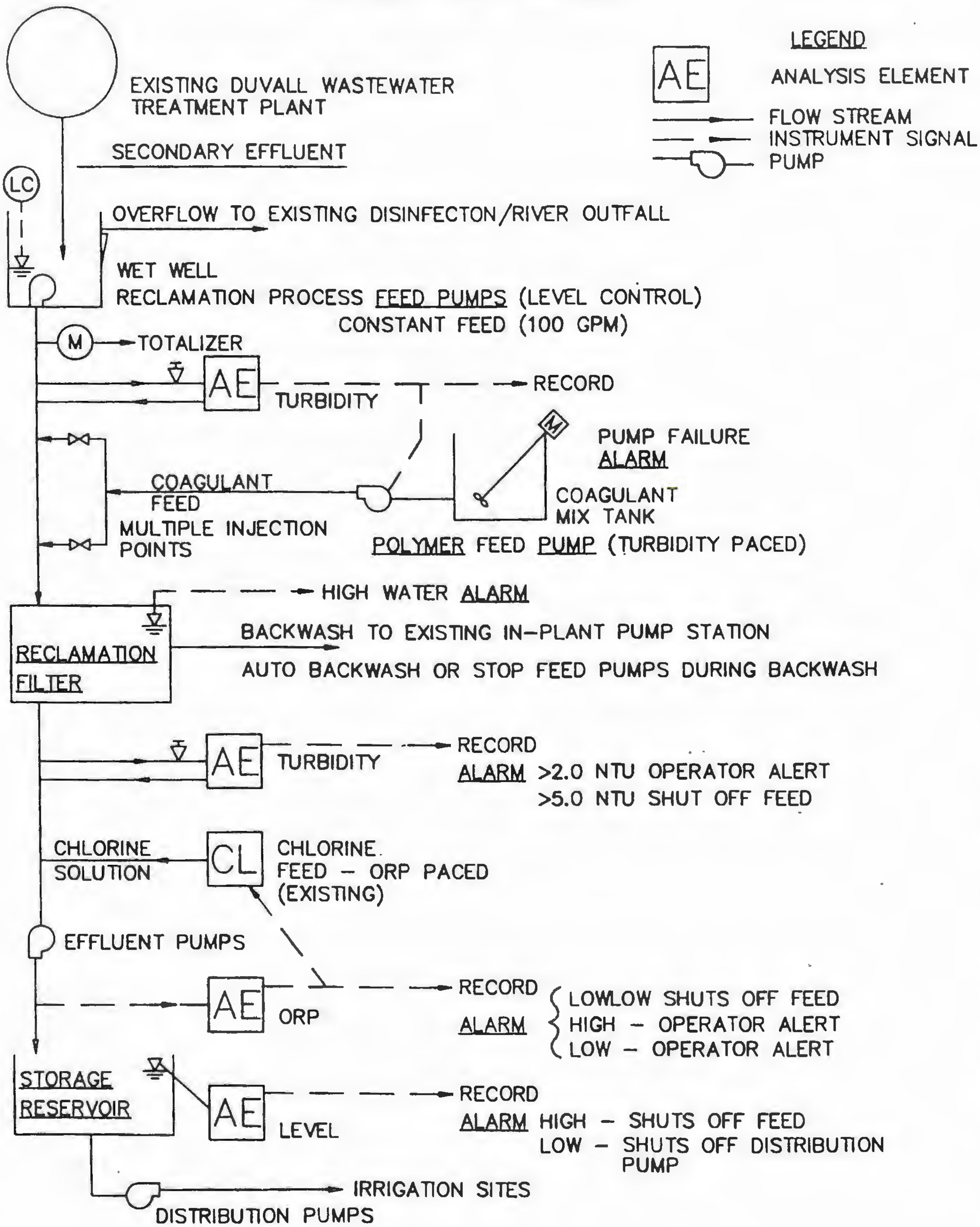
Table 1

Potential Reclaimed Water Usage Rates

Time Period	Type of Use	Average Daily Rate (gpd)	Peak Daily Rate (gpd)	Annual Usage (ccf)
Current	Irrigation (High School) (8 ac.)	20,300	40,600	4,100
	Irrigation (Elem. School) (2 ac.)	5,100	10,200	1,000
	Irrigation (Park) (30 ac.)	38,000	76,000	15,200
	Dust Control	32,900	32,900	6,600
	Flushing of Pipelines	0	0	200
	Current Subtotal	96,300	159,700	27,100
0 to 5 years	Residential Irrigation (191 ac.)	483,200	966,400	97,000
	Commercial/Industrial (cooling & irrigation)	15,300	30,600	3,100
	0 to 5-yr Subtotal	498,500	997,000	100,100
	Cummulative Subtotal	594,800	1,156,700	127,200
5 to 10 years	Residential Irrigation (253 ac.)	385,500	771,000	77,300
	Commercial/Industrial (cooling & irrigation)	20,600	41,200	4,100
	5 to10-yr Subtotal	406,100	812,200	81,400
	Cummulative Subtotal	1,000,900	1,968,900	208,600
10 to 15 years	Irrigation (231 ac.)	350,600	701,200	70,300
	Commercial/Industrial (cooling & irrigation)	49,600	99,200	9,900
	10 to 15-yr Subtotal	400,200	800,400	80,200
	Cummulative Subtotal	1,401,100	2,769,300	288,800
15 to 20 years	Irrigation (212 ac.)	322,400	644,800	64,700
	15 to 20-yr Subtotal	322,400	644,800	64,700
	Potential 20-year Total	1,724,000	3,414,000	354,000
	Basis for Design Rates	862,000	1,724,000	177,000
	(50% of potential)			

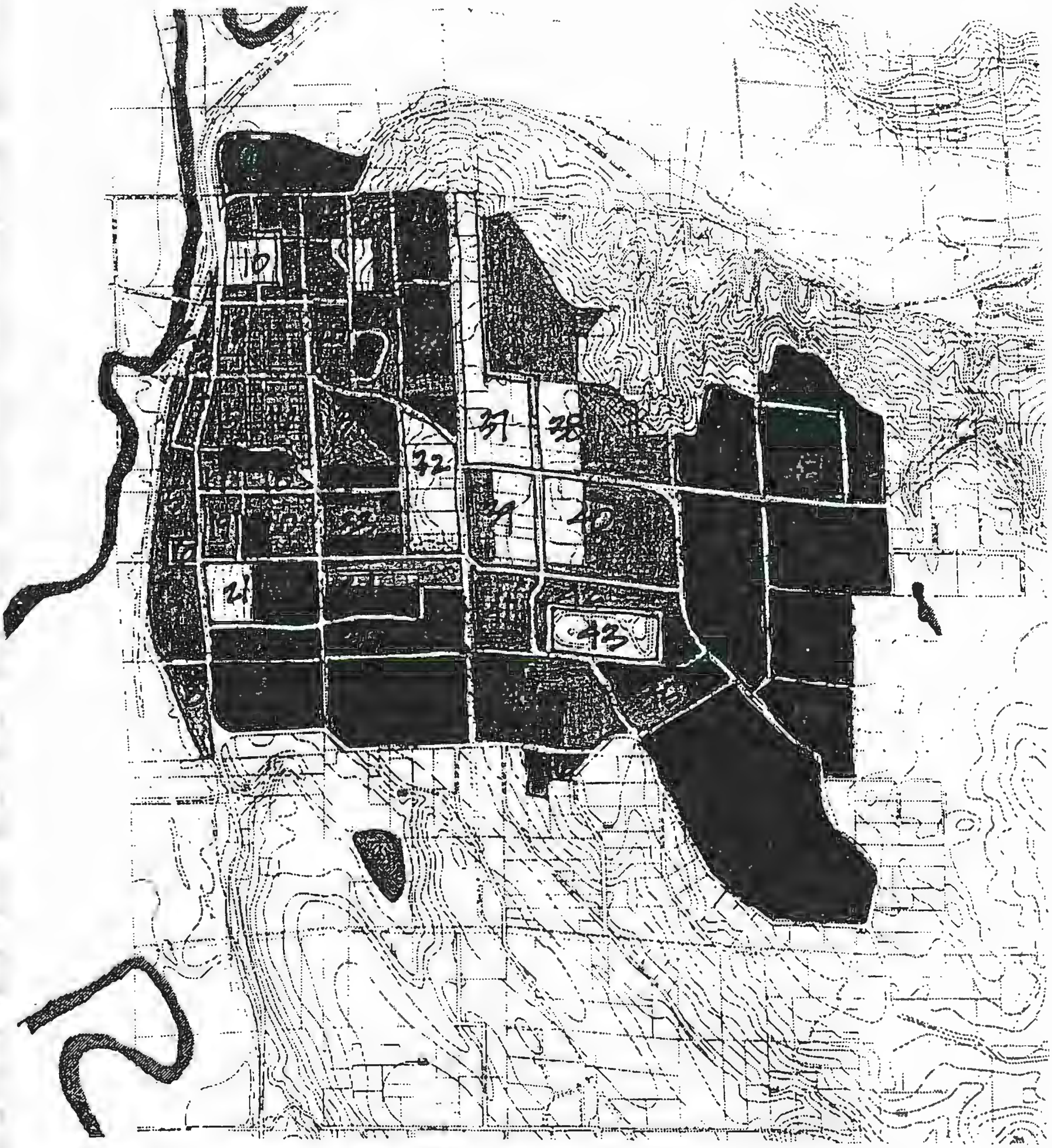
FIGURE 2

RECLAIMED WATER TREATMENT SYSTEM
PROCESS FLOW DIAGRAM



APPENDIX B

Land use planning units



= AREA PREVIOUSLY DEVELOPED OR WITH LITTLE POTENTIAL FOR USE OF RECLAIMED WATER

= CURRENT REUSE POTENTIAL

= 0 to 5 YEAR DEVELOPMENT

= 5 to 10 YEAR DEVELOPMENT

= 10 to 15 YEAR DEVELOPMENT

= 15 to 20 YEAR DEVELOPMENT

APPENDIX I

Wastewater Treatment Plant Alternatives
Estimate of Probable Costs

Duvall WWTP

Estimate of Probable Costs

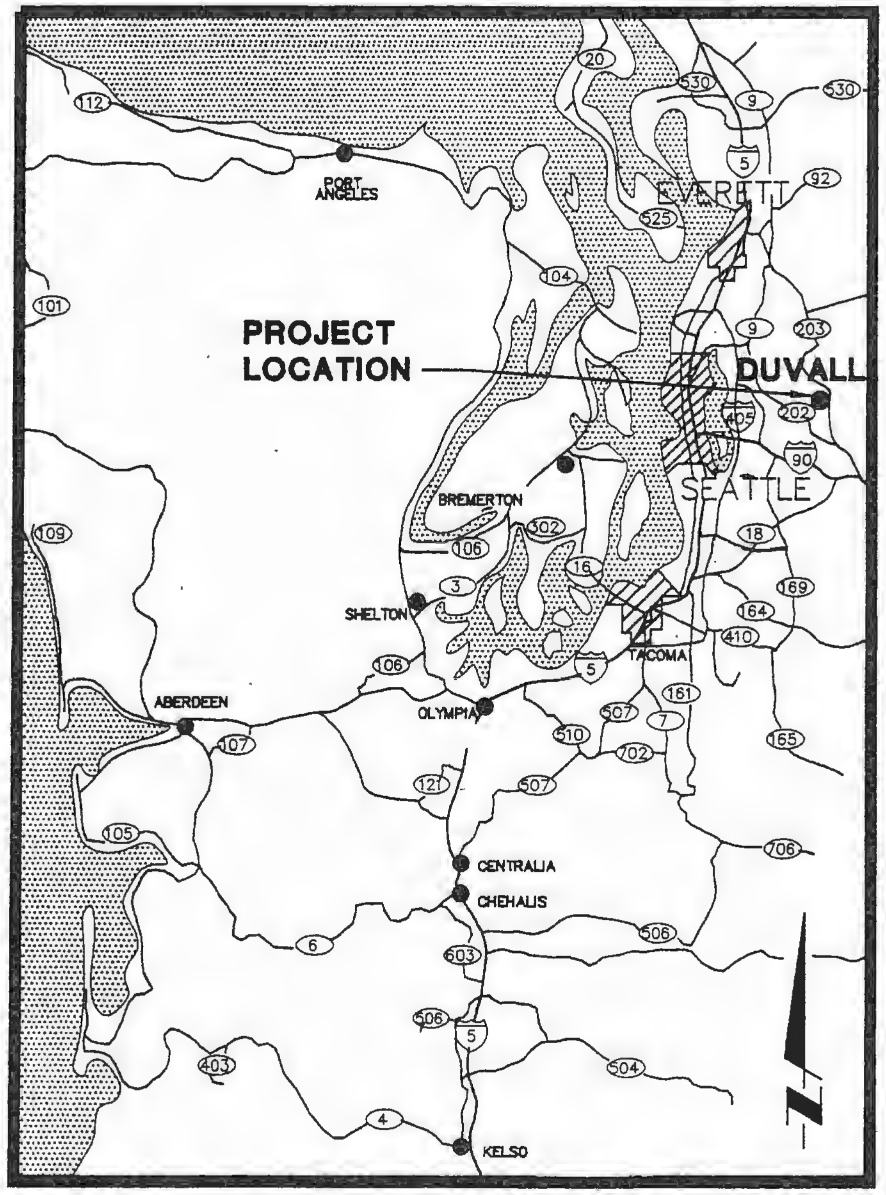
09/12/2001

Description	Quantity	Units	Primary Clarifier Alternative	Membrane Alternative	Oxidation Ditch Alternative
CIVIL SITEWORK					
Site Preparation & Grading	1	ls	$20,000	$10,000	$20,000
Excavation	1	ls	$40,000	$4,000	$45,000
Dewatering	1	ls	$12,000	$2,000	$13,000
Demolition	1	ls	$25,000	$10,000	$25,000
Paving	1	ls	$35,000	$20,000	$35,000
Site Landscaping & Restoration	1	ls	$22,000	$11,000	$22,000
Influent Sewer Modifications	1	ls	$15,500	$15,500	$15,500
Interim Operation	1	ls	$6,000	$10,000	$6,000
STRUCTURAL, MECHANICAL & ELECTRICAL					
- **Headworks Equipment**	1	ls	$171,120	$171,120	$171,120
Influent Flow Measurement	1	ls	$5,500	$5,500	$5,500
Selector Mixers	1	ls	$16,000		$16,000
Headworks Piping	1	ls	$30,000	$20,000	$30,000
Headworks Structure Concrete	1	ls	$48,000	$48,000	$48,000
Selector Concrete	1	ls	$44,755		$44,755
Splitter Box & Biofilter Concret	1	ls	$28,000	$20,000	$28,000
- **Membrane Equipment**	1	ls		$4,080,000	
- **Primary Clarifier Mechanical**	1	ls	$89,286		
Piping	1	ls	$15,000		
Primary Clarifer Concrete	1	ls	$116,963		
- **Oxidation Ditch**	1	ls	$107,640	$169,000	$135,240
New Aerator Ditch 1	1	ls	$107,640		$107,640
Piping	1	ls	$20,000	$20,000	$40,000
Oxidation Ditch Concrete	1	ls	$196,598	$30,000	$346,234
- **2nd Clarifier Mech. Parts**	1	ls	$105,570		$105,570
RAS Pumps	1	ls	$124,000		$124,000
Piping	1	ls	$80,000		$80,000
Secondary Clarifer Concrete	1	ls	$149,111	$22,000	$149,111
- **UV Building**	1	ls	$0	$0	$0
UV Equipment	1	ls	$214,200	$214,200	$214,200
- **Digester Equipment/Pipe**	1	ls	$40,000	$40,000	$40,000
Digester Concrete	1	ls	$97,850	$97,850	$97,850
Metal Handrail & Misc.	1	ls	$146,370	$87,370	$164,970
- **Solids Building**	1	ls	$205,000	$205,000	$205,000
Belt Press	1	ls	$200,000	$200,000	$200,000
Chemical System	1	ls	$20,000	$20,000	$20,000
Pumps	1	ls	$24,000	$24,000	$24,000
Conveyor and Misc	1	ls	$61,000	$61,000	$61,000
- **Plant Yard Piping**	1	ls	$82,000	$55,000	$82,000
Water & Storm Systems	1	ls	$42,000	$28,000	$42,000
- **Outfall Pipeline**	1	ls	$45,000	$45,000	$45,000
Effluent Pump Station	1	ls	$75,000	$75,000	$75,000
Effluent Pump Concrete/Bldg.	1	ls	$60,000	$60,000	$60,000
- **Biofilter & Fan Building**	1	ls	$50,000	$50,000	$50,000
Biofilter Equipment	1	ls	$72,000	$72,000	$72,000
Misc. Equip. & HVAC	1	ls	$30,000	$30,000	$30,000
- **Electrical and Control Equip**	1	ls	$562,000	$1,120,000	$564,000
Emergency Generator	1	ls	$89,010	$89,010	$97,290
SUBTOTAL			$3,746,114	$7,241,550	$3,756,980
Contingencies,		30.0%	$1,123,834	$2,172,465	$1,127,094
Mobilization/Demobilization,		5%	$243,497	$470,701	$244,204
Tax,		8.6%	$439,756	$850,086	$441,032
CONSTRUCTION COST (nearest $1,000)			$5,553,000	$10,735,000	$5,569,000
Engineering, Legal and Administration,		26%	$1,443,780	$2,281,140	$1,447,940
Geotechnical Investigation			$15,000	$15,000	$15,000
Interim Financing			$150,000	$250,000	$150,000
Permitting			$20,000	$20,000	$20,000
TOTAL CAPITAL COST (nearest $1,000)			**$7,182,000**	**$13,301,000**	**$7,202,000**

APPENDIX J

Outfall Design Drawings

CITY OF DUVALL
OUTFALL IMPROVEMENTS



VICINITY MAP

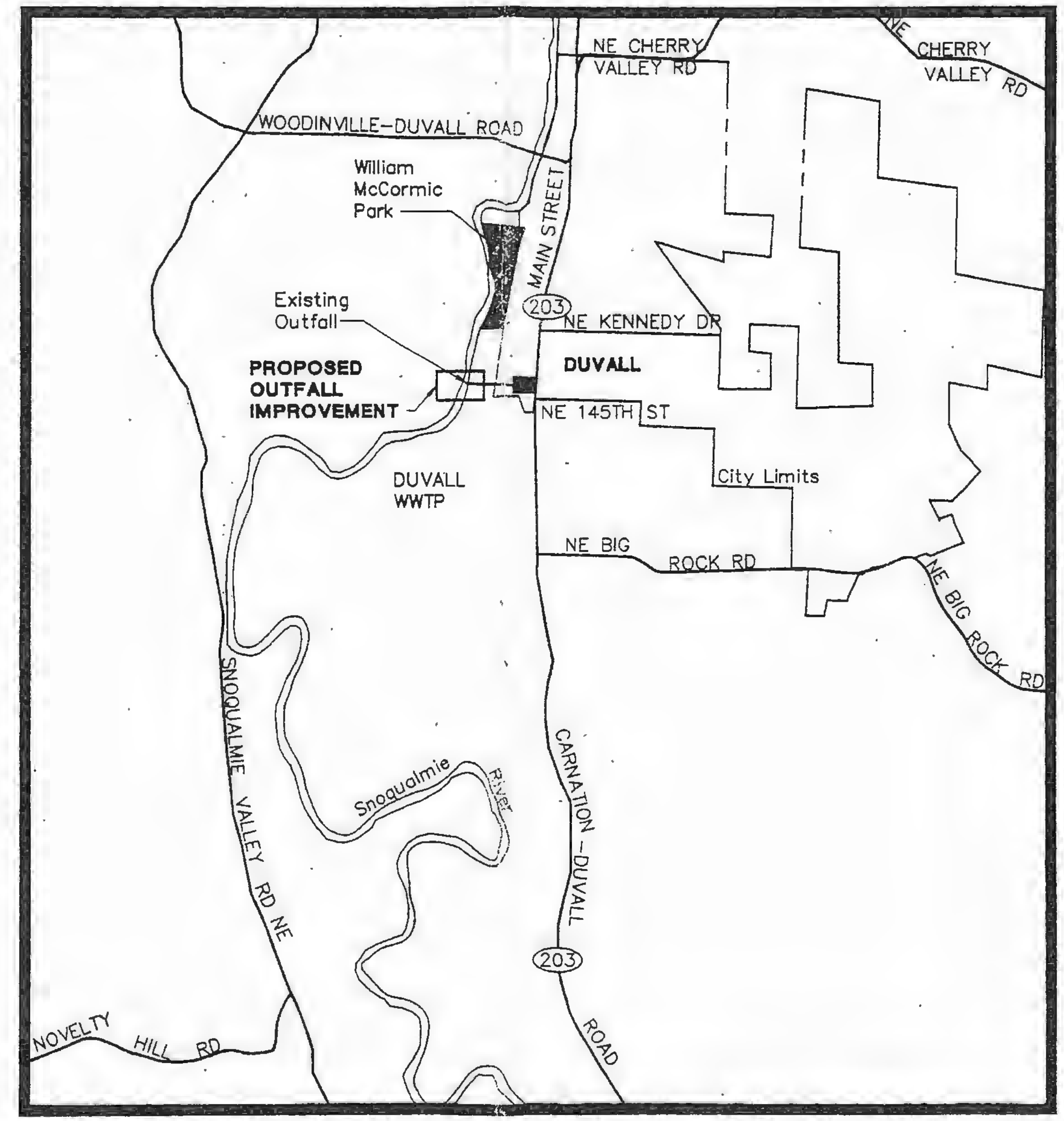
MAYOR
GLEN KUNTZ

CITY COUNCIL
JEANE BALDWIN
MARK COLE
PAT FULLMER
TOM LOUTSIS
JONATHAN RICE

PROJECT OFFICIALS
ELIZABETH GOODE
DIRECTOR OF PUBLIC WORKS

SHEET INDEX:

1 COVER SHEET
2 GENERAL NOTES, ABBREVIATIONS, AND LEGEND
3 PLAN AND PROFILE
4 EROSION AND SEDIMENTATION CONTROL PLAN
5 OUTFALL CONSTRUCTION ACCESS ROAD



LOCATION MAP

MICHAEL T. OLLIVANT, STATE OF WASHINGTON, REGISTERED PROFESSIONAL ENGINEER
4-02-01
EXPIRES 9-12-02

NO.	REVISIONS	DATE	BY	DESIGNED M. OLLIVANT; DRAWN K. HINDS; CHECKED; APPROVED

0 1" 2"
TWO INCHES AT FULL SCALE IF NOT SCALE ACCORDINGLY
SCALE AS SHOWN
DATE APRIL 2001

Parametrix, Inc. "Quality Service Through Employee Ownership"
1231 Fryar Avenue
Sumner, WA 98390
Ph: (253) 863-5128
Fax: (253) 863-0946
http://www.parametrix.com
WASHINGTON Sumner Bremerton Kirkland
OREGON Portland

PROJECT NAME CITY OF DUVALL OUTFALL IMPROVEMENTS
DUVALL, WASHINGTON
JOB NO. 216-3240-001 FILE NAME: 32400104

COVER SHEET

SHEET NO. 1 / 5

STANDARD ESC PLAN NOTES

1. APPROVAL OF THIS EROSION AND SEDIMENTATION CONTROL (ESC) PLAN DOES NOT CONSTITUTE AN APPROVAL OF PERMANENT ROAD OR DRAINAGE DESIGN (E.G., SIZE AND LOCATION OF ROADS, PIPES, RESTRICTORS, CHANNELS, RETENTION FACILITIES, UTILITIES, ETC.).
2. THE IMPLEMENTATION OF THESE ESC PLANS AND THE CONSTRUCTION, MAINTENANCE, REPLACEMENT, AND UPGRADING OF THESE ESC FACILITIES IS THE RESPONSIBILITY OF THE APPLICANT/ESC SUPERVISOR UNTIL ALL CONSTRUCTION IS APPROVED.
3. THE BOUNDARIES OF THE CLEARING LIMITS SHOWN ON THIS PLAN SHALL BE CLEARLY FLAGGED BY A CONTINUOUS LENGTH OF SURVEY TAPE (OR FENCING, IF REQUIRED) PRIOR TO CONSTRUCTION. DURING THE CONSTRUCTION PERIOD, NO DISTURBANCE BEYOND THE CLEARING LIMITS SHALL BE PERMITTED. THE CLEARING LIMITS SHALL BE MAINTAINED BY THE APPLICANT/ESC SUPERVISOR FOR THE DURATION OF CONSTRUCTION.
4. THE ESC FACILITIES SHOWN ON THIS PLAN MUST BE CONSTRUCTED PRIOR TO OR IN CONJUNCTION WITH ALL CLEARING AND GRADING SO AS TO ENSURE THAT THE TRANSPORT OF SEDIMENT TO SURFACE WATERS, DRAINAGE SYSTEMS, AND ADJACENT PROPERTIES IS MINIMIZED.
5. THE ESC FACILITIES SHOWN ON THIS PLAN ARE THE MINIMUM REQUIREMENTS FOR ANTICIPATED SITE CONDITIONS. DURING THE CONSTRUCTION PERIOD, THESE ESC FACILITIES SHALL BE UPGRADED AS NEEDED FOR UNEXPECTED STORM EVENTS AND MODIFIED TO ACCOUNT FOR CHANGING SITE CONDITIONS (E.G., ADDITIONAL SUMP PUMPS, RELOCATION OF DITCHES AND SILT FENCES, ETC.).
6. THE ESC FACILITIES SHALL BE INSPECTED DAILY BY THE APPLICANT/ESC SUPERVISOR AND MAINTAINED TO ENSURE CONTINUED PROPER FUNCTIONING. WRITTEN RECORDS SHALL BE KEPT OF WEEKLY REVIEWS OF THE ESC FACILITIES DURING THE WET SEASON (OCT. 1 TO APRIL 30) AND OF MONTHLY REVIEWS DURING THE DRY SEASON (MAY 1 TO SEPT. 30).
7. ANY AREAS OF EXPOSED SOILS, INCLUDING ROADWAY EMBANKMENTS, THAT WILL NOT BE DISTURBED FOR TWO (2) DAYS DURING THE WET SEASON OR SEVEN (7) DAYS DURING THE DRY SEASON SHALL BE IMMEDIATELY STABILIZED WITH THE APPROVED ESC METHODS (E.G., SEEDING, MULCHING, PLASTIC COVERING, ETC.).
8. ANY AREA NEEDING ESC MEASURES THAT DO NOT REQUIRE IMMEDIATE ATTENTION SHALL BE ADDRESSED WITHIN FIFTEEN (15) DAYS.
9. THE ESC FACILITIES ON INACTIVE SITES SHALL BE INSPECTED AND MAINTAINED A MINIMUM OF ONCE A MONTH OR WITHIN FORTY-EIGHT (48) HOURS FOLLOWING A STORM EVENT.
10. AT NO TIME SHALL MORE THAN ONE (1) FOOT OF SEDIMENT BE ALLOWED TO ACCUMULATE WITHIN A CATCH BASIN. ALL CATCH BASINS AND CONVEYANCE LINES SHALL BE CLEANED PRIOR TO PAVING. THE CLEANING OPERATION SHALL NOT FLUSH SEDIMENT-LADEN WATER INTO THE DOWNSTREAM SYSTEM.
11. STABILIZED CONSTRUCTION ENTRANCES AND ROADS SHALL BE INSTALLED AT THE BEGINNING OF CONSTRUCTION AND MAINTAINED FOR THE DURATION OF THE PROJECT. ADDITIONAL MEASURES, SUCH AS WASH PADS, MAY BE REQUIRED TO ENSURE THAT ALL PAVED AREAS ARE KEPT CLEAN FOR THE DURATION OF THE PROJECT.
12. NOT USED.
13. WHERE STRAW MULCH FOR TEMPORARY EROSION CONTROL IS REQUIRED, IT SHALL BE APPLIED AT A MINIMUM THICKNESS OF 2 TO 3 INCHES.
14. PRIOR TO THE BEGINNING OF THE WET SEASON (OCT. 1), ALL DISTURBED AREAS SHALL BE REVIEWED TO IDENTIFY WHICH ONES CAN BE SEEDED IN PREPARATION FOR THE WINTER RAINS. DISTURBED AREAS SHALL BE SEEDED WITHIN ONE (1) WEEK OF THE BEGINNING OF THE WET SEASON. A SKETCH MAP OF THOSE AREAS TO BE SEEDED AND THOSE AREAS TO REMAIN UNCOVERED SHALL BE SUBMITTED TO THE DDES INSPECTOR. THE DDES INSPECTOR CAN REQUIRED SEEDING OF ADDITIONAL AREAS IN ORDER TO PROTECT SURFACE WATERS, ADJACENT PROPERTIES, OR DRAINAGE FACILITIES.

SILT FENCE MATERIAL SPECIFICATION

THE GEOTEXTILE USED MUST MEET THE STANDARDS LISTED BELOW. A COPY OF THE MANUFACTURER'S FABRIC SPECIFICATIONS MUST BE AVAILABLE ON SITE.

AOS (ASTM D4751)	30–100 SIEVE SIZE (0.60–0.15 MM) FOR SILT FILM 50–100 SIEVE SIZE (0.30–0.15 MM) FOR OTHER FABRICS
WATER PERMITTIVITY (ASTM D4491)	0.02 SEC^{-1} MINIMUM
GRAB TENSILE STRENGTH (ASTM D4632)	180 LBS. MIN. FOR EXTRA STRENGTH FABRIC 100 LBS. MIN. FOR STANDARD STRENGTH FABRIC
GRAB TENSILE ELONGATION (ASTM D4632)	30% MAX.
ULTRAVIOLET RESISTANCE (ASTM D4355)	70% MIN.

STANDARD STRENGTH FABRIC REQUIRES WIRE BACKING TO INCREASE THE STRENGTH OF THE FENCE. WIRE BACKING OR CLOSER POST SPACING MAY BE REQUIRED FOR EXTRA STRENGTH FABRIC IF FIELD PERFORMANCE WARRANTS A STRONGER FENCE.

CONSTRUCTION SEQUENCE

A DETAILED CONSTRUCTION SEQUENCE IS REQUIRED AND TO BE COMPLETED BY THE CONTRACTOR TO ENSURE THAT EROSION AND SEDIMENT CONTROL MEASURES ARE APPLIED AT THE APPROPRIATE TIMES. A RECOMMENDED CONSTRUCTION SEQUENCE IS PROVIDED BELOW:

1. HOLD THE PRE-CONSTRUCTION MEETING.
2. FLAG OR FENCE CLEARING LIMITS (BY OWNER).
3. POST A SIGN WITH THE NAME AND PHONE NUMBER OF THE ESC SUPERVISOR.
4. NOT USED.
5. GRADE AND INSTALL CONSTRUCTION ENTRANCE.
6. INSTALL PERIMETER PROTECTION (SILT FENCE, BRUSH BARRIER, ETC.).
7. NOT USED.
8. GRADE AND STABILIZE CONSTRUCTION ROAD AS REQUIRED FOR MOVEMENT OF CONSTRUCTION EQUIPMENT.
9. CONSTRUCT SURFACE WATER CONTROLS (INTERCEPTOR DIKES, PIPE SLOPE DRAINS, ETC.) SIMULTANEOUSLY WITH CLEARING AND GRADING FOR PROJECT DEVELOPMENT.
10. MAINTAIN EROSION CONTROL MEASURES IN ACCORDANCE WITH KING COUNTY STANDARDS AND MANUFACTURER'S RECOMMENDATIONS.
11. RELOCATE SURFACE WATER CONTROLS OR EROSION CONTROL MEASURES, OR INSTALL NEW MEASURES SO THAT AS SITE CONDITIONS CHANGE, THE EROSION AND SEDIMENT CONTROL IS ALWAYS IN ACCORDANCE WITH THE KING COUNTY EROSION AND SEDIMENT CONTROL STANDARDS.
12. COVER ALL AREAS THAT WILL BE UNWORKED FOR MORE THAN SEVEN (7) DAYS DURING THE DRY SEASON OR TWO (2) DAYS DURING THE WET SEASON WITH STRAW, WOOD FIBER MULCH, COMPOST, PLASTIC SHEETING, OR EQUIVALENT.
13. STABILIZE ALL AREAS WITHIN SEVEN (7) DAYS OF REACHING FINAL GRADE.
14. SEED OR SOD ANY AREAS TO REMAIN UNWORKED FOR MORE THAN 30 DAYS.
15. UPON COMPLETION OF THE PROJECT, STABILIZE ALL DISTURBED AREAS AND REMOVE BMPS IF APPROPRIATE.

FINAL STABILIZATION:

PRIOR TO OBTAINING FINAL CONSTRUCTION APPROVAL, THE SITE SHALL BE STABILIZED, THE STRUCTURAL ESC MEASURES, SUCH AS SILT FENCES AND SEDIMENT TRAPS, REMOVED, AND DRAINAGE FACILITIES CLEANED. THE REMOVAL OF ESC MEASURES IS REQUIRED.

TO OBTAIN FINAL CONSTRUCTION APPROVAL, THE FOLLOWING CONDITIONS MUST BE MET:

1. ALL DISTURBED AREAS OF THE SITE SHALL BE VEGETATED OR OTHERWISE PERMANENTLY STABILIZED. AT A MINIMUM, DISTURBED AREAS SHALL BE SEEDED AND MULCHED WITH A HIGH LIKELIHOOD THAT SUFFICIENT COVER WILL DEVELOP SHORTLY AFTER FINAL APPROVAL. MULCH WITHOUT SEEDING IS NOT ADEQUATE TO ALLOW FINAL APPROVAL OF THE PERMIT.
2. STRUCTURAL MEASURES SUCH AS, BUT NOT LIMITED TO, SILT FENCES, PIPE SLOPE DRAINS, CONSTRUCTION ENTRANCES, STORM DRAIN INLET PROTECTION, AND SEDIMENT TRAPS AND PONDS SHALL BE REMOVED FROM THE SITE. MEASURES THAT WILL QUICKLY DECOMPOSE, SUCH AS BRUSH BARRIERS AND ORGANIC MULCHES, MAY BE LEFT IN PLACE. IN THE CASE OF SILT FENCES, IT MAY BE BEST TO REMOVE FENCES IN CONJUNCTION WITH THE SEEDING, SINCE IT MAY BE NECESSARY TO BRING MACHINERY BACK IN TO REMOVE THEM. THIS WILL RESULT IN DISTURBED SOILS THAT WILL AGAIN REQUIRE PROTECTION. THE DDES INSPECTOR MUST APPROVE AN APPLICANT'S PROPOSAL TO REMOVE FENCING PRIOR TO THE ESTABLISHMENT OF VEGETATION. IN SOME CASES, SUCH AS RESIDENTIAL BUILDING FOLLOWING PLAT DEVELOPMENT, IT MAY BE APPROPRIATE TO LEAVE SOME OR ALL ESC MEASURES FOR USE DURING SUBSEQUENT DEVELOPMENT. THIS SHALL BE DETERMINED ON A SITE-SPECIFIC BASIS.
3. ALL PERMANENT SURFACE WATER FACILITIES, INCLUDING CATCH BASINS, MANHOLES, PIPES, DITCHES, CHANNELS, R/D FACILITIES, AND WATER QUALITY FACILITIES, SHALL BE CLEANED. ANY OFFSITE CATCH BASIN THAT REQUIRED PROTECTION DURING CONSTRUCTION (SEE SECTION D.4.5.3) SHALL ALSO BE CLEANED.

MICHAEL T. OLLIVANT
STATE OF WASHINGTON
32573
REGISTERED PROFESSIONAL ENGINEER
4-02-01
EXPIRES: 9-12-02

LEGEND:

90° BEND MECHANICAL JOINT

22 1/2° BEND MECHANICAL JOINT

11 1/4° BEND MECHANICAL JOINT

TEE FLANGED

GATE VALVE, FLANGED

REDUCER, FLANGED

TRANSITION COUPLING

MJ x FL ADAPTER

THRUST BLOCK

WATER LEVEL

EXISTING CONTOUR 1' INTERVAL

EXISTING CONTOUR 5' INTERVAL

EXISTING EASEMENT

EXISTING GRADE

15"SS EXISTING SS

SILT FENCE

SILT CURTIAN

FLOATING STIFF ARM AND ANCHOR

OUTFALL PIPE

RED VALVE CHECK VALVE

OUTFALL PIPE INSIDE CASING

NO DISTURBANCE AREA BOUNDARY

BT SOIL BORING LOCATION AND NUMBER

STABILIZED CONSTRUCTION ENTRANCE

FE PLASTIC FENCE

ABBREVIATIONS:

DI	DUCTILE IRON
DIA	DIAMETER
E	EAST/EASTING
EL	ELEVATION
EXIST	EXISTING
FL	FLANGE, FLANGED
FT	FEET, FOOT
GA	GAGE
IE	INVERT ELEVATION
MAX	MAXIMUM
MIN	MINIMUM
MJ	MECHANICAL JOINT
N	NORTH/NORTHING
OC	ON CENTER
PVC	POLYVINYL CHLORIDE
RGS	RIGID GALVANIZED STEEL
SS	SANITARY SEWER
TYP	TYPICAL
W/	WITH

WET AREA SEED MIX SPECIFICATION*

	% WEIGHT	% PURITY	% GERMINATION
TALL OR MEADOW FESCUE FESTUCA ARUNDINACEA OR FESTUCA ELATIOR	60–70	98	90
SEASIDE/CREEPING BENTGRASS AGROSTIS PALUSTRIS	10–15	98	85
MEADOW FOXTAIL ALEPOCURUS PRATENSIS	10–15	90	80
ALSIKE CLOVER TRIFOLIUM HYBRIDUM	1–6	98	90
REDTOP BENTGRASS AGROSTIS ALBA	1–6	98	85

*MODIFIED BRIARGREEN, INC. HYDROSEEDING GUIDE WETLANDS SEED MIX

APPLY THIS MIXTURE AT A RATE OF 60 LBS PER ACRE.

NO.	REVISIONS	DATE	BY

DESIGNED M. OLLIVANT
DRAWN K. HINDS
CHECKED
APPROVED

0 1" 2"
TWO INCHES AT FULL SCALE IF NOT SCALE ACCORDINGLY
SCALE AS SHOWN
DATE APRIL 2001

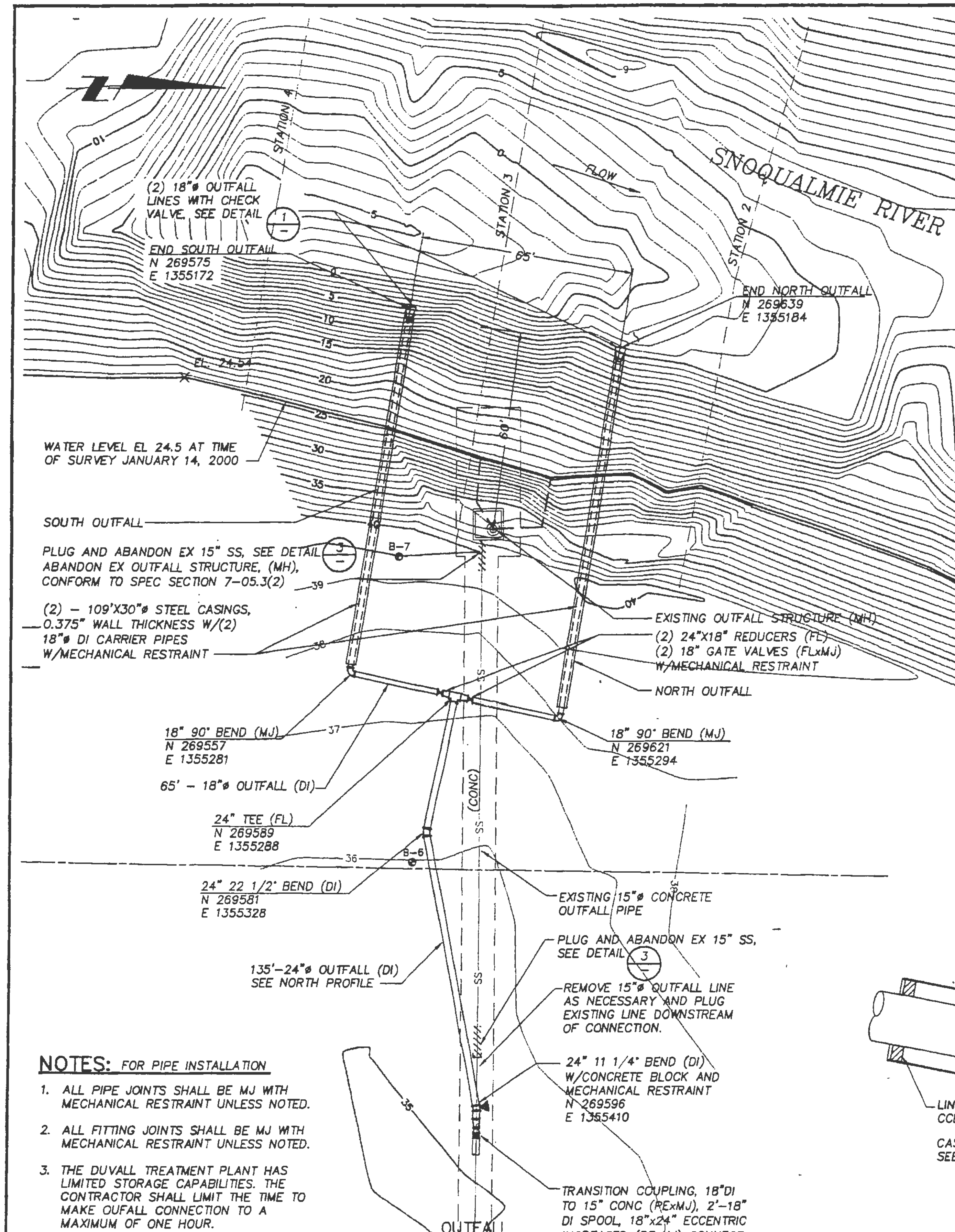
Parametrix, Inc. "Quality Service Through Employee Ownership"
1231 Fryar Avenue Sumner, WA 98390 Ph: (253) 863-5128 Fax: (253) 863-0946 http://www.parametrix.com
WASHINGTON Sumner Bremerton Kirkland
OREGON Portland

PROJECT NAME CITY OF DUVALL OUTFALL IMPROVEMENTS DUVALL, WASHINGTON
JOB NO. 216-3240-001 FILE NAME: 32400105

GENERAL NOTES, ABBREVIATIONS, AND LEGEND

SHEET NO. 2 / 5

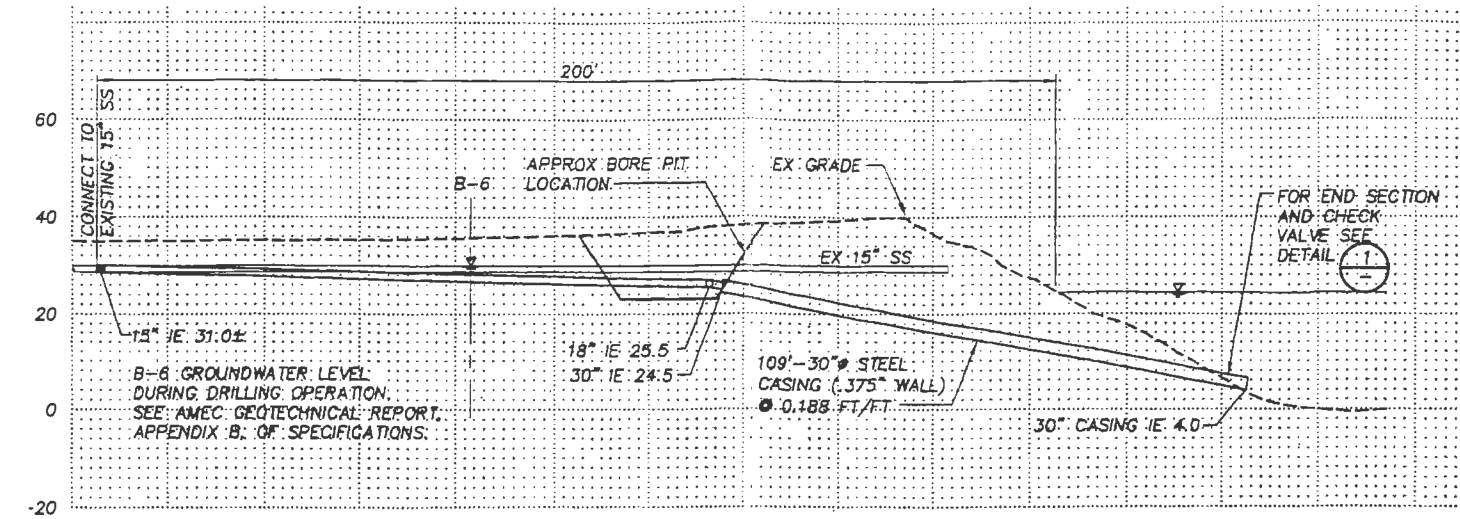
IMAGES:
XREFS:
DATE: 04/02/01



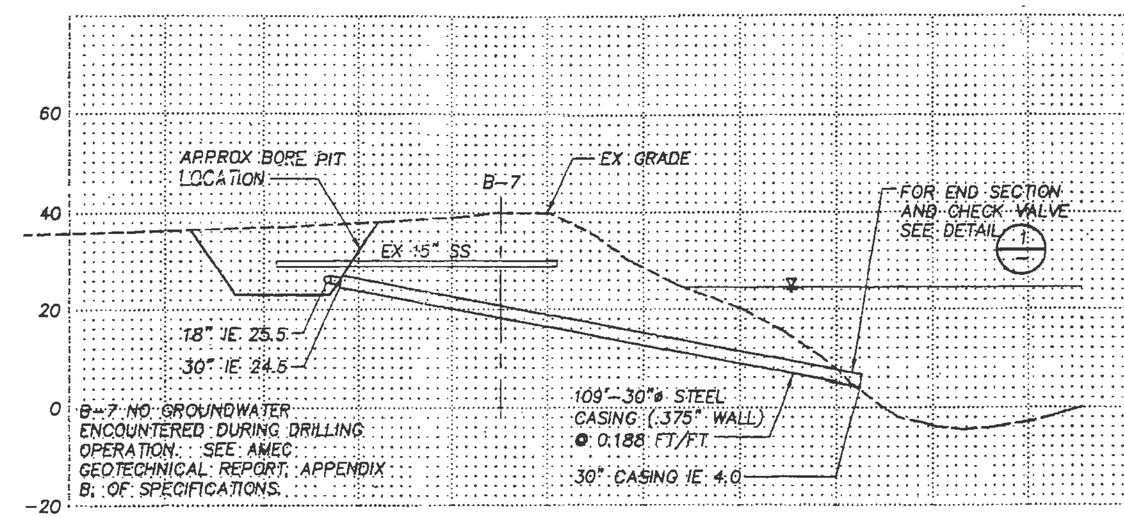
OUTFALL
PLAN
SCALE: 1"=20'

NOTES: FOR PIPE INSTALLATION

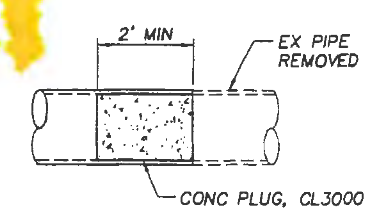
1. ALL PIPE JOINTS SHALL BE MJ WITH MECHANICAL RESTRAINT UNLESS NOTED.
2. ALL FITTING JOINTS SHALL BE MJ WITH MECHANICAL RESTRAINT UNLESS NOTED.
3. THE DUVALL TREATMENT PLANT HAS LIMITED STORAGE CAPABILITIES. THE CONTRACTOR SHALL LIMIT THE TIME TO MAKE OUFALL CONNECTION TO A MAXIMUM OF ONE HOUR.
4. BORE PIT & PIPELINE DEWATERING SHALL CONFORM TO SPEC SECTION 2-09.3(3)F.



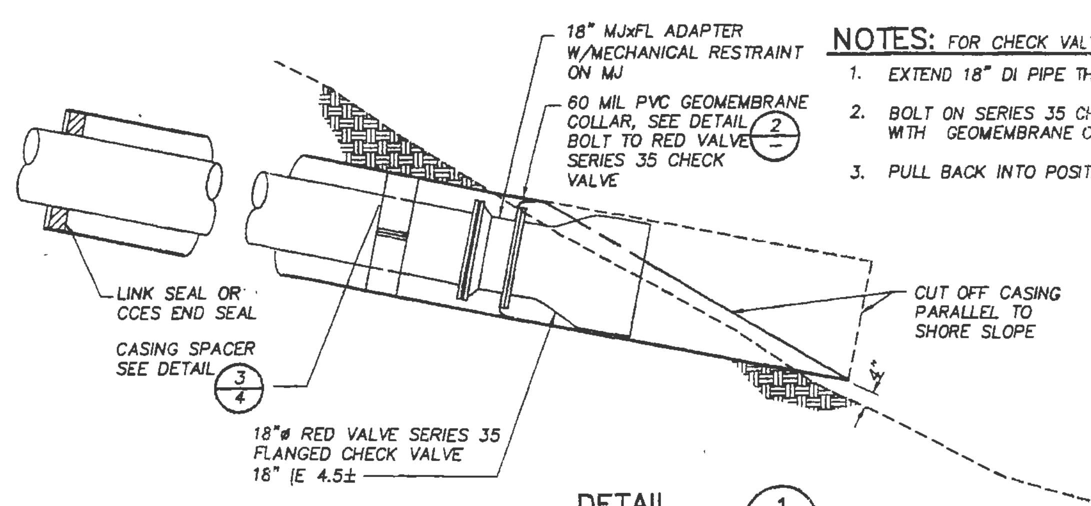
NORTH OUTFALL
PROFILE
SCALE: 1"=20'



SOUTH OUTFALL
PROFILE
SCALE: 1"=20'



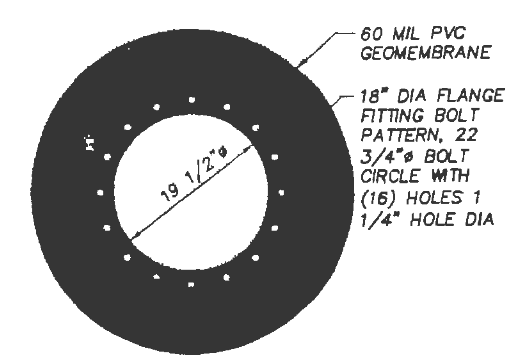
PLUG AND ABANDON PIPE
DETAIL 3
SCALE: 1" = 2'



DETAIL 1
SCALE: 1"=2'

NOTES: FOR CHECK VALVE INSTALLATION

1. EXTEND 18" DI PIPE THRU CASING
2. BOLT ON SERIES 35 CHECK VALVE WITH GEOMEMBRANE COLLAR
3. PULL BACK INTO POSITION



GEOMEMBRANE COLLAR
DETAIL 2
SCALE: 1"=1'

NO.	REVISIONS	DATE	BY

DESIGNED R. HERMES
DRAWN K. HINDS
CHECKED
APPROVED

TWO INCHES AT FULL SCALE IF NOT SCALE ACCORDINGLY
SCALE AS SHOWN
DATE APRIL 2001

RICKI V. HERMES, STATE OF WASHINGTON, REGISTERED PROFESSIONAL ENGINEER, 12636
4/2/01
EXPIRES 11/14/02

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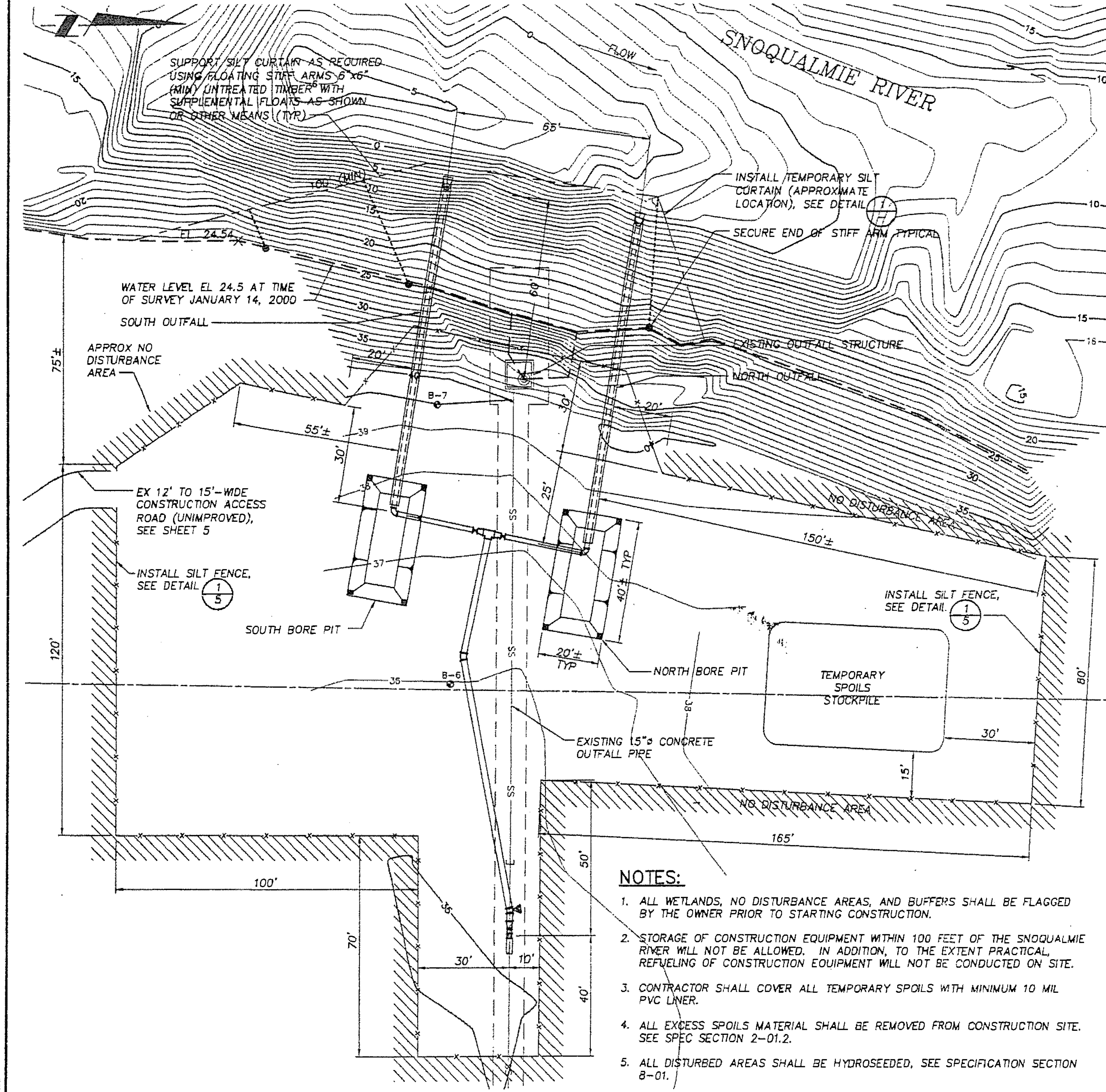
OREGON Portland

PROJECT NAME CITY OF DUVALL OUTFALL IMPROVEMENTS
DUVALL, WASHINGTON
JOB NO. 216-3240-001 FILE NAME: 32400102

PLAN AND PROFILE

SHEET NO. 3 / 5

DATE: 04/02/01 XREF'S: 32400I8A 32400IDE IMAGES:



OUTFALL PLAN

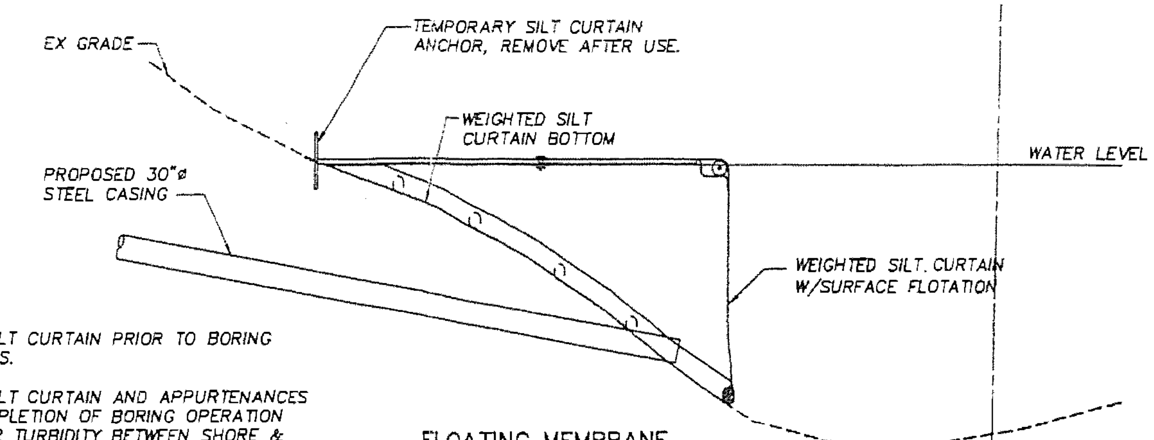
SCALE: 1"=20'

NOTES:

1. ALL WETLANDS, NO DISTURBANCE AREAS, AND BUFFERS SHALL BE FLAGGED BY THE OWNER PRIOR TO STARTING CONSTRUCTION.
2. STORAGE OF CONSTRUCTION EQUIPMENT WITHIN 100 FEET OF THE SNOQUALMIE RIVER WILL NOT BE ALLOWED. IN ADDITION, TO THE EXTENT PRACTICAL, REFUELING OF CONSTRUCTION EQUIPMENT WILL NOT BE CONDUCTED ON SITE.
3. CONTRACTOR SHALL COVER ALL TEMPORARY SPOILS WITH MINIMUM 10 MIL PVC LINER.
4. ALL EXCESS SPOILS MATERIAL SHALL BE REMOVED FROM CONSTRUCTION SITE. SEE SPEC SECTION 2-01.2.
5. ALL DISTURBED AREAS SHALL BE HYDROSEEDED, SEE SPECIFICATION SECTION 8-01.
6. STOCKPILED SOILS SHALL BE COVERED WITH PLASTIC (VISQUEEN).

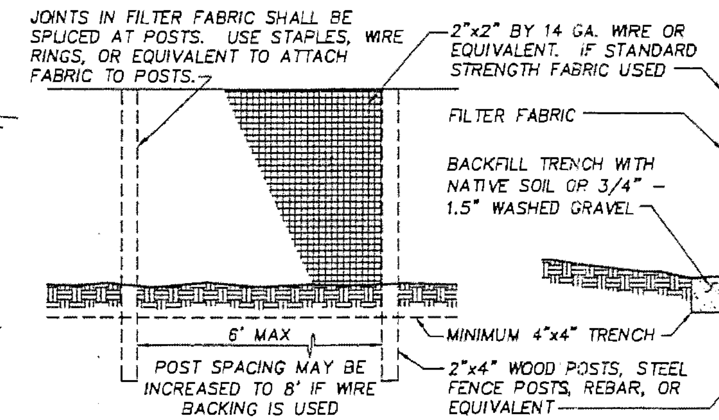
NOTES:

1. INSTALL SILT CURTAIN PRIOR TO BORING OPERATIONS.
2. REMOVE SILT CURTAIN AND APPURTENANCES UPON COMPLETION OF BORING OPERATION AND AFTER TURBIDITY BETWEEN SHORE & SILT CURTAIN IS LESS THAN 5 NTU.



FLOATING MEMBRANE DETAIL 1

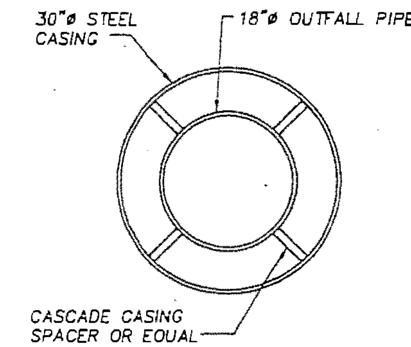
SCALE: 1"=10'



NOTE: FILTER FABRIC FENCES SHALL BE INSTALLED ALONG CONTOUR WHENEVER POSSIBLE

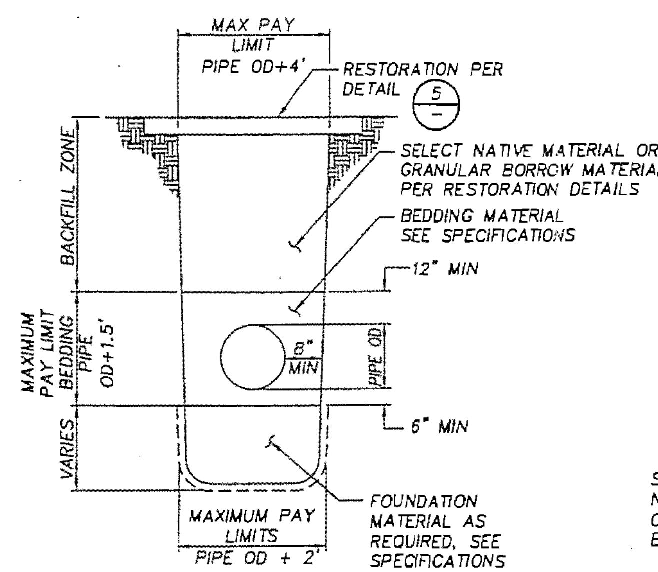
TEMPORARY SILT FENCE DETAIL 2 TYP

NO SCALE



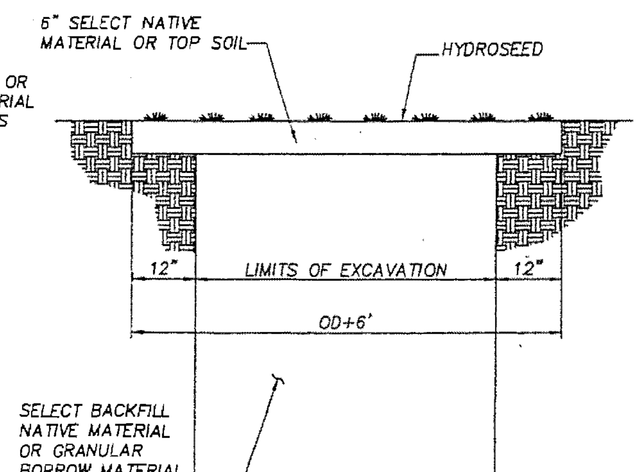
STEEL CASING DETAIL 3/3

NO SCALE



TYPICAL TRENCH DETAIL 4 TYP

NO SCALE



LANDSCAPING RESTORATION DETAIL 5 TYP

NO SCALE

NO.	REVISIONS	DATE	BY

DESIGNED M. OLLIVANT
DRAWN K. HINDS
CHECKED
APPROVED

TWO INCHES AT FULL SCALE IF NOT SCALE ACCORDINGLY
SCALE AS SHOWN
DATE APRIL 2001

MICHAEL T. OLLIVANT, STATE OF WASHINGTON, 22573, REGISTERED PROFESSIONAL ENGINEER
4-02-01
EXPIRES 9-12-02

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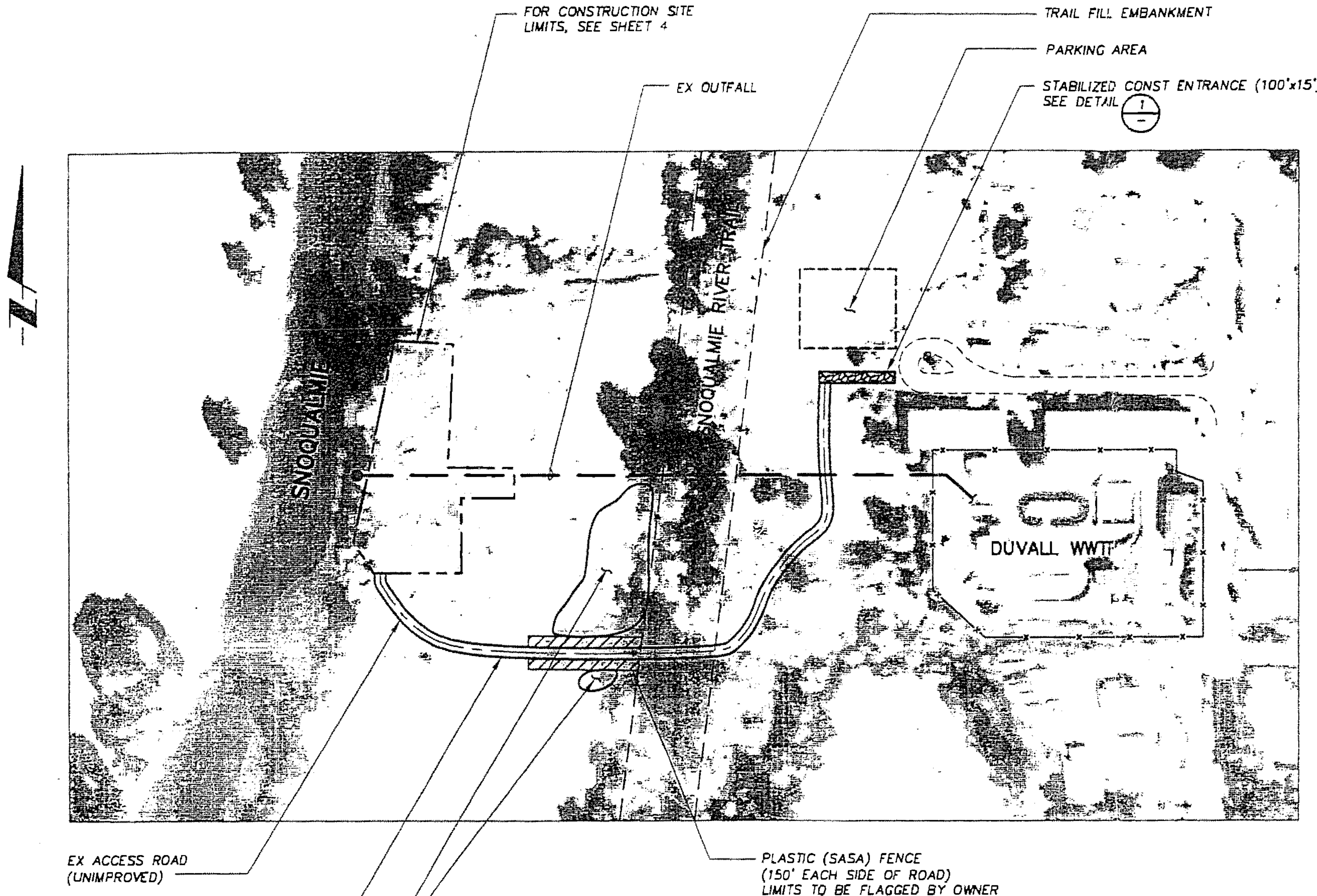
WASHINGTON: Sumner, Bremerton, Kirkland
OREGON: Portland

PROJECT NAME: CITY OF DUVALL OUTFALL IMPROVEMENTS
DUVALL, WASHINGTON
JOB NO. 216-7340-001 | FILE NAME: 32400107

EROSION AND SEDIMENT CONTROL PLAN

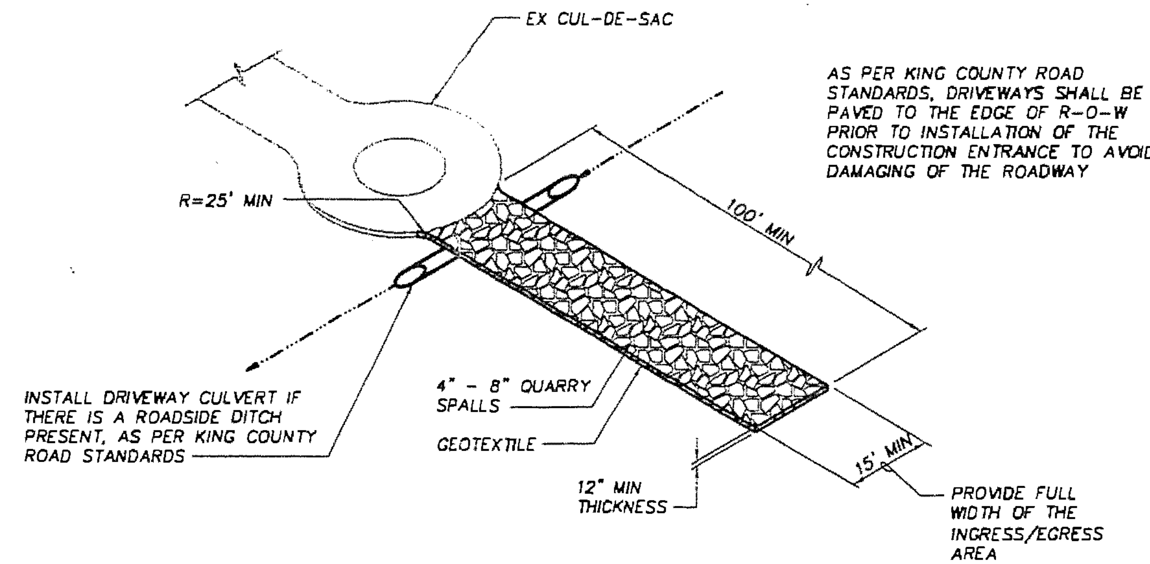
SHEET NO. 4/5

IMAGES: XREFS: 32400IBA 32400IDE
DATE: 04/02/01



PLAN

APPROX SCALE: 1" = 100'



PLACEMENT AND MAINTENANCE OF STABILIZED CONSTRUCTION ENTRANCE SHALL CONFORM TO SECTION D.4.4 OF KING COUNTY SURFACE WATER DESIGN MANUAL

A SEPARATION GEOTEXTILE SHALL BE PLACED UNDER THE SPALLS TO PREVENT FINE SEDIMENT FROM PUMPING UP INTO THE ROCK PAD. THE GEOTEXTILE SHALL MEET THE FOLLOWING STANDARDS:

GRAB TENSILE STRENGTH (ASTM D4751)	200 psi MIN
GRAB TENSILE ELONGATION (ASTM D4632)	30% MAX
MULLEN BURST STRENGTH (ASTM D3786-80a)	400 psi MIN
AOS (ASTM D4751)	20-45 (US STANDARD SIEVE SIZE)

STABILIZED CONSTRUCTION ENTRANCE

DETAIL 1

NO SCALE

NOTES:

1. USE OF EXISTING ACCESS ROAD SHALL BE LIMITED TO CONSTRUCTION EQUIPMENT ONLY.
2. CONTRACTOR EMPLOYEE PARKING SHALL BE RESTRICTED TO DESIGNATED AREA.
3. LIMITS OF UNIMPROVED ACCESS ROAD WILL BE FLAGGED BY OWNER PRIOR TO CONSTRUCTION.
4. WETLAND AREAS SHALL BE FLAGGED BY OWNER.

DUE TO REPRODUCTION PLEASE SEE FULL SIZE FOR SEAL

DATE: 04/02/01 IMAGES: ph07sk12bw XREFS:

NO.	REVISIONS	DATE	BY	
				DESIGNED R. HERMES
				DRAWN PMX
				CHECKED
				APPROVED

0 1" 2" TWO INCHES AT FULL SCALE IF NOT SCALE ACCORDINGLY

SCALE AS SHOWN

DATE APRIL 2001

Parametrix, Inc. "Quality Service Through Employee Ownership"
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WASHINGTON Sumner Bremerton Kirkland
OREGON Portland

PROJECT NAME CITY OF DUVALL OUTFALL IMPROVEMENTS DUVALL, WASHINGTON

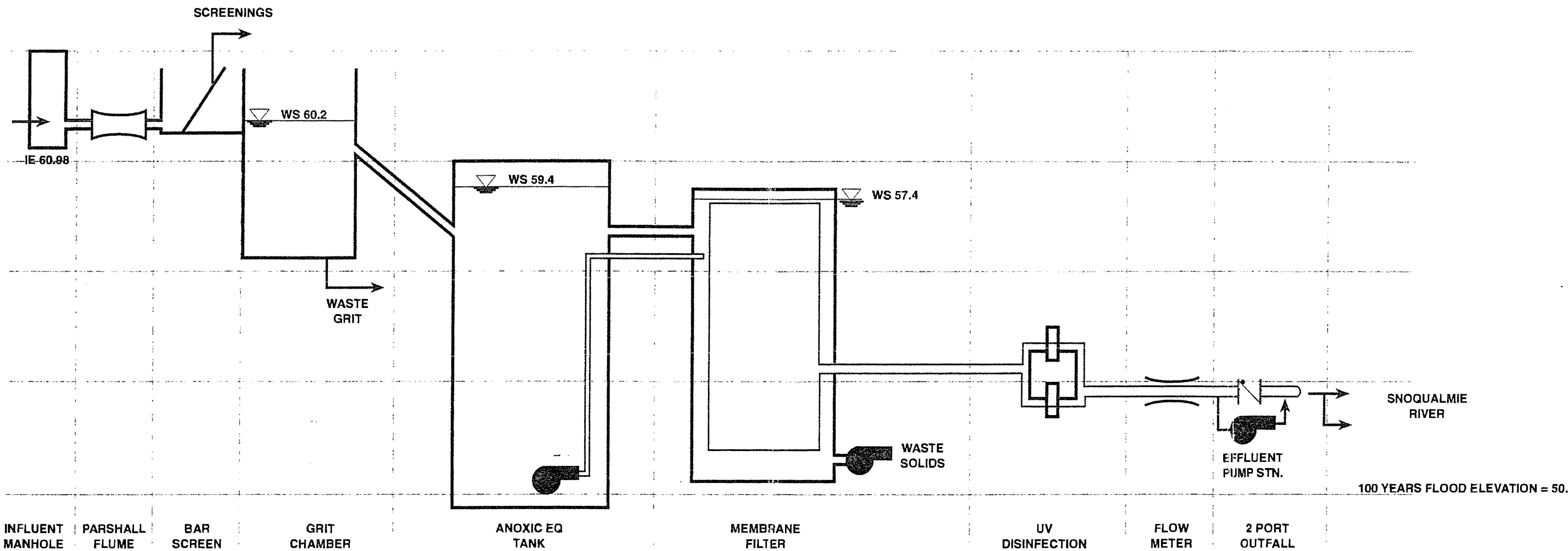
JOB NO. 216-3240-001 FILE NAME:

OUTFALL CONSTRUCTION ACCESS ROAD

SHEET NO. 5

APPENDIX K

Wastewater Treatment Plant Hydraulic Profile



Appendix K
Membrane Process
Hydraulic Profile