OFFICE COPY

TOWN OF CONCRETE

SKAGIT COUNTY WASHINGTON

COMPREHENSIVE SEWER AND WASTEWATER FACILITY PLAN

G & O No. 98749

FEBRUARY 2000

Gray & Osborne, Inc.
CONSULTING ENGINEERS
701 DEXTER AVENUE NORTH SUITE 200
SEATTLE, WASHINGTON 98109 (206) 284-0860

TOWN OF CONCRETE

SKAGIT COUNTY WASHINGTON

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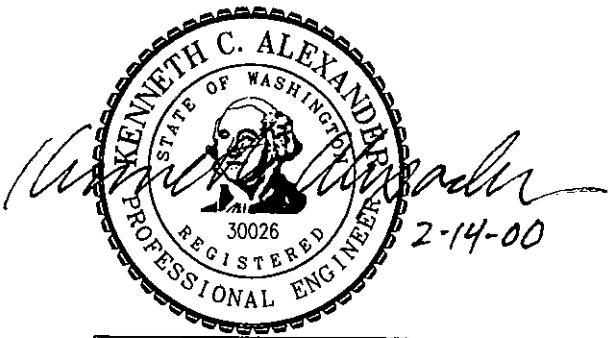

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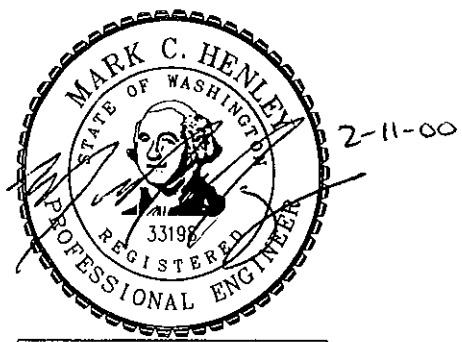

EXPIRES: 2/26/01

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February 14, 2000

Mayor David Williams
Town of Concrete
P.O. Box 39
Concrete, Washington 98237

SUBJECT: COMPREHENSIVE SEWER AND WASTEWATER FACILITY PLAN
TOWN OF CONCRETE, SKAGIT COUNTY, WASHINGTON
G&O #98749

Dear Mayor Williams:

We are pleased to submit eight (8) copies of the Town of Concrete *Comprehensive Sewer and Wastewater Facility Plan* (Plan) dated February 2000. Please submit two (2) copies to Mr. Gerald Shervey, Department of Ecology (Ecology), no later than February 18, 2000, to make this project eligible for the Ecology funding described at the end of this letter.

Mr. Shervey's address is:

Mr. Gerald Shervey, P.E.
Department of Ecology
Northwest Regional Office
Water Quality Program
3190 160th Avenue SE
Bellevue, Washington 98008-5452

The February 2000 Plan addresses comments received in the following communications:

- Department of Ecology letter from Gerald Shervey dated December 27, 2000, regarding the soil map (Figure 2-4) and present worth costs in Tables 6-2, 6-4, 6-6 and 6-7
- Verbal comments from Pat Hayden, Town attorney, of February 4 and 10, 2000, concerning the need to identify a minimum of 80 percent grant funding as the Town's goal for the capital portion of the project and revising initial O&M costs to reflect start-up conditions at the treatment facility
- Letter from the Town's attorney dated February 10, 2000, concerning revisions to zoning and UGA boundaries in the Town's *Comprehensive Plan*

As requested by the Town's attorney in correspondence dated December 13, 2000, we have contacted Gary Sturdy regarding the treatment system alternative that Sturdy

Engineering proposed to Gray & Osborne in a fax from Gary Sturdy dated August 18, 1999. Our fax to Sturdy Engineering of September 1, 1999 and our letter to the Town of December 10, 2000, detailed our concerns regarding reliability and design standards for the treatment system proposed by Sturdy Engineering.

As we stated in our December 10 correspondence to the Town and as we discussed at the February 4 meeting with Ecology, Gray & Osborne is not in a position to include Sturdy Engineering's proposal in engineering documents that we prepare for the Town. During our February 4 meeting with Department of Ecology it was determined that Sturdy Engineering may prepare an amendment to the *Comprehensive Sewer and Wastewater Facility Plan* for the Town to submit to Ecology that recommends a different treatment system than the one recommended by Gray & Osborne.

As also discussed during our meeting with Ecology, Gray & Osborne will prepare applications for Centennial Clean Water Fund/State Revolving Fund dollars for the Town to submit to Department of Ecology by February 29, 2000. As required by Department of Ecology, the applications must request funds based on the costs identified in the February 2000 Plan. If the Town is able to identify cost savings that will not require the full amount of funding requested, the Town is under no obligation to accept all funds that are offered.

Once again, thank you for the opportunity to work on this project with you and your staff.

Very truly yours,

GRAY & OSBORNE, INC.

Ken Alexander, P.E.

KA/sdm
Encl.

cc: Mr. Alan Wilkins, Maintenance Superintendent, Town of Concrete, w/encl.
Mr. Patrick Hayden, Town Attorney, Town of Concrete, w/encl.
Mr. Gary Sturdy, P.E., Sturdy Engineering, w/encl.
Ms. Cathi Read, Community Assistance Center, DCTED, w/encl.

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EXECUTIVE SUMMARY

INTRODUCTION

The purpose of this *Comprehensive Sewer and Wastewater Facility Plan* is to provide a long-term strategy for the Town of Concrete, over a twenty year planning horizon (through year 2020), to manage its wastewater collection, treatment and disposal systems. This document is based on growth assumptions and planning data found in the Town's *Comprehensive Plan* that was prepared by the Town in accordance with the Growth Management Act.

The *Comprehensive Sewer Plan* portion of this document was prepared in accordance with the Department of Ecology (Ecology) requirements specified in Washington Administrative Code (WAC) Chapter 173-240-050. The *Wastewater Facility Plan* portion of the document was prepared in accordance with requirements for an Engineering report specified in WAC Chapter 173-240-060. The *Comprehensive Sewer and Wastewater Facility Plan* is also being prepared to comply with stipulations contained in the Town's Consent Order (No. DE 98WQ-N103) issued by the Department of Ecology in April 1998.

BACKGROUND

The Town of Concrete is located along Highway 20 approximately 25 miles east of Sedro Woolley and 30 miles northeast of Mount Vernon in Skagit County, in the northwestern corner of Washington State. The Town occupies an area of 747 acres and currently has a population of 785 people.

SERVICE AREA

The existing service area is defined as the residential, commercial, industrial, and public areas served by the existing sewer collection system within the municipal corporation limits only. Various commercial establishments, including restaurants, taverns, grocery stores and shops are served by the collection system.

The sewer service area is expected to grow within the existing city limits and interim urban growth area (UGA) during the 20 year planning period. Within the existing city limits, vacant lots zoned for residential purposes are available for future development. Inside the interim UGA, residential, commercial, and industrial areas are expected to develop. For the purposes of this Plan, the future service area boundary for the sewer utility will be the interim UGA boundary, which encompasses 995 acres.

POPULATION

The 1990 Census revealed that 735 people in the Concrete vicinity were housed in 276 dwelling units, for an average household size of 2.7 persons. The average number of households per acre is 2.4. The 1998 population within Concrete's corporate limits is approximately 785 people.

By the year 2020, the population for Concrete (town limits plus IUGA) is projected to be 1,343 people. This projection is based on growth rates found in the Town's *Comprehensive Plan*.

EXISTING FACILITIES

The Town of Concrete currently provides sanitary sewer service within its corporate limits and is the only entity providing centralized wastewater treatment within its 747 acre service area. The Town's sewer collection system currently consists of approximately 24,680 feet of 8-inch gravity sewer pipe, and 3,740 feet of pressure sewer pipe, ranging in size from 4-inch to 6-inch in diameter. The Town also operates three sewage lift stations located at Albert Street and Dillard Avenue (No. 1), on Fir Street, just South of Highway 20 (No. 2), and in the eastern portion of the Town at North Everett Avenue (No. 3). These pump stations have a maximum capacity of 190 gpm, 175 gpm and 190 gpm, respectively. The Town owns and operates a wastewater treatment plant located in the central portion of the Town. Treated effluent from the treatment plant is discharged via an outfall to the Baker River.

WASTEWATER FLOW CHARACTERISTICS

A summary of the wastewater treatment facility current flows and loadings, together with the permitted plant capacity and projected wastewater flows and loadings, is presented in Table ES-1.

TABLE ES-1

Current, Permitted, and Projected Wastewater Flows and Loadings
Town of Concrete Wastewater Treatment Plant

Parameter	Permitted Capacity	Current Flow or Loading (1994-1998)	Design Flow or Loading (Year 2020)
Average Annual Flow	--	90,000 gpd	226,000 gpd
Maximum Monthly Flow	100,000 gpd	155,000 gpd	362,000 gpd
Maximum Daily Flow	--	303,000 gpd	746,000 gpd
Peak Hourly Flow	--	N/A	904,000 gpd
Design BOD_5 Loading	200 lb/day	165 lb/day	362 lb/day
Design TSS Loading	--	141 lb/day	362 lb/day

SYSTEM EVALUATION

This Plan evaluated the capacity and condition of all major components of the Town's wastewater collection, treatment and disposal systems. The evaluation concluded that the three lift stations will require major improvements to provide the necessary operational reliability required by Department of Ecology. The major improvements required for lift stations include new control panels and auxiliary power capability. As seen in Table ES-1, the existing aerated lagoon treatment facility has exceeded its capacity and will require significant upgrades to increase capacity to handle current and future loadings to the plant.

Since the treatment facility's construction in the early 1970s, new environmental regulations governing the discharge of toxic substances to fish bearing streams have been enacted. An evaluation of the Town's wastewater discharge to the Baker River by Department of Ecology has determined that two toxic substances (ammonia and chlorine) present in the Town's treatment plant effluent are likely to cause a violation of water quality standards. Thus, in addition to providing greater capacity for increased flows and loadings, upgrades to the treatment and/or disposal facilities will be required to meet more stringent ammonia and chlorine standards in the Baker River.

CAPITAL IMPROVEMENTS

Collection System Improvements

Table ES-2 summarizes recommended collection system improvements identified in the evaluation.

Wastewater Treatment and Disposal Improvements

Several alternatives were considered for the treatment and disposal of the Town's domestic wastewater including:

1. Continued Lagoon Treatment and Disposal to the Baker River via New or Modified Outfall
2. New Lagoon Treatment Facility and Disposal to the Skagit River via New Outfall
3. Upgrade Treatment Plant and Continued Disposal to Baker River via Existing Outfall
4. Land Treatment System
5. Streamflow Augmentation with Ancillary Commercial/Institutional Uses
6. Groundwater recharge with Ancillary Commercial/Institutional Uses

Alternatives 1, 3 and 5 were selected for more detailed technical and cost evaluations. A cost summary for these three alternatives is presented in Table ES-3, and includes total project costs (in 1999 dollars) for capital expenditures and annual operations and maintenance costs (in 1999 dollars).

Table ES-2

Summary of Collection System Improvements
Town of Concrete

Improvement	Completion Year	Estimated Project Cost (1999 Dollars)
Short-term:		
1. Smoke Testing	1999	$500*
2. Grout MH R-2 & R-3	2000	$3,000
3. Investigate 427 Duffy Street	2000	Depends on Outcome of Investigation, $3,000
4. Disconnect By-pass Line to Creek from Manhole M-1	1999	$200*
Long-term:		
1. Provide Electrical Modifications to Existing Lift Stations.	Before Year 2005**	$155,000
2. Provide an additional sewer line MH A-4 to MH A-1	Before Year 2005**	$243,000
Service to Grassmere Area (IUGA):		
1. Install Lift Station No. 4	***	$140,000
2. New Forcemain and gravity lines for IUGA	***	$2,750,000
3. New pumps at Lift Station No. 2	***	$30,000

* - Assumes that the STEP members and Town maintenance staff will provide the labor - remaining costs represent material costs only.

** Based on obtaining financing and scheduling improvements concurrent with wastewater treatment plant upgrades which will need to be completed by the end of the next permit cycle (assumed January 2000 - January 2005)

*** These improvements will be dependent upon requirements for further development in this area.

TABLE ES-3

Wastewater Treatment Alternatives Cost Summary
Town of Concrete

Treatment Option	Total Project Cost	Annual O&M Costs
1. Expanded Lagoon System	$2,600,000	$103,000
3. Upgrade WWTF and Retain Existing Outfall	$2,600,000	$110,000
5. Water Reclamation Facility with Streamflow Augmentation	$3,800,000	$138,500

Alternative 3, Upgrade Treatment Plant and Continued Disposal to Baker River via Existing Outfall, was recommended based on the high levels of treatment, potential for acceptance by the public and regulatory/funding agencies, and cost effectiveness relative to all alternatives evaluated.

The recommended treatment process includes a new headworks, a sequencing batch reactor to provide ammonia removal, a new ultraviolet (UV) light disinfection facility to eliminate chlorine for the effluent and continued disposal to Baker River via the existing outfall. The recommended alternative for handling and treating biosolids produced by the wastewater facility consists of treating the sludge in a re-lined aerated lagoon, dewatering the biosolids via a new dewatering screw press, and hauling the dewatered biosolids to a permitted, beneficial use facility.

The estimated project costs (in 1999 dollars) for the recommended alternative are $2,600,000 (capital cost) and $110,000 per year for operations and maintenance costs. These costs include biosolids treatment and disposal as well as a full time operator and a part time operator. Costs also include planning level estimates for contingencies, legal, engineering and administrative fees.

CAPITAL PROJECT FINANCING

A financial analysis was performed and a financing plan was prepared as a part of the Plan. The financial analysis showed that the Town will need to obtain substantial grant funding to finance the capital improvements. Sewer rate increases will also be required to finance debt service for the improvements and fund operation and maintenance (O&M) costs for the new treatment plant.

Table ES-4 summarizes sewer rate increases required to pay sewer utility expenses, assuming the Town can secure grant funding for 75 percent of the project cost.

Table ES-4

Projected Monthly Sewer Rates* **
Town of Concrete

Year	Single Family Residential Monthly Rate
1999	$21.00
2000	$21.00
2001	$21.00
2002	$21.00
2003	$26.00
2004	$27.00
2005	$50.00

*** Assumes 75% grant and 25% loan

The Town will apply for funds from a variety of sources (Department of Community Trade & Economic Development for Public Works Trust Fund and Community Development Block Grant programs, Centennial Clean Water Fund and State Revolving Fund from Department of Ecology, USDA Rural Development) to finance the capital improvements to the collection system and the wastewater facility. Applications for each funding program will need to be prepared beginning in early 2000 and continue through the year 2002.

The Town will need to obtain a significant percentage of grant funding to make the project viable and avoid sewer rates that exceed $50.00 per month. Grant funding is limited and the Town will have to obtain funding from a variety of agencies to maximize grant funding for the project.

The majority of the projected monthly residential sewer rate will fund O&M for the plant. Of the $50.00 per month rate, $42.00 will be for O&M while $8.00 will be for debt service. O&M costs will increase substantially, primarily because of labor to staff the treatment facility on a full-time (40-hour/week) basis.

CHAPTER 1

INTRODUCTION

GENERAL

The Town of Concrete (Town) contracted with Gray and Osborne, Inc. to prepare a Comprehensive Sewer and Wastewater Facility Plan for the Town's sewage collection, treatment and disposal systems. This Plan is required to ensure sufficient capacity to collect, convey, treat and dispose of wastewater within the 20 year projected sewer service area boundary. In addition, the Comprehensive Sewer and Wastewater Facility Plan is being completed in order to fulfill conditions described in the Town's Consent Order No. DE 98WQ-N103.

PURPOSE

The purpose of this Comprehensive Sewer and Wastewater Facility Plan is to provide the Town of Concrete with a plan to collect, treat and dispose of domestic wastewater for a twenty (20) year planning period. Since it is anticipated that an upgrade to the plant will need to be constructed within the planning period, this plan evaluates requirements and necessary improvements for treatment capacity up to the year 2020.

This report will fulfill the requirements for an engineering report as required by WAC 173-240 and 40 CFR 35, to be eligible for State Revolving Fund (SRF) funding and addresses stipulations contained in the Town's Consent Order.

BACKGROUND

The original collection system was constructed in the early 1970's and consisted of approximately 20,400 feet of mostly 8-inch diameter concrete and cast iron gravity sewers as well as two (2) sewage lift stations and associated force mains. Expansions to this system have occurred periodically in response to growth and maintenance requirements and have occurred primarily east of the Baker River, south of State Route 20 and in the western section of Town. A third lift station was constructed to serve the eastern portion of Concrete.

The original domestic wastewater treatment facility (WWTF) in Concrete was constructed in the early 1970's, and consisted of a manual bar screen, aerated lagoon, and chlorine contact tank. A recent improvement at the treatment plant included upgrading the effluent flow meter. The Town has also recently initiated a sludge removal and disposal project.

The engineering evaluation will address a variety of issues. The evaluation must examine the wastewater utility needs over 20 years as required by the Growth Management Act (GMA). These needs will be dictated by new environmental requirements established since the 1970's, for the protection of groundwater and surface water quality. The evaluation must identify collection and treatment system improvements needed to properly convey, treat and dispose of domestic wastewater generated within the Town's projected (20 year) sewer service area. The treatment plant's ability to meet effluent limits for discharge to the existing receiving water body (Baker River) will also be addressed.

SCOPE OF WORK

The scope of work for the Town of Concrete's Comprehensive Sewer and Wastewater Facility Plan includes the following items:

- Planning Considerations
- Regulatory Requirements
- Existing Facilities
  - collection system
  - wastewater treatment plant
  - wastewater outfall
- Flows and Loadings
- Wastewater Treatment Alternatives
- Collection System Alternatives
- Recommended Improvements
- Financial Plan
- Environmental Evaluation

CHAPTER 2

PLANNING CONSIDERATIONS

INTRODUCTION

The Town of Concrete is located along Highway 20 approximately 25 miles east of Sedro Woolley and 30 miles northeast of Mount Vernon, in Skagit County, in the northwestern corner of Washington State, as shown in Figure 2-1. The Town occupies an area of 747 acres and currently has a population of 785 people.

GROWTH MANAGEMENT

The Growth Management Act (GMA) was passed into law in 1990 with the intention of reducing the threat to the environment caused by uncoordinated and uncontrolled growth within the State of Washington. It was determined by the State that "it is in the public interest that citizens, communities, local governments, and the private sector cooperate and coordinate with one another in comprehensive land use planning". The objective is for local city and county government to develop and use a 20 year comprehensive plan that outlines their community development.

Under GMA, comprehensive planning is done at the county level. However, all municipalities within the county must do their own city planning, and must coordinate these planning efforts with those of the county. A comprehensive plan must contain six elements: land use, transportation, housing, capital facilities, utilities, and rural. This *Comprehensive Sewer/Wastewater Facility Plan* fulfills the Town of Concrete's capital facilities sewer and treatment system elements of their *Comprehensive Plan.*

Fundamental to the philosophy of GMA planning is the premise that municipalities should provide basic urban services such as water, sewer, schools, and police and fire protection to developments within its Urban Growth Area (UGA) boundary. This means the cost of providing sewer extensions must be factored into the cost of any planned development.

The *Town of Concrete Final Review Draft Comprehensive Plan (Comprehensive Plan)* was developed and adopted by the Town in May 1998 and has been submitted to Skagit County for review and approval. The Town is currently awaiting approval of the Plan by the County. The planning period for the *Comprehensive Plan* is 21 years; 1999 - 2020. This plan shows the existing city limits, and defines a proposed "interim" Urban Growth Area (IUGA) boundary, that is larger than the existing city limits, and will be required to

accommodate the growth projected in the *Comprehensive Plan*. The interim boundary will become the Town's UGA provided the *Comprehensive Plan* is approved and adopted by Skagit County. Both the existing city limits and IUGA boundaries are shown in Figure 2-2. The *Comprehensive Plan* contains land use data that was used in conjunction with population projections to determine wastewater flow projections for the Town's sewer collection system and wastewater treatment facility.

PLANNING PERIOD

The current planning period for this Comprehensive Sewer and Wastewater Facility Plan is from 1999 through 2020. This planning period is based on a useful life of the new wastewater collection and treatment plant facilities of 21 years, assuming these facilities will be constructed and put into service no later than the year 2020.

EXISTING SERVICE AREA

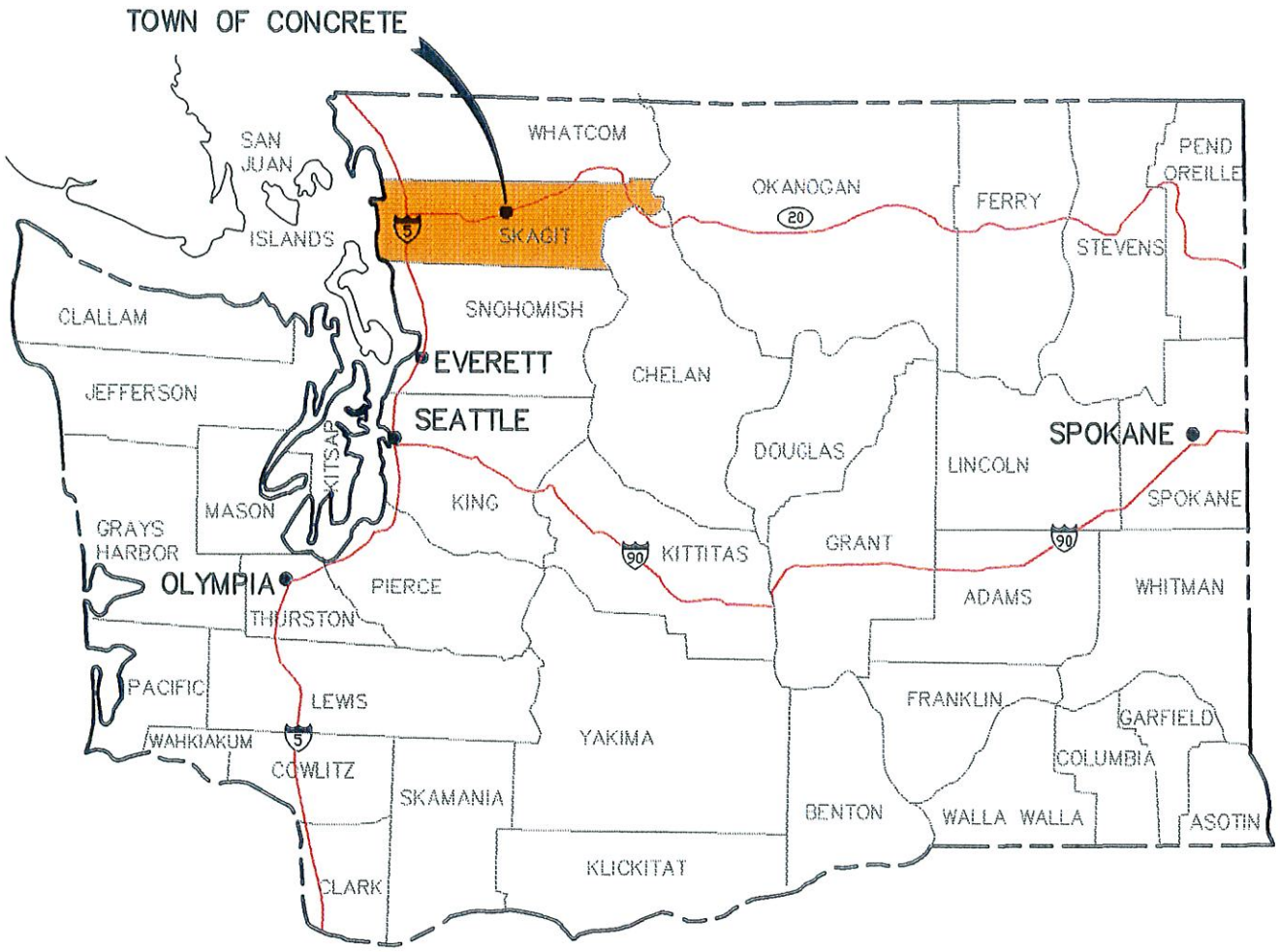
The existing sewer service area, also shown in Figure 2-2, is defined as the residential, business, commercial, industrial, and public areas served by the existing sewer collection system. The collection system currently serves residential and commercial areas within the Town limits only. Commercial establishments including restaurants, taverns, grocery stores, shops and health care facilities are served by the collection system.

FUTURE SERVICE AREA

The sewer service area is expected to grow within the existing Town limits and interim UGA during the 20 year planning period. Within the existing Town limits, vacant residential properties exist. Inside the interim UGA, residential areas are expected to develop in addition to property zoned for commercial and industrial uses.. For the purposes of this Plan, the future service area boundary for the sewer utility will be the interim UGA boundary, which encompasses 995 acres, as shown on Figure 2-2.

EXISTING AND FUTURE LAND USE

The land use designations within the Town of Concrete's municipal limits and IUGA boundary were obtained from the *Comprehensive Plan* and are shown in Figure 2-2.



VICINITY MAP

NOT TO SCALE

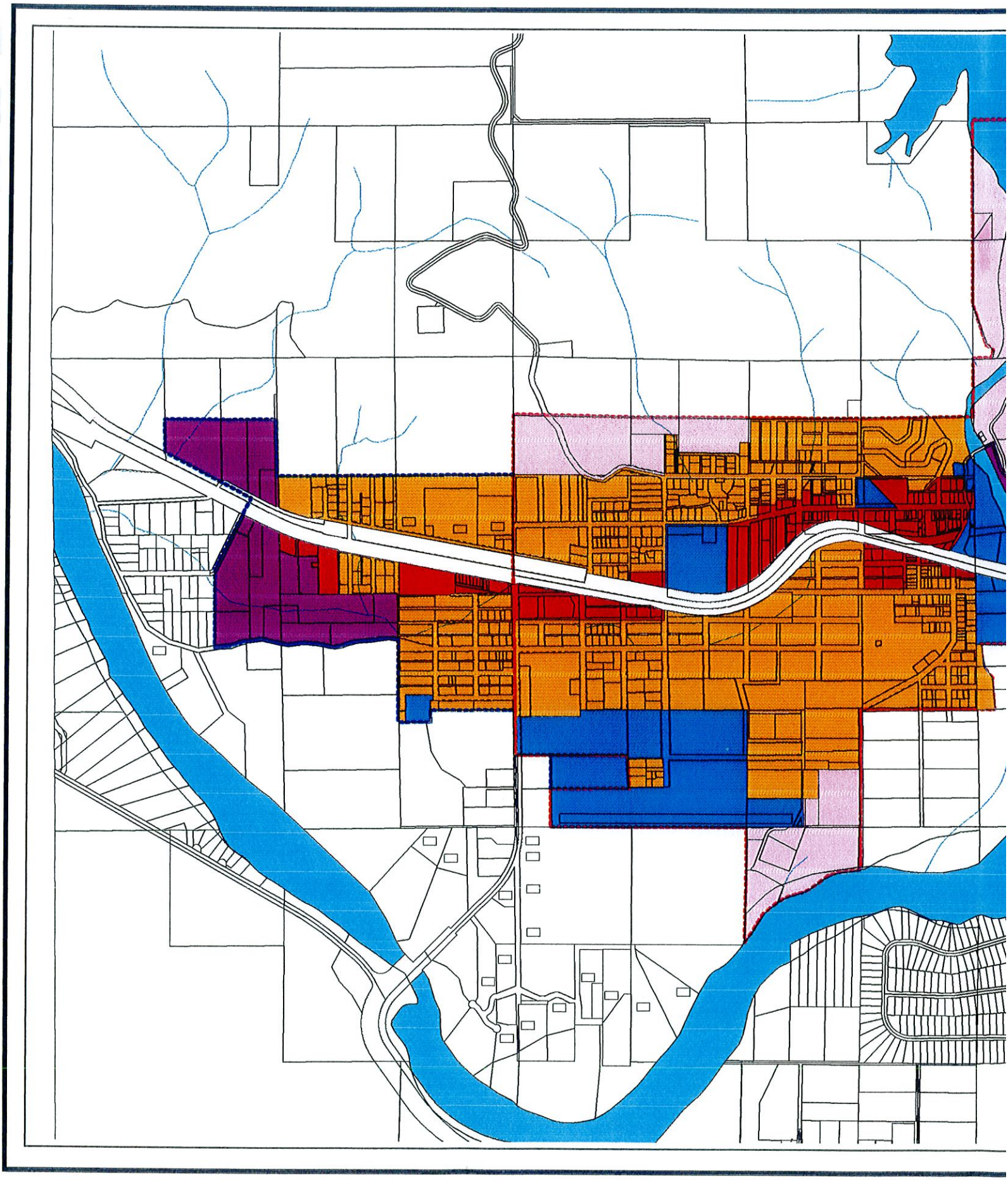
TOWN OF CONCRETE

COMPREHENSIVE SEWER & WASTEWATER FACILITY PLAN

FIGURE 2-1
VICINITY MAP

Gray & Osborne, Inc.
CONSULTING ENGINEERS

BY: MW CREATED: APR 21 1999 09:00:04 UPDATED: APR 26 1999 11:54:44 PLOTTED: JUL 06 1999 10:44:42 FILE: L:\CONCRETE\98749\FIGURES\VICINITY.DWG



According to the *Comprehensive Plan*, a land use inventory was completed in March and August 1997 and identified the use of each parcel of land, amount of land currently available, and the manner in which each parcel is used within the Town limits and adjacent areas to the Town that were candidates for an urban growth area. This effort resulted in generalizing land use into three different groups including (1) Roads, Railway and Rights-of-Way, (2) Vacant Lands and (3) Developed Lands. Under the category of Developed Lands, subcategories include the following: single-family, multi-family, commercial, public use/community, transportation, park, utilities/communications, and industry. The types of existing land use and extent within the Town limits is presented in Table 2-1.

TABLE 2-1

Existing Land Use Within the Town Limits
Town of Concrete

EXISTING LAND USE	ACRES	LOTS	PERCENTAGE
Roads/Rail/R-O-W	**199.4**	N/A	27%
Vacant Land	**353.1**	254	47%
Developed Land	**194.7**	322	26%
Single-Family	81.9	230	
Multi-Family	4.6	4	
Commercial/	13.2	33	
Public Use/ Community	32.9	27	
Transportation	30.9	9	
Park	4.3	7	
Utilities/ Communications	12.5	5	
Industry	14.4	5	
TOTAL	**747.2**	**574**	**100**

Source: Town of Concrete's *Comprehensive Plan, May 1998*
N/A - Not Applicable

As Table 2-1 indicates, 574 lots exist within the corporate limits of Concrete and 322 of these lots have either been partially or fully developed. According to the *Comprehensive Plan*, lots vary in size from several acres to 1,250 square feet, and residential densities in existing neighborhoods range from two to six dwelling units per acre throughout the Town.

The *Comprehensive Plan* defined the IUGA as parcels of land adjacent to the current corporate limits that will be required to provide sufficient area to accommodate the

growth expected during the 21 year planning period. Table 2-2 illustrates the type of land use and extent within the IUGA, but outside of the Town limits.

TABLE 2-2

Existing Land Use Outside of Town Limits Within the IUGA
Town of Concrete

EXISTING LAND USE	ACRES	LOTS	PERCENTAGE
Roads/Rail/R-O-W	**81.1**	N/A	32.6%
Vacant Land	**78**		31.4%
Developed Land	**89.4**		36.0%
Single-Family	19.2		
Multi-Family	0		
Commercial/	4.4		
Public Use/ Community	2.8		
Transportation	0		
Park	0		
Utilities/ Communications	0		
Industry	54.5		
TOTAL	**248.5**		**100%**

Source: Town of Concrete's *Comprehensive Plan, May 1998*
N/A - Not Applicable

The land use of the unincorporated IUGA confirmed that there are 248.5 acres of land within the boundaries of the IUGA but outside the Town limits.

In the *Comprehensive Plan*, the Town developed five (5) Comprehensive Plan Designations to help guide its growth in a manner consistent with the Town's vision. A brief definition of each land use designation, as stated in the *Comprehensive Plan*, is given below.

- ***Residential.*** The residential land use category is intended to create an optimal living environment for dwellings that limits development to relatively low urban density. This designation provides for the development of single-family detached and attached dwellings and for accessory uses that are related, incidental and not detrimental to the residential environment.

- ***Public.*** The public land use category is intended to provide adequate land for government services and facilities, including utilities, office buildings, cemeteries, public access areas, schools, other local, State or Federal land, and for parks or open space.

- ***Open Space.*** This land use category is intended to encourage appropriate natural resource management in areas of Concrete which, by reason of geology, slope, floods, wetlands, wildlife habitat, location are not suited for intensive land uses and may require specific management techniques. Appropriate uses include low-density housing, open space, wildlife habitat, steep slope protection, water resource management, and activities/uses consistent with such management practices.

- ***Commercial.*** The commercial land use category is intended to provide for and encourage commercial uses that are attractive to pedestrian shoppers and offer quality office space or commercial shop environments. The core area for this designation should be the Central Business District.

- ***Industrial.*** The industrial land use category is intended to provide for the location and grouping of industrial and commercial services that possess similar characteristics and have higher impacts than other urban uses, such as manufacturing, assembling, fabrication and processing, storage and warehousing, commercial lumber yards and other related uses. Containing these uses to one specific area and applying performance standards and buffers will reduce the overall impact of the uses.

The land use designations and number of acres per designation are summarized in Table 2-3.

In regard to residential acreage, the amounts listed under Table 2-3, are not completely available for future in-fill capacity. The future residential acreage available for development must take into account existing developed land, rights-of-way, undevelopable land (steep slopes, flood areas, etc.), and a market factor. Based on these criteria, the *Comprehensive Plan* estimates that 43.6 acres and 32.5 acres are available for future residential development within the Town limits and within the IUGA, respectively.

TABLE 2-3

Land Use Designations
Town of Concrete

Land Use Designations	Current Town Limits (Acres)	Interim UGA (Acres)	Total (Acres)
Residential	261.5	75.9	337.4
Public	107.6	16.2	123.8
Open Space	134.4	0	134.4
Commercial	43.1	6.2	49.3
Industrial	13.3	69.1	82.4
Rights-of-Way	187.4	81.1	268.5
Total	**747.3**	**248.5**	**995.8**

Source: Town of Concrete's *Comprehensive Plan, May 1998*

The existing commercial areas within the Town limits include 43.1 acres, with 23.8 acres already either partially or fully developed. This leaves 19 acres within the Town limits vacant and usable for future development. In regard to the IUGA, 6.2 acres are designated for commercial activity; however, 4.4 acres are already developed.

The Town has a relatively small industrial sector within its corporate limits, which includes a hydroelectric plant, a gravel plant, and a shingle mill. The gravel plant and the shingle mill, however, are not connected to the Town's collection system. According to Town staff, it is anticipated that the gravel plant will close in the near future. The hydroelectric plant is owned and operated by Puget Sound Energy (PSE) and currently discharges domestic wastewater only from their office and maintenance shop to the Town's WWTP. In the future, additional PSE building units will discharge domestic wastewater to the treatment plant. Therefore, no industrial entities discharge process wastewater to the Town's WWTP.

Currently, 13.3 acres are zoned for industrial activity within the corporate limits and four acres are presently being utilized by Puget Sound Energy. Thus, approximately 9 acres are vacant for future development within the Town limits. With respect to the IUGA, the Comprehensive Plan has designated 69.1 acres for industrial development. However, 41.4 acres are already developed. The *Comprehensive Plan* indicates that the 41.4 developed acres belongs to a logging company that is under utilizing the property. The *Comprehensive Plan* recommends the consolidation of industrial land into one (1) sixty-nine acre section located adjacent to Highway 20.

POPULATIONS

Past Population

The population growth rate within Skagit County has increased significantly over the last several years. According to the Office of Financial Management (OFM) statistics, Skagit County grew by 16.7 % between 1990 and 1996. Population growth rate data for Skagit County, and the cities and towns within Skagit County for the period 1990-1996 is presented in Table 2-4.

TABLE 2-4

Skagit County Annual Population Trends

Jurisdiction	1990	1991	1992	1993	1994	1995	1996
Anacortes	11,451	11,700	12,110	12,260	12,510	12,820	13,140
Burlington	4,349	4,760	4,690	4,690	5,170	5,385	5,445
Concrete	**735**	**735**	**730**	**730**	**740**	**740**	**765**
Hamilton	228	228	230	234	240	250	248
La Conner	686	720	690	713	720	737	780
Lyman	275	290	290	290	290	312	320
Mount Vernon	17,647	18,720	19,550	20,450	20,950	21,580	21,820
Sedro-Woolley	6,333	6,496	6,710	6,920	7,120	7,340	7,540
Unincorporated Area	37,841	39,139	40,490	42,212	43,260	43,936	45,442
Skagit County TOTAL	79,545	82,790	85,490	88,500	91,000	93,100	95,500

Source: *Office of Financial Management, April 1996*

According to the *Skagit County Comprehensive Plan*, the County has experienced population growth as a result of absorbing urban spillover from the Seattle/Everett metropolitan areas and its rural atmosphere is conducive to the recent rural rebound trend. Population growth within Skagit County has also been attributed to its convenient location on the I-5 corridor and its natural beauty, including its gateway location to the San Juan Islands and the Cascade National Park system.

For the period 1990-1996, the population of Concrete has remained relatively constant with an average growth rate of approximately 0.7% per year. This growth rate represents the lowest growth rate of the municipal entities listed in Table 2-4. However, Concrete's growth rate has increased over the last several years, reaching 3.3 percent annually from 1995 to 1996.

The 1990 Census revealed that 735 people in the Concrete vicinity were housed in 276 dwelling units, for an average household size of 2.7 persons. The *Comprehensive Plan* notes that the average households per acre is 2.4. The 1998 population within Concrete's corporate limits was approximately 785 people.

Population Projections

Population projections for Skagit County, and the cities and towns within Skagit County for the period 1995-2015 are presented in Table 2-5. It should be noted that the projected estimates contained in Table 2-5 include the corporate limit population as well as the interim urban growth area populations. As indicated in Table 2-4, the 1995 population within the corporate limits was 740. However, the population for Concrete in the year 1995, as indicated in Table 2-5, was 846. This higher population count includes the population within the IUGA (immediately west of Concrete known as Grassmere) in addition to the population within the Town limits.

TABLE 2-5

Skagit County Urban/Rural Population, Projections, and Distribution

City/IUGA	1995	2000	2005	2010	2015
Anacortes	12,960	14,130	15,350	16,570	18,440
Burlington Co.	2,000	2,355	2,710	3,065	3,420
Big Lake	1,000	1,300	1,625	1,950	2,400
Burlington	6,995	7,380	7,750	8,120	8,675
Concrete	**846**	**925**	**1,015**	**1,107**	**1,216**
Hamilton	282	297	312	326	347
La Conner	739	772	807	845	892
Lyman	312	320	334	348	370
Mount Vernon	23,416	28,531	33,463	38,396	43,559
Sedro-Woolley	8,340	9,135	10,007	10,829	12,030
Swinomish	1,500	1,805	2,110	2,415	2,722
Incorporated & UGA	58,426	66,986	75,519	84,007	94,107
County Unincorporated (Non-UGA)	36,674	36,849	39,116	41,503	43,593
County Total	95,100	103,475	114,635	125,510	137,700

Source: Town of Concrete *Comprehensive Plan, May 1998.*

Residential Population

For future residential populations, the *Comprehensive Plan* assumes that future development will occur at approximately the same density that has historically taken place: an average build-out of four units per acre and with an average household size of 2.7 persons.

According to the Town's *Comprehensive Plan*, vacant residentially zoned land within the current corporate limits is available to accommodate an estimated 470 people while 351 people within the unincorporated IUGA can be accommodated. According to the Town's *Comprehensive Plan*, the ability to accommodate an additional 821 residents represents 451 more people than the OFM/county projections of 370 additional people for the year 2015.

Since the planning period for the Comprehensive Sewer and Wastewater Facility Plan ends in the year 2020 and the county projections for Concrete forecast only up to the year 2015, a population estimate for the year 2020 must be made. The OFM/county projections reflect about a 2% annual average growth rate for the years 1995-2015. Using this percentage growth rate (2%), the population for Concrete (town limits plus IUGA) is estimated to be 1,343 people in the year 2020.

Commercial Population

As described above, 19 acres are vacant and usable within the Town limits and 1.8 acres are vacant and usable within the IUGA for future commercial development.

Public School Population

The wastewater contribution from a school system must be included in flow projections if a significant fraction of the student and faculty population commute from outside the sewer service area. The Town of Concrete has an elementary school, a junior high school, and a high school. According to Town personnel, the high school has rest room, shower, and kitchen facilities and the junior high school has rest room facilities only. The elementary school has rest room facilities and a mini-cafeteria. However, food for the elementary school population is prepared at the high school. The estimated 1998-1999 enrollment for the elementary, junior high school, and high school was 419 students, 152 students and 282 students, respectively. There was a combined 100 teachers and support staff employed at the three schools. Therefore, the combined 1998-1999 student and staff population located in Concrete is 977 people.

The Concrete schools include student and staff populations that live within and outside of the Town limits. The Concrete School District provides transportation services for approximately 76 percent of the student population. About 50 percent of student and support staff commute from outside the Town limits (radius greater than 5 miles); multiplying 977 people x 50% commuters yields 489 people from outside the Town limits attending the Concrete schools. A review of Concrete School District records indicates that the student population of the Concrete School District has increased at 0.2 percent for the period 1991-1999. Assuming that the ratio of support staff to students is maintained at approximately 10%, 509 people will be attending Concrete schools from outside the Town limits by year 2020.

Industrial Population

As discussed in the industrial section above, approximately 9 acres are vacant for future industrial development within the Town limits. Assuming that the recommendation in the Comprehensive Plan is acted upon, a one 69.1 acre tract will be used for industrial development within the IUGA. The *Comprehensive Plan*, however, did not report the number of employees per acre that the industrial zoned land can support. Assuming 2 employees per industrial acre, yields 158 additional employees that will contribute to the domestic sewer system. In a letter dated September 30, 1998, from Leonard, Boudinot, & Skodje, Inc., (Appendix A), future peak domestic flows from Puget Sound Energy are estimated to be 1,695 gallons per day.

ENVIRONMENTAL FACTORS

Environmental factors play a critical role in the operation and maintenance of wastewater collection, treatment and disposal systems. The discussion presented below is intended to address key environmental issues including climate (temperature, precipitation, evaporation), geography (topography, soils) and water resources (surface and groundwater) that impact the Town's wastewater facilities.

Climate

Climate has a significant effect on the operation of collection and treatment systems as briefly discussed below. Climatic information is quantified in the following discussion (as opposed to speaking of it in broad qualitative terms), to allow an accurate engineering evaluation of the Town's existing and future wastewater facilities in later chapters of this Plan.

Heavy precipitation will impact collection systems by causing increased infiltration and inflow. Precipitation will also impact lagoon treatment system by increasing the

hydraulic loading to the plant and using up capacity in the treatment plant and outfall (see Chapter 4). Precipitation is an important factor in assessing water reuse alternatives that use irrigation or groundwater recharge.

Temperature affects the operation of biological wastewater treatment systems such as the existing lagoon facility operated by the Town as well as other biological treatment systems that will be included in the evaluation of potential future treatment alternatives (see Chapter 6). Temperature is also a factor in evaluating wastewater reuse alternatives.

Evaporation affects the hydraulic balance of large water bodies such as the Town's lagoon. Evapotranspiration rates are a factor in evaluating wastewater reuse options that include irrigation (see Chapter 6)

Concrete has a climate typical of western Washington communities with mild, cool summers, and cold, wet winters. Table 2-6 lists monthly temperature data and the number of temperature days below freezing for each month during the period 1988 - 1998. The ten-year average annual temperature is 50.7° F, and the average frost-free season is about 317 days. The ten-year average temperatures for January and July are 37.7° F and 64.0° F, respectively. The historical minimum and maximum monthly average temperatures are 31.1° F and 66.6° F, respectively. Table 2-7 lists the total monthly precipitation in the Town of Concrete for the period 1988 - 1998. The ten-year average annual rainfall is 73.02 inches. On average, November represents the wettest month of the year, averaging 13.32 inches. In addition to temperature and precipitation data, estimated pan evaporation and evapotranspiration rates are included in Table 2-8.

TABLE 2-6

1988-1998 Temperature History[1]
Town of Concrete

Year	Monthly Average Temperature (°F)												Annual
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Average
1988	37.7	40.9	43.6	48.8	54.5	58.1	63.0	63.9	59.0	54.7	43.0	39.6	50.6
1989	37.4	33.2	40.7	51.5	53.4	61.5	62.4	62.8	62.0	51.2	44.4	40.4	50.1
1990	39.1	35.3	44.5	51.6	54.3	58.8	66.6	66.6	62.5	48.8	43.9	31.1	50.3
1991	34.9	43.9	42.1	48.4	53.2	57.3	64.0	64.9	61.5	52.4	44.2	40.8	50.6
1992	40.5	45.4	50.2	51.5	58.1	63.0	64.2	65.4	57.8	52.9	43.9	35.2	52.3
1993	31.8	39.8	45.4	49.0	59.5	58.3	60.8	64.2	60.8	55.3	39.8	39.0	50.3
1994	42.6	37.3	46.8	52.2	56.4	58.2	65.4	65.3	62.6	51.1	38.4	37.5	51.2
1995	39.2	41.8	44.8	49.4	57.5	61.1	*65.6*	60.2	63.9	50.2	45.5	39.5	51.6
1996	36.5	41.0	44.3	50.4	50.8	58.6	65.0	64.8	57.4	50.1	41.2	34.0	49.5
1997	36.9	40.4	42.1	48.9	56.9	58.2	62.8	*66.5*	62.0	50.6	47.1	39.7	51.0
1998	37.7	42.8	45.6	49.6	55.6	60.7	67.0	65.7					
10-year Average	**37.7**	**39.9**	**44.5**	**50.2**	**55.5**	**59.3**	**64.0**	**64.5**	**61.0**	**51.7**	**43.1**	**37.7**	**50.7**

Year	Number of Days 32°F or Below												Annual
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
1988	13	6	3	1	0	0	0	0	0	0	0	12	35
1989	12	20	6	0	0	0	0	0	0	0	0	11	49
1990	12	18	11	0	0	0	0	0	0	0	0	20	61
1991	20	1	9	2	0	0	0	0	0	4	2	5	43
1992	7	2	3	0	0	0	0	0	0	2	4	17	35
1993	22	15	6	0	0	0	0	0	0	0	9	17	69
1994	4	14	3	0	0	0	0	0	0	0	9	10	40
1995	12	9	8	2	0	0	0	0	0	3	4	11	49
1996	16	12	8	0	0	0	0	0	0	0	6	18	60
1997	13	13	2	1	0	0	0	0	0	0	0	5	34
1998	10	2	5	0	0	0	0	0					
10-year Average	**13**	**11**	**6**	**1**	**0**	**0**	**0**	**0**	**0**	**1**	**3**	**13**	**48**

Note: An italicized number denotes an estimated value.

[1] *Washington Climatological Data*, Annual Summaries, V. 92-102, National Oceanic and Atmospheric Administration (NOAA), 1988-98

TABLE 2-7

Precipitation History (1988-1998)
Town of Concrete [1]

Year	Total Monthly Precipitation (inches)												Annual Total
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
1988	6.12	5.05	10.42	7.15	4.23	1.68	2.03	0.40	5.11	6.14	13.55	5.92	67.80
1989	10.43	3.64	7.87	3.91	4.50	1.90	0.81	3.49	0.33	6.14	19.15	7.10	69.27
1990	12.98	11.06	6.00	3.36	2.12	5.25	0.63	3.51	0.75	14.08	22.08	11.30	93.12
1991	9.65	9.64	5.77	7.40	3.52	3.06	0.68	2.71	0.61	2.22	13.40	8.56	67.22
1992	11.97	5.32	0.96	6.89	1.84	3.68	1.90	2.04	4.61	2.99	11.63	8.61	62.44
1993	5.79	0.33	5.87	4.93	4.63	5.27	2.95	0.87	0.86	4.92	4.14	11.24	51.80
1994	7.32	8.54	5.57	3.77	1.89	3.40	0.87	0.29	2.78	8.54	12.51	13.57	69.05
1995	8.06	8.19	7.26	3.44	1.51	1.79	2.17	2.83	1.16	10.50	17.95	10.21	75.07
1996	9.73	10.51	3.01	8.70	7.30	0.51	0.98	1.67	3.66	10.12	12.27	15.93	84.39
1997	15.06	7.79	13.47	6.18	4.33	5.75	3.45	1.25	6.29	9.65	6.55	10.28	90.05
1998	10.29	5.37	6.11	2.84	2.56	1.07	0.77	0.22					
10-year Average	**9.71**	**7.01**	**6.62**	**5.57**	**3.59**	**3.23**	**1.65**	**1.91**	**2.62**	**7.53**	**13.32**	**10.27**	**73.02**
10-year Maximum	**15.06**	**11.06**	**13.47**	**8.70**	**7.30**	**5.75**	**3.45**	**3.51**	**6.29**	**14.08**	**22.08**	**15.93**	**93.12**
10-year Minimum	**5.79**	**0.33**	**0.96**	**3.36**	**1.51**	**0.51**	**0.63**	**0.29**	**0.33**	**2.22**	**4.14**	**5.92**	**51.80**

Note: An italicized number denotes an estimated value.
[1] *Washington Climatological Data*, Annual Summaries, V. 92-102, National Oceanic and Atmospheric Administration (NOAA), 1988-98

TABLE 2-8

Estimated Pan Evaporation and Evapotranspiration Rates
Town of Concrete

	Month												Total
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Pan Evaporation (in/mo)[1]	0.2	0.9	1.9	2.9	3.3	5.8	6.9	5.5	3.8	1.8	0.5	0.1	33.6
Evapotranspiration (in/mo)[1]	0.2	0.7	1.4	2.2	2.5	4.4	5.2	4.2	2.9	1.4	0.4	0.1	25.4
10-year Average Precipitation (in/mo)[2]	9.71	7.01	6.62	5.57	3.59	3.23	1.65	1.91	2.62	7.53	13.32	10.27	73.03
Net Irrigation Requirement					0.63	2.72	4.11	2.75	0.90				11.12

1. Based on State of Washington Irrigation Guide (WA210-VI-WAIG, Oct. 1985) data for Sedro Woolley (Pasture).
2. Washington Climatological Data, Annual Summaries, V. 92-101, National Oceanic and Atmospheric Administration (NOAA), 1988-97.

Geography

As previously indicated, the Town of Concrete is located in the eastern portion of Skagit County, approximately 30 miles east of Interstate 5. The Town of Concrete is located in the northwestern part of Washington and on the western slope of the Cascade Mountain range.

Topography

Concrete is located in the Skagit River valley; bounded by mountains to the north, and south of the Town. The land generally slopes from the north portion of Town to the south, towards the Skagit River. Hill slopes immediately to the north of Town average between 40% to 60% gradient and consist of unconsolidated sand, gravel and clay. The Baker River runs through the eastern edge of the downtown portion of the Town. The elevation of Concrete ranges from 160 feet mean sea level (MSL) near the Skagit River to 600 feet MSL at the northern boundary of the Town limits. A topographic map of the Town of Concrete is provided in Figure 2-3.

Geology

The information contained in this section is excerpted from the *Wellhead Protection Study* (Geoengineers, May 1994). The complex geologic conditions in the Skagit and Baker River valleys are the result of volcanism, interglacial erosion, glacial scour, deposition of glacial and non-glacial sediments, and post-glacial deposition and erosion. The Fraser Glaciation is the most recent continental glaciation of Skagit County. Erosion and deposition during and following the Fraser Glaciation have resulted in the modern topography of the Skagit and Baker River valleys. Approximately 15,000 years ago, glacial ice was likely more than 1,000 feet thick in the vicinity of the Town.

The mountains that form the valley walls northeast, northwest and south of the Town consist of a complex assemblage of volcanic, metamorphic, igneous and sedimentary rocks. The upland plateau area located north of the Town and west of Lake Shannon is comprised of a substantial thickness of fluvial, glacial and lacustrine sediments overlying bedrock.

Surface Water

The major water body within the planning area is the Skagit River which forms part of the Town's southern corporate limits. The Baker River, a tributary to the Skagit River, flows southerly throughout the eastern portion of Concrete and is a regulated river as the Baker dam is located upstream. The 100-year flood elevation of the Baker River is about

190 feet MSL. A 100-year flood map for the vicinity of Concrete is located in Appendix B. Shannon Lake located north of Town has the Baker dam at its outlet. In addition to the Skagit and Baker rivers, there are a number of small streams that drain from the steep slopes located to the north of Concrete. The most significant stream in Town is Lorentzen Creek which runs southerly from the hills north of Town (near Limestone Avenue & Seidel Street) to Highway 20, and then runs west for a distance for approximately a mile and a half. Lorentzen Creek flows underground through portions of the Town through a series of culverts and does not appear to have an influence on ground water near the treatment plant, as it is located approximately 3,200 feet away.

In regard to environmental concerns, the upper Skagit River is not listed as a 303(d) waterbody, as of May 29, 1996. According to Ecology, the Baker River Sockeye was proposed for an Endangered Species Act (ESA) listing, but was determined to not be warranted for the listing, as of March 16, 1999 (telephone conversation with G. Shervey, March 23, 1999). However, the Chinook Salmon is listed as an endangered species for the entire Puget Sound area. According to Ecology, this would apply to the Baker River and the Town's outfall (telephone conversation with G. Shervey, March 23, 1999).

Soils

According to the *Soil Survey of Skagit County Area, Washington* (National Resource Conservation Service, formerly the Soil Conservation Service, September 1989), soils in Concrete can be generally classified as either 1) soils on flood plains, low terraces, and deltas or 2) soils on uplands and mountains. For the first category, the soils in the vicinity of Concrete can be described as the Larush-Pilchuck type (very deep, well drained and excessively drained, level to gently sloping soils; on flood plains and low terraces). For the second category, the soils in the vicinity of Concrete can be described as the Barneston-Dystric Xerorthents-Indianola type (very deep, somewhat excessively drained and excessively drained, level to very steep slopes; on terraces and terrace escarpments).

A review of the detailed soil map from the *Soil Survey of Skagit County Area, Washington* (Figure 2-4) indicates that the main specific soil type in the vicinity of Concrete's wastewater treatment plant is the Pilchuck loamy sand. This soil classification is described as very deep, excessively drained soil on floodplains. The permeabilities of the Pilchuck loamy sand at depths of 0-43 inches and 43-60 inches are rapid at 6.0-20.0 inches/hour and greater than 20.0 inches/hour, respectively. In regard to sewage lagoon areas, the *Soil Survey of Skagit County Area, Washington,* indicates that the Pilchuck loamy sand has severe restrictions due to seepage, flooding, and wetness characteristics.

As described earlier in this chapter, the Grassmere area is currently located outside the Town limits but within the IUGA. Residential and commercial establishments in this area rely on septic tanks and drainfields for the disposal of their wastewater. The predominate soil type in the Grassmere area is the Indianola sandy loam. This type of soil is somewhat excessively drained with rapid permeabilities and available water capacity is moderate to moderately high. Indianola sandy loam exhibits slow runoff characteristics and the hazard of water erosion is slight. In regard to septic tank absorption fields, the *Soil Survey of Skagit County Area, Washington* indicates that the Indianola sandy loam has severe restrictions due to the soil's poor filter capabilities.

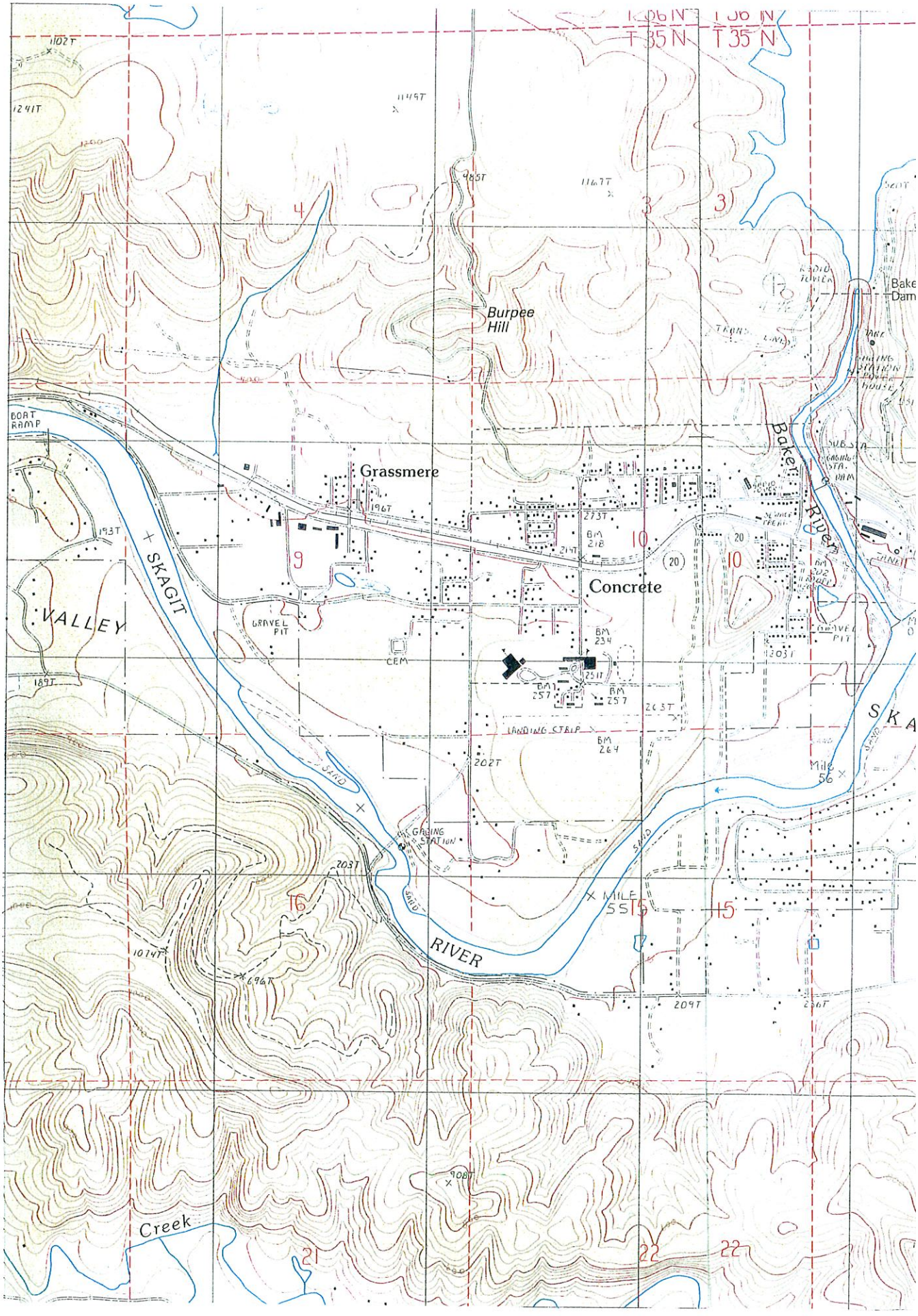
Groundwater

Background

According to the *Wellhead Protection Study* (Geoengineers, May 1994), at least two aquifers are present in the vicinity of the Town of Concrete: 1) an unconfined aquifer located in the advance outwash, and 2) a shallow unconfined aquifer located in the recent fluvial deposits near the Skagit River. The Town of Concrete's spring collection systems appear to be completed in the unconfined aquifer located in the advance sand and gravel outwash. This aquifer is situated beneath a roughly triangular-shaped upland plateau area located north of the Town.

Groundwater Quality

Based on telephone conversations with the Skagit County Department of Health (Ken Willis, March 11, 1999), available records do not indicate that there is widespread groundwater contamination (fecal coliform, nitrates, metals, etc.) within Concrete's IUGA. For example discussions with Mr. Willis as well as Ms. Lorna Parent, indicate that Albert's Red Apple Market has a small "unapproved" private well located underneath their building and there is a concern on the part of the Health Department that this well is at risk of contamination from nearby septic tanks .



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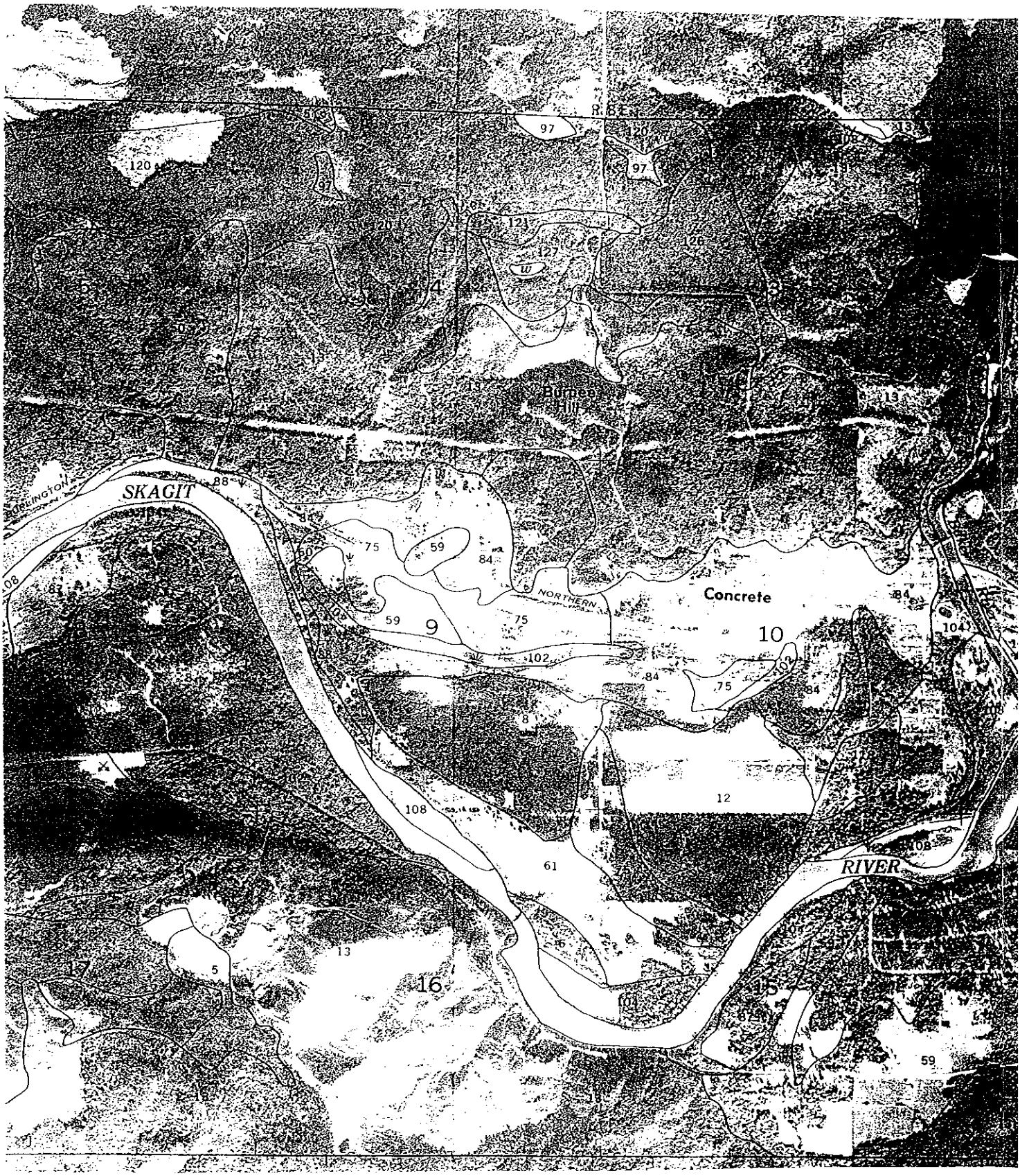
SOIL SURVEY OF SKAGIT COUNTY AREA, WASHINGTON - SHEET NUMBER 25



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WATER SUPPLY

General

The Town of Concrete prepared a *Water System Plan* in 1994. The Town's water system map is presented in Figure 2-5. The following is a summary of the information contained in that report.

The Town's water supply source comes from a well known as the Grassmere well. This well is located approximately 100 feet inside Burpee Hill and is capable of yielding approximately 400 gallons per minute. From the covered intake structure, the water enters a concrete sump box where it is then conveyed by a pipeline to the distribution area.

Water Rights

Water Rights information is not included in the Town's *Water System Plan*. According to the Department of Ecology (Peggy Williams, July 12, 1999) the Town's water rights are provided under a water right certificate issued to Superior Portland Cement (Certificate No. 00071D). The water right certificate is 750 gpm instantaneous withdrawal, 1,119 acre-ft/year (translates to approximately 1 MGD average). However, Department of Ecology requires that water rights be "perfected" in order for the Town to have a legal right to use.

Storage

Current water storage is provided by a 40-year old 100,000 gallon wood tank and is located just north of the Town's maintenance shop. The Town plans to continue using this tank for water storage. The Water System Plan reported that construction of additional storage capacity of 320,000 gallons is required and should be constructed as soon as possible. In March 1999, the Town constructed a new 200,000 gallon tank near Seidel Street and plans to construct another 200,000 gallon capacity tank near the source in early Summer 1999.

Distribution

The distribution system is comprised of several different pipe materials including steel, wood stave, polyvinyl chloride (PVC), and miscellaneous pipe materials. According to the Comprehensive Plan, the pipe sizes range from 1.25 inches to 10 inches in diameter. The largest diameter pipes in the system are PVC. According to the *Water System Plan*,

the water lines consisting of wood stave pipe are subject to leakage. The *Water System Plan* also notes that some water lines are too restrictive for fireflow requirements.

Water Quality

The *Water System Plan* reported that the maximum contaminant levels (MCLs) for regulated drinking water parameters were not exceeded on the samples taken (reference Table 3-7 through 3-9 of *Water System Plan*). As part of the Town's Coliform Monitoring Plan, distribution system water quality samples are obtained monthly and analyzed for coliform bacteria. The monthly bacteriological analysis from 1986 to 1994 resulted in a "satisfactory" rating.

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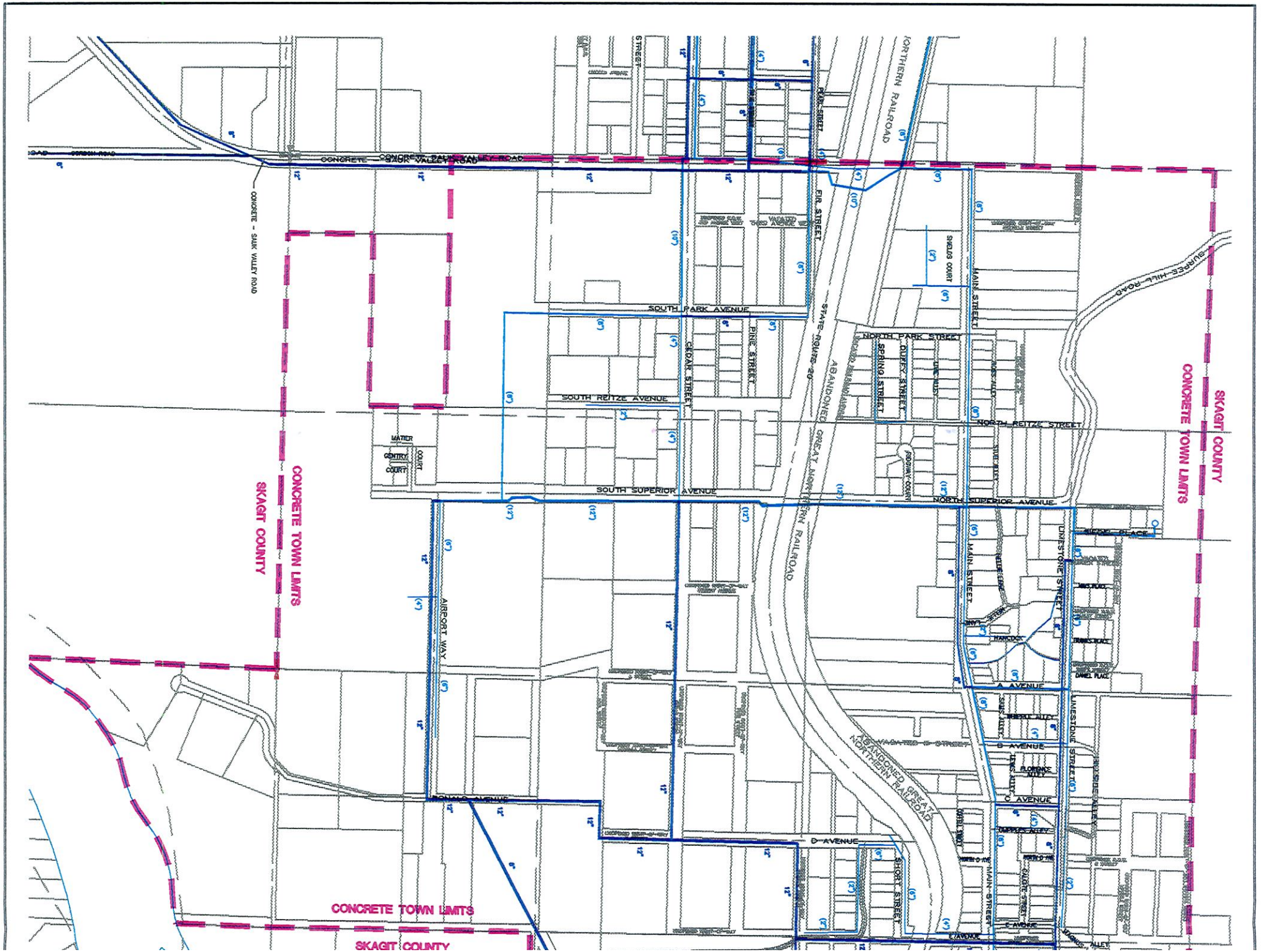


CHAPTER 3

REGULATORY REQUIREMENTS FOR WASTEWATER TREATMENT, DISPOSAL AND REUSE

BACKGROUND

The Town of Concrete operates a wastewater treatment facility that disposes treated effluent to the Baker River. The Town's wastewater facilities are subject to State and Federal laws governing the disposal of liquid and solid wastes generated from a municipal wastewater treatment process.

This chapter identifies and discusses current regulatory requirements that apply to the treatment, disposal and reuse of municipal wastewater. This Chapter also identifies and discusses the current status of the Town's existing National Pollutant Discharge Elimination System (NPDES) permit. Regulations governing disposal and beneficial use of municipal sewage sludge (biosolids) are discussed in the Sludge Removal Project Plan as contained in Appendix C.

Specific alternatives for treatment and discharge of wastewater are described and evaluated in Chapter 6 of this Plan. However, the treatment method and the level of treatment will be dictated to a large degree by the ultimate disposition of the wastewater and the regulations governing the method of disposition.

Three alternatives will be assessed for ultimate disposition of the Town's wastewater:

(1) Surface water disposal
(2) Land disposal (land treatment)
(3) Beneficial reuse (reclaimed water)

Issues to be addressed in the evaluation of these alternatives include environmental protection, public health protection and public acceptance which are briefly discussed below.

Environmental Impacts

The environmental aspects of any wastewater discharge are most easily discussed in terms of water quality. In the State of Washington, water quality is defined in both qualitative and quantitative terms. These terms are different for surface water and ground water. This distinction is critical to evaluating a wastewater discharge to surface water as compared to ground water. The basis for these differences is the intended use of the water in question.

Surface Water Quality Standards

In the State of Washington, WAC 173-201A establishes water quality standards for surface waters based on maintaining public health, recreational use and protection of fish, shellfish and wildlife. Surface water quality standards are broken into five groups: AA (extraordinary), A (excellent), B (good), C (fair) and Lake Class. Each class has its own characteristic use and measurable criteria.

Measurable parameters used to distinguish the different surface water classifications include fecal coliform levels, dissolved oxygen concentration, temperature, pH and turbidity. The surface water criteria also include twenty-nine toxic substances, including ammonia, residual chlorine, several heavy metals, polychlorinated biphenyls (PCBs) and common/persistent pesticides.

It is the policy of the State of Washington to maintain existing beneficial uses of surface water by preventing degradation of existing water quality. However, certain allowances are made by Ecology for discharging treated wastewater into a surface water which enables a temporary or mitigated degradation to occur. These allowances are made by establishing *mixing zones* and determining the *assimilative capacity* of the receiving water.

Mixing zones may be granted for a substance like ammonia because the water quality criteria may be too stringent for traditional wastewater treatment technology to meet the criteria on an end-of-pipe basis. Before a mixing zone is granted, the discharger is required to apply all known available and reasonable technology (AKART) prior to discharge. The definition of AKART is left to the regulatory authorities, however, regulatory trends in this state as well as throughout the United State indicate that the definition for AKART is slowly evolving to require higher levels of treatment.

Assimilative capacity is a term that describes a surface water's ability to accept waste loadings without a permanent degradation of water quality. The Department of Ecology (Ecology) is presently conducting waste load capacity studies, called total maximum daily load (TMDL) studies for several major watersheds in the State of Washington. Per a meeting between the Town and Ecology on December 7, 1998, there are currently no plans at this time for Ecology to conduct a Total Maximum Daily Load (TMDL) study for the upper Skagit River.

According to WAC 173-201A, the Baker River is classified as a Class AA fresh surface water. Table 3-1 shows water quality standards and characteristic beneficial uses of a Class AA freshwater stream.

TABLE 3-1

Class AA Surface Water Quality Standards (Freshwater)

Parameter	Standard
Fecal Coliform	$\leq$ 50 colonies/100 mL (geometric mean)
Dissolved Oxygen	$\geq$ 9.5 mg/L
Temperature	$\leq$ 16.0 °C
pH	6.5 to 8.5
Turbidity	shall not exceed 5 NTU over background
Toxics	Shall be below levels specified by WAC 173-201A-040
Beneficial Uses	Water Supply (Potable & Livestock) Fish and Shellfish Habitat Wildlife Habitat

Groundwater Quality Standards

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.)

Public Health Impacts

The public health impacts of a wastewater discharge, whether to a surface water or to land, will be primarily related to the risk for human contact with human-borne pathogens found in the discharge. These risks are mitigated by treatment, dilution in the environment and control of public access.

Municipal Wastewater Discharged to a Surface Water

For a surface water discharge, the risk of public contact with human-borne pathogens is mitigated by providing adequate disinfection of the wastewater prior to discharge as well as dilution in the receiving stream. A group of indicator organisms, fecal coliform, are used to provide a method of measuring the level of disinfection treatment provided. Table 3-1 shows maximum fecal coliform limits for a surface water discharge. The Town's current effluent limitation for fecal coliform bacteria on a monthly average and weekly average basis is 200/100 mL and 400/100 mL, respectively.

Municipal Wastewater Discharged to Land

The Washington Departments of Health (DOH) and Ecology have promulgated standards for water reclamation and reuse as well as separate design criteria for land treatment systems. These standards are intended to protect public health by minimizing the potential for contact with human-borne pathogens in *land applied* wastewater. Protection is provided by a combination of disinfection requirements, setback distances and site access controls. These requirements differ significantly based on the type of land treatment or water reuse system and are discussed later on in this Chapter.

Public Acceptance

Public acceptance is critical to any wastewater utility project. Issues relating to environmental protection, public health, land use and financing must be adequately addressed in the project development to gain public acceptance of the project. Wastewater projects have the potential to impact not only existing utility customers, but surrounding landowners and land users.

For a wastewater utility that discharges to a surface water, the downstream users of the surface water are potentially impacted. With land application of municipal wastewater,

adjacent landowners may be impacted. Under the State Environmental Policy Act (SEPA), it is necessary for a municipality proposing an action that has potential environmental impacts to consider the adverse environmental impacts of such action and evaluate alternatives for mitigation. Reviews of such proposed actions by the jurisdictional public agencies and the public itself are a requirement of the SEPA process.

REGULATORY REQUIREMENTS FOR SURFACE WATER DISPOSAL

For a surface water discharge to be permitted to state waters, it must be demonstrated that the discharge will not harm beneficial use of the receiving water. A National Pollutant Discharge Elimination System (NPDES) NPDES permit is required to discharge to surface water. Minimum NPDES limits (termed "technology-based limits") are established by WAC 173-221 and are shown in Table 3-2.

TABLE 3-2

Minimum Effluent Standards for a Surface Water Discharge (Technology Based Limits)

Parameter	Standard Limit (monthly average)	Alternative Standard For Waste Stabilization Ponds < 2 MGD (monthly average)
BOD_5	30 mg/L / 85% removal	45 mg/L / 65% removal
TSS	30 mg/L / 85% removal	45 mg/L / 65% removal
Fecal Coliform	200 per 100 mL	

WAC 173-221 specifically allows relaxed TSS limitations for waste stabilization ponds with capacities less than two million gallons per day. Specifically, WAC 173-221-050 (2) (b) allows discharge standards for TSS to be adjusted by Ecology to "concentrations achievable with waste stabilization pond". The Town's current permit limitation for total suspended solids (TSS) is 75 mg/L daily average and 110 mg/L weekly maximum. The Town's facility is rated at 0.1 MGD, and thus qualifies for the relaxed limitation. In a letter dated December 14, 1998 (Appendix D), Ecology stated that the current TSS effluent limitation will remain in effect, as long as the existing lagoon treatment system treats flow less than 2 MGD.

Under WAC 173-201A-060, State Water Quality Standards, Ecology is authorized to condition NPDES permits so that the discharge meets water quality standards. Ecology has determined that two toxic pollutants present in the Town's treated effluent pose a reasonable potential for exceeding water quality criteria: ammonia and chlorine. Accordingly, the Town's new NPDES permit will likely contain chlorine effluent limits as well as a requirement for ammonia monitoring (G. Shervey, 3/23/99). These potential limits are discussed in more detail at the end of this Chapter.

Endangered Species Act

The Endangered Species Act (ESA) is having an increased impact on activities that release pollutants to fish bearing waters, including municipal wastewater treatment plants. This increased impact has resulted from listing a number of native salmon species as threatened or endangered, triggering possible actions for protecting the streams inhabited by these species. Biological assessments are now required for any activity that uses federal funds and may contribute to the release of pollutants to the habitat of protected species. These assessments are required to determine that the survival and restoration of threatened and endangered species is not impeded by the activity receiving federal dollars. As discussed in Chapter 2, Chinook salmon are an endangered species native to the Baker and Skagit Rivers. The presence of Chinook salmon in the Baker River is expected to trigger the need for a biological assessment if any changes to the Town's outfall are included as part of the wastewater improvement project. *(Note: It is uncertain at this time if a biological assessment will be required if the outfall is not moved, but the treatment plant capacity is increased to allow a greater pollutant loading into the river. This issue will be dealt with during the preparation of the SEPA checklist.)*

REGULATORY REQUIREMENTS FOR LAND DISPOSAL (LAND TREATMENT)

Design Criteria for Municipal Wastewater Land Treatment Systems

The *Design Criteria for Municipal Wastewater Land Treatment Systems* (February 1994) apply to municipal land application projects that do not fall under the definition of a direct beneficial reuse. A land treatment system differs from a system that land applies reclaimed water in that additional treatment is required to occur in the soil/vegetation layer. Land treatment system must meet the criteria described below.

(1) Treatment that is equal to or better than that of a waste stabilization pond as defined in WAC 173-221 (see Table 3- 2);
(2) Provide quiescent settling storage for at least seven days;
(3) Provide disinfection such that no more than 200 fecal coliform per 100 mL are present in any effluent sample taken from weekly sampling;
(or)
Provide minimum setback distances from drinking water wells and public contact areas (see Table 3-3).

The land application area itself is subject to certain operational constraints, including setback distances shown in Table 3- 3. A critical requirement for the land application site is that it be under ownership of the operating municipality or controlled through long term agreements which have been approved by the regulatory agencies.

TABLE 3-3

Waste Stabilization Pond Requirements for Facilities with Land Treatment Systems

PARAMETER	LIMIT	
	30-day avg.	7-day avg.
BOD_5	45 mg/L	65 mg/L
TSS	45 mg/L[a]	65 mg/L[a]
BOD_5 Removal	65% minimum	

a The discharge standard for TSS may be adjusted with the approval of Ecology when it can be demonstrated that these levels cannot be achieved.

A land treatment system must be operated in such a way that the soil/vegetation system will provide adequate treatment to prevent the degradation of groundwater. The nitrogen content of municipal wastewater and the seasonal variations in treatment make agronomic application the most prudent method of managing a land application system. Additionally, Ecology's implementation guidance for the state groundwater quality standards (April 1996), requires groundwater monitoring for wastewater land application systems.

Accordingly, in order to reliably comply with current Ecology criteria, a land treatment system must provide the following:

- Sufficient land to allow application at the rate of crop water uptake
- Sufficient land for storage lagoons and buffers
- Sufficient storage volume during the non-growing season
- Treatment prior to land application meeting standards shown in Table 3-3
- A groundwater monitoring system

TABLE 3-4

Minimum Setback Distances for Facilities With Land Treatment Systems[a,b,c,d]

Type of Facility	Setback distance
Facilities Meeting Disinfection Requirement of < 200 fecal coliform/100 mL	
• Property Lines, Local Access Roads	100 feet
Restricted Access Roads, Highways	
• Any Residence, Domestic Well	500 feet
• Any Residential Area, School, Playground	1000 feet
Facilities NOT Meeting the Disinfection Requirement[e]	
• Property Lines, Local Access Roads, Restricted Access Roads	650 feet
• Site Access Controls (by ownership or easement)	1000 feet
• Any Residence, Domestic Well, County Road	1000 feet
• Any Residential Area, School, Playground	1000 feet
Secondary Highway, Freeway,	
Main Access Road	

a Setbacks based on spray irrigation are measured from the edge of the irrigated area

b Setbacks for surface irrigation systems are 100 ft and drip irrigation systems are 10 feet from the edge of the application point

c Setbacks are based on public health studies, other state regulations and minimizing exposure to aerosols from inadequately treated wastewater

d The DOE Guidelines for Preparation of Engineering Reports for Industrial Wastewater Land Application Systems recommends a 50 ft buffer zone between the land application site and any surface water drainage and wetlands

e Setbacks may be reduced by mitigation measures approved by reviewing agencies

REGULATORY REQUIREMENTS FOR WATER RECLAMATION AND REUSE

Water reuse 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.

Treatment Standards

The State of Washington's standards for municipal wastewater reuse, Table 3-5, have four classifications based on the type of treatment provided.

Permitted Uses of Reclaimed Municipal Wastewater

Allowable water reuse methods are presented in Table 3-6. 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 are provided below.

Groundwater Recharge

Groundwater recharge using reclaimed water is permitted under the WRR standards. Three categories of groundwater recharge are covered in the WRR 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 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.

TABLE 3-5

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	240/100l
B	YES	NO	NO	≤2.2/100m1	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.

TABLE 3-6

Allowable Uses of Reclaimed Water

Use	Class of Reclaimed Water Required			
	Class A	Class B	Class C	Class D
Irrigation of Non-Food Crops				
Trees and fodder, fiber, and seed 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

Additionally, for direct injection to a drinking water aquifer, pre-injection treatment must include the following:

(1) reverse osmosis treatment
(2) turbidity $\leq$ 0.1 NTU (average) and $\leq$ 0.5 (maximum)
(3) total organic carbon levels $\leq$ 1.0 mg/L
(4) total nitrogen $\leq$ 10 mg/L as N

Direct injection of reclaimed water to a non-drinking water aquifer must be Class A reclaimed water treatment standards as well as the following additional criteria:

(1) BOD5 $\leq$ 5 mg/L
(2) TSS $\leq$ 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".

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 WRR 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, the criteria will require a Class A reclaimed water. Essentially, this means that for a water reclamation project to have any degree of flexibility as well as a potential for relatively unrestricted use, the reclaimed water should meet the Class A reuse standard.

The use of reclaimed water for agricultural purposes is allowed under the WRR 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 WRR standards establish criteria for siting and identifying water reclamation projects and their facilities. Water reclamation storage facilities, valves and piping must be clearly labeled and no cross connections between potable water and reclaimed water lines is allowed. A key area requirement for a water reclamation project is setback distance. Table 3-7 summarizes setback requirements for water reclamation facilities.

Operational and Reliability Requirements

Under the reuse standards there 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.
- 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 3-7

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 Town of Concrete does not presently discharge treated municipal wastewater to land. Should the Town elect to discharge treated effluent to land in the future (including reclaimed water) the Town would be required to obtain a State Waste Discharge Permit.

NPDES PERMIT

The Town of Concrete has a NPDES discharge permit (WA-002085-1) to discharge treated effluent to the Baker River. The Town's NPDES permit was issued on February

25, 1983, and expired on February 25, 1988 (Appendix E). Effluent limits in the Town's NPDES current permit are shown in Table 3-8. According to Ecology, a new permit will likely be issued in 1999 (telephone conversation with G. Shervey, 3/23/99).

TABLE 3-8

Current NPDES Permit Limits
Town of Concrete

Parameter	Monthly Average Limit	Weekly Average Limit
5-Day BOD	30 mg/L / 85 % removal 25 lb/day	45 mg/L 38 lb/day
Suspended Solids	75 mg/L 63 lb/day	110 mg/L 92 lb/day
Fecal Coliform	200/100 mL	400/100 mL
	Daily Limit	
Residual Chlorine	Chlorine content in excess of that needed to achieve effluent fecal coliform limits shall be avoided	
pH	Shall not be outside the range 6.0 to 9.0	

Mixing Zone Analysis

Ecology has performed a mixing zone analysis to determine whether water quality based effluent limits will be included in the new NPDES permit. A copy of the mixing zone analysis is found in Appendix F. Table 3-9 summarizes Ecology's preliminary mixing zone analysis.

The mixing zone analysis was performed to gain an understanding of the mixing characteristics of the effluent in the river for several potential outfall configurations which are briefly described below.

Case 1 - Use existing outfall with only 33 percent of river flowing over outfall at "critical" flow conditions

Case 2 - Extend outfall into main channel of river, use 10-ft diffuser with six alternating 2-inch ports

Case 3 - Extend outfall into main channel of river, use single 4-inch nozzle

The key issue in obtaining a mixing zone is the amount of dilution that can be reliably achieved as the effluent is discharged into the river. Dilution is measured in terms of a dilution factor (DF) which can be mathematically described as shown in equation 3-1.

$$DF = (nQ_R + Q_E)/ Q_E = 1 + (nQ_R/ Q_E) \qquad \text{Equation 3-1}$$

where

DF = dilution factor
Q_R = river flow at "critical" conditions
Q_E = effluent flow from treatment plant
n = percentage of river flow available for dilution ÷100

Equation 3-2 shows the relationship between the DF and the water quality based effluent limits shown in the last two columns of Table 3-9.

$$C_X = [C_W - C_R(DF - 1)] / DF \qquad \text{Equation 3-2}$$

where

C_X = concentration of pollutant "x" at edge of mixing zone boundary
C_W= concentration of pollutant in effluent
C_R = background concentration of pollutant in river

It is evident from Equation 3-2 that as the dilution factor increases, the concentration of pollutant "x" at the edge of the mixing zone decreases.

Table 3-9 shows dilution factors for both acute and chronic toxicity.

TABLE 3-9

Department of Ecology Mixing Zone Analysis Summary
Town of Concrete

Parameter	Acute Dilution Factor[e]	Chronic Dilution Factor[f]	Ambient Conc'n	Water Quality Standard (Acute)[g]	Water Quality Standard (Chronic) h	Average Monthly Limit	Maximum Daily Limit
CASE 1[a]	24	38					
Ammonia			0.06	5.7 mg/L	1.29 mg/L	38 mg/L	77 mg/L
Chlorine				19.0 µg/L	11.0 µg/L	174 µg/L	456 µg/L
CASE 2[b]	31	70					
Ammonia			0.06	5.7 mg/L	1.29 mg/L	71 mg/L	142 mg/L
Chlorine				19.0 µg/L	11.0 µg/L	225 µg/L	589 µg/L
CASE 3[c]	16	83					
Ammonia				5.7 mg/L	1.29 mg/L	45 mg/L	90 mg/L
Chlorine				19.0 µg/L	11.0 µg/L	116 µg/L	304 µg/L
Minimum[d]							
Ammonia	11		0.06	5.7 mg/L	1.29 mg/L	31 mg/L	62 mg/L
Ammonia		30	0.06	5.7 mg/L	1.29 mg/L	30 mg/L	61 mg/L

a CASE 1 - Keep existing outfall location, move rocks upstream of outfall to prevent exposure during low river flow.
b CASE 2 - Move outfall 10 feet further into the river channel, keep existing diffuser configuration
c CASE 3 - Move outfall 10 feet further into river channel, with 4-inch nozzle
d Minimum dilution required to meet water quality standards
e Based on a maximum day flow of 120,000 gpd and river flow of 26 cfs for Case 1, 80 cfs for Cases 2 and 3
f Based on a monthly average flow of 80,000 gpd and river flow of 26 cfs for Case 1, 80 cfs for Cases 2 and 3
g,h The lower value in these two columns represents a "end-of-pipe" limit if the Town were not granted a mixing zone by Department of Ecology

Selection of the critical flows for the river and the effluent controls the magnitude of the dilution factors, thereby controlling to a large extent the pollutant concentration at the edge of the mixing zone.

In all three cases modeled, to calculate the acute DF Ecology selected 0.12 MGD for Q_{WWTF} and for the chronic DF Ecology selected Q_{WWTF} as 0.08 MGD. For acute toxicity, Q_{WWTF} is the maximum day flow observed during the "critical" flow period of August through October when flows in the Baker and Skagit Rivers are lowest; for chronic toxicity Q_{WWTF} is the average monthly flow during the same period.

The value for Q_{RIVER} is 80 cubic feet per second (cfs) for Cases 2 and 3, where the outfall is moved from its present location into the more active portion of the river channel. For Case 1, Ecology assumed that the outfall remains in its present location, but in order to provide continual flow through this portion of the river channel large boulders located upstream of the existing outfall would need to be moved.

The factor "n" is a function of the mixing zone geometry, hydraulic characteristics of the river and the outfall diffuser configuration. Ecology assumed dimensions for the acute and chronic mixing zones based on WAC 173-201A which allows the acute mixing zone to extend 30 feet downstream of the outfall and the chronic mixing zone 300 feet downstream of the outfall. River dimensions were assumed to be 150 feet wide with a velocity of 0.3 feet pr second and an average depth of 1.78 feet. Cases 1 and 2 assumed a multiport diffuser (10-ft diffuser with six alternating 2-inch ports) while Case 3 assumed a single nozzle diffuser. Using these assumptions Ecology utilized a standard computer dilution model to determine the factor "n".

The acute and chronic water quality standards are based on levels of ammonia and chlorine that are known to be toxic to fish. Ammonia standards vary with pH and temperature because the portion of ammonia that is in its un-ionized form (NH_3) will increase with pH and temperature. Un-ionized ammonia is far more toxic to fish than ionized ammonia (NH_4^+). Ecology selected "worst case" pH and temperature values typical for the Baker River during the August - October time period of 8.0 and 15 °C respectively.

The Town of Concrete has not monitored its effluent for ammonia and chlorine. However, effluent ammonia concentrations from a municipal wastewater treatment plant without nitrification such as that of the Town of Concrete can range from 20 - 40 mg/L. For a municipal treatment plant using chlorine disinfection agents without a dechlorination step following disinfection typically range from 0.5 to 1.0 mg/L.

Ecology's analysis indicates that with current plant flows and effluent quality, water quality standards will be violated for both ammonia and chlorine. As seen by Equations 3-1 and 3-2, as effluent flows increase, the DF value will decrease, causing further increases in the pollutant concentration at the edge of the mixing zone.

Accordingly, the plant will either require modifications to its treatment processes to achieve higher ammonia and chlorine removal and/or relocation of its outfall to provide greater dilution in the river. Because there is not sufficient flow in the river to meet water quality requirements for chlorine using dilution, it will be necessary to either replace the existing chlorine-based disinfection process with one that does not use chlorine or add a dechlorination step following disinfection.

Chapter 6 describes and discusses alternatives for outfall and treatment plant modifications needed to meet water quality standards for ammonia and chlorine.

Per WAC 173-201A, Ecology's decision to grant a mixing zone is based on the achievement of AKART (**a**ll **k**nown **a**vailable and **r**easonable **t**reatment). As the definition for AKART evolves over the twenty year planning period, it is possible that the State of Washington will follow the lead taken by other states to restrict or discontinue the use of dilution to achieve water quality standards. For example nitrification (biological ammonia removal) may ultimately be defined as AKART for municipal wastewater treatment plants. If and when this were to happen, it would not be possible for the Town to obtain a mixing zone for ammonia and nitrification would be necessary to achieve water quality standards for ammonia on an "end-of-pipe" basis.

Consent Order

Consent Order No. DE 98WQ-N103 was issued by the Department of Ecology on April 3, 1998 (see Appendix G). The Consent Order requirements and status thereof are summarized in Table 3-10.

TABLE 3-10

Status of Consent Order DE 98WQ-N103
Town of Concrete

Due Date	Item	Status
April 30, 1998	Submit Residual Solids Handling Plan	Submitted Lagoon biosolids removal underway
September 1, 1998	Install Baffling Curtain in Lagoon	Postponement requested pending engineering evaluation
October 31, 1998	Complete Smoke Testing	Partially complete, additional smoke testing to be conducted in 2000
December 15, 1998	Submit Smoke Testing Results to Ecology	Postponed pending additional smoke testing in 2000
April 15, 1999	Prepare and Submit Draft Engineering Report	Requested new due date to be submitted as part of draft Comprehensive Sewer and Wastewater Facility Plan
April 15, 1999	Prepare and Submit Draft Comprehensive Sewer Plan Plan must address the following: • extension of P/S No. 3 forcemain to headworks • inflow and infiltration • improved influent sampling • sludge removal from existing lagoon • wastewater treatment plant improvements to reliably meet NPDES permit requirements	Requested new due date to be submitted as part of draft Comprehensive Sewer and Wastewater Facility Plan
Quarterly beginning June 1998	Quarterly Progress Reports	On-going

CHAPTER 4

EXISTING FACILITIES

BACKGROUND

The purpose of this chapter is to evaluate the existing wastewater collection, treatment and disposal systems to determine their reliability and capacity. The evaluation includes an assessment of physical and operating condition and a comparison of recent operation history relative to the facilities' original design criteria as well as current applicable design standards such as Department of Ecology's *Criteria for Sewage Works Design* (December 1998).

The evaluation is based on existing construction drawings (Sleavin-Kors, February 1972), site visits by Gray & Osborne, discussions with City staff and the City's Engineer (Sturdy Engineering) and a review of monthly discharge monitoring reports (DMRs) supplied by Department of Ecology.

The Town of Concrete currently provides sanitary sewer service within its corporate limits and is the only entity providing centralized wastewater treatment within its current 747 acre service area. The Town owns and operates a wastewater collection system and a wastewater lagoon treatment facility. Effluent from the treatment plant is discharged via an outfall to the Baker River.

COLLECTION SYSTEM

Background

The Town of Concrete currently operates three sewage lift stations which together with the gravity sewers serve most of the area within the corporate limits. The three lift stations are located at Albert Street and Dillard Avenue (No. 1), on Fir Street, just South of Highway 20 (No. 2), and in the eastern portion of the Town at North Everett Avenue (No. 3).

The original collection system was constructed in the early 1970's and consisted of approximately 20,400 feet of 8-inch diameter concrete and cast iron gravity sewers. Approximately 1,250 feet of 6-inch diameter and 500 feet of 4-inch force mains were installed as well. Expansions to this system have occurred periodically in response to growth and maintenance requirements.

BY: MW CREATED: APR 21 1999 10:54:14 UPDATED: APR 26 1999 14:04:01 PLOTTED: JUL 06 1999 10:42:56 FILE: L:\CONCRETE\98749\FIGURES\SEWER-BS-MAP.DWG

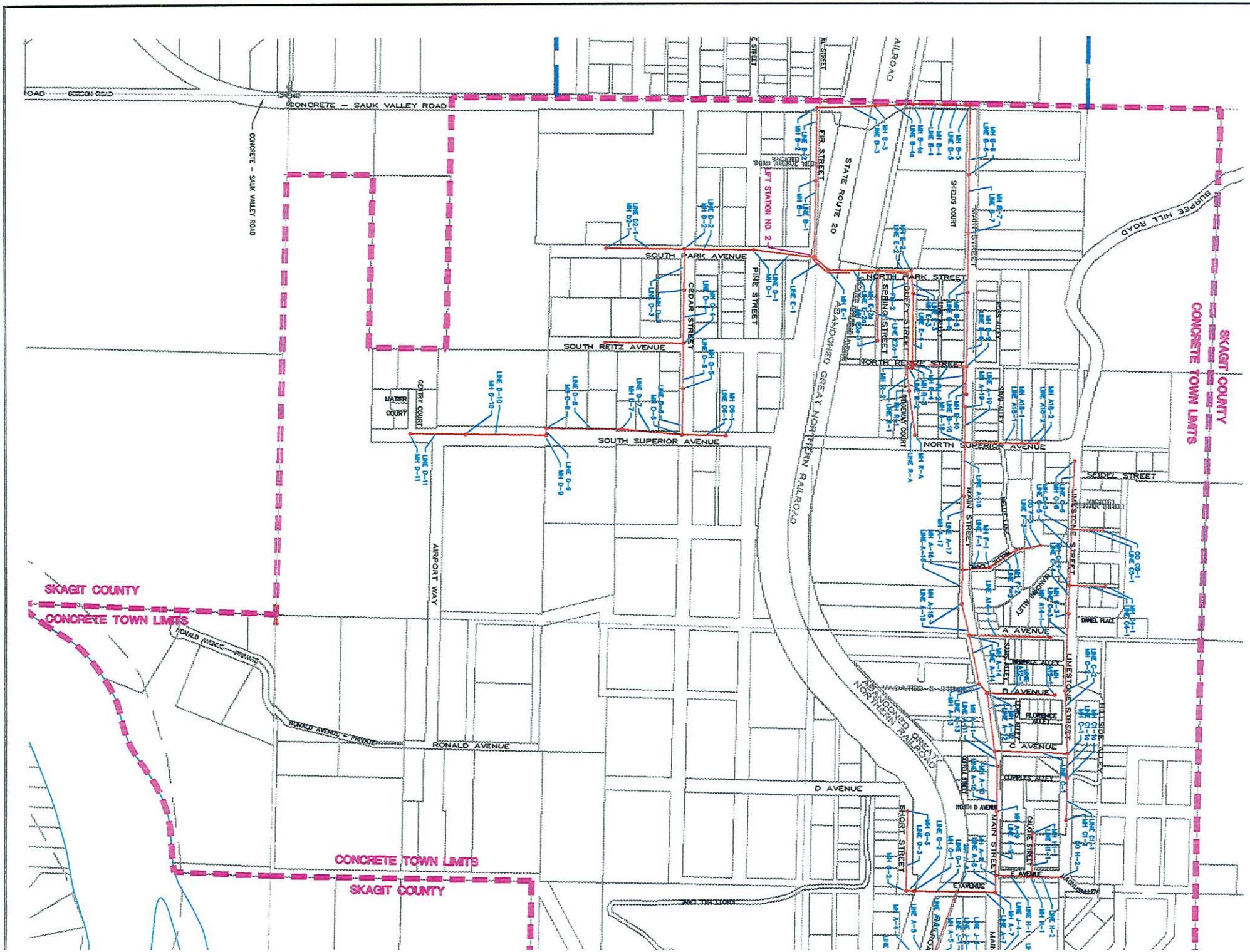


TABLE 4-1

Sewer Pipe Inventory
Town of Concrete

Pipe Diameter (in.)	Pipe Material	Pipe Length
8 (gravity)	Asbestos Concrete	24,093
8 (gravity)	Cast Iron	589
6 (pressure)	PVC	1,380
4 (pressure)	PVC	1,800
4 (pressure)	Asbestos Concrete	560
Total Sewer Footage		**28,422**

Source: *Comprehensive Plan, May 1998*

Recent expansions to the sewer system have included additional sewer lines on Ridgeway Court and Shields Court. According to the Town's *Comprehensive Plan*, the current sewer collection system consists of approximately 24,682 feet of gravity sewer and 3,740 feet of pressure sewer line. A sewer base map showing the extent of the Town's collection system is presented in Figure 4-1. Table 4-1 describes the type and length of sewer pipe currently present in the Town's collection system.

The construction drawings show that the lift stations are all constructed in a similar manner. Each lift station consists of a 16-ft deep, 6-ft diameter precast manhole, equipped with two submersible pumps. Table 4-2 provides key design criteria for each lift station.

TABLE 4-2

Sewage Lift Station Design Criteria
Town of Concrete

Lift Station	Pump Suction Elevation	Pump Capacity	Total Dynamic Head at Rated Capacity	Pump Horse power	Pump Motor
	(ft)	(gpm)	(ft)	(hp)	(phase/voltage/amps)
No. 1	166.36	190	48	7.5	3 ϕ / 230V / 21 A
No. 2	166.63	175	98	20	3 ϕ / 230V / 56 A
No. 3	170.01	190	48	7.5	3 ϕ / 230V / 21 A

Reference: Sanitary Sewer System Plans, Town of Concrete, Sleavin-Kors, February 1972
Site visit by Gray & Osborne, November 19, 1998

Collection System Field Investigations

Smoke Testing

Smoke testing was conducted by Town personnel on September 17-19, 1997, and covered about 7% of the collection system. The results of the smoke testing are included in Appendix H. The majority of the problems were associated with improper venting in the houses. As a result of the smoke testing, a number of corrections by Town personnel were made. For example, the roof drain at the old grade school and the drain from the swimming pool at the new high school were recently disconnected. In addition, a fish pond associated with a homeowner on Main Street was discovered. According to Town personnel, it is believed that this drain has been disconnected.

Manhole and Lift Station Inspections

Field investigations were conducted in November 1998 and January 1999 in order to assess the condition of manholes and the three lift stations. Based on interviews with Town maintenance staff, manhole inspections were conducted on a select number of manholes on January 26, 1999. Manhole inspection logs are included in Appendix I. The inspections were conducted on manholes that were constructed in the early 1970's as well as on recently constructed manholes.

The inspections concluded that the originally constructed manholes were in good condition in contrast to the more recently constructed manholes, which exhibited points of infiltration. Specifically, manholes constructed in the area of Ridgeway Court (near N. Rietze Avenue and Duffy Street) had points of infiltration where the influent pipe enters the manhole and at sections of the manhole. At the time of the inspections, it was estimated that Manholes R-2 and R-3 were contributing a combined amount of about 2 gpm. In addition, a very shallow manhole located in a field south of Ridgeway Court in an undeveloped lot was not channeled. This manhole had significant accumulation of debris at its base.

On November 19, 1998 and January 26, 1999, inspections were conducted at each of the three lift stations. The inspections revealed that none of the three lift stations meet Department of Ecology *Criteria for Sewage Works Design* for the following items:

- provisions for auxiliary power in the case of a power outage
- alarm annunciation to alert the operator when a malfunction occurs

(each station is equipped with a light on a pole which is activated by high wet well level, however, this does not meet the Ecology design criteria which requires the alarm signal be sent to a location that is continuously monitored)

- grit, grease and clogging protection
- corrosion control
- easy access to valves and piping

Control panels on lift stations Nos. 1 and 3 show signs of significant physical deterioration. The access hatch and the wood pole supporting the control panel on lift station No. 3 are badly deteriorated (the access hatch on lift station No. 3 has corrosion damage due to hydrogen sulfide generation). Electrical conduit and wire insulation in all three lift stations appear to be deteriorated. Town maintenance personnel report that lift stations No. 1 and No. 2 have experienced problems with grease accumulation. Town maintenance personnel also report that a re-built pump and a new pump have recently been installed in lift stations No. 1 and No. 2, respectively. In addition, Town personnel report that new alternating relays and plug-in relays have recently been installed in lift stations No. 1 and No. 2, respectively. Two running time meters have been installed in lift station No. 3 and a new power pole has been installed at each of the lift stations. No odor problems were noted during the inspection by Gray & Osborne and Town personnel have not reported any odor complaints from the lift stations.

Run time records were collected by Town personnel during the period December 1998 - January 1999 in order to assess the capacity of the lift stations. Each of the two pumps at Lift Stations No. 1, No. 2, and No. 3 had average daily run times for the above period of 0.9 hours, 2.0 hours, and 0.6 hours, respectively. This data indicates that the pumps are not running excessively. At lift station No. 1, a bypass pipe to Little Baker Creek presently exists.

Infiltration and Inflow Investigations

Background

Infiltration is defined as groundwater that enters the sewer through cracks, holes and defects in sewer pipes and manholes. In general, excessive infiltration occurs when the groundwater elevation rises to a level above that of the sewer system. The magnitude of infiltration is also a function of pipe material and particularly the age of the collection system.

Inflow is defined as surface water (usually rain water) that enters the collection system through sources such as roof drains connected to the sewer system or leaking manhole lids. Together, infiltration and inflow (I/I) increase the quantity of wastewater that must be transported and treated, thus increasing the required capacity of the collection and treatment facilities.

The United States Environmental Protection Agency (USEPA) has determined specific quantitative guidelines for excessive infiltration and inflow. To determine if excessive infiltration is occurring, a threshold value of 120 gallons per capita per day (gpcd) is used. This infiltration value is based on an average daily flow over a seven to fourteen day non-rainfall period during seasonal high ground water conditions. To determine if excessive inflow is present in a collection system, the USEPA uses a threshold value of

275 gpcd. If the average daily flow (excluding major commercial and industrial flows greater than 50,000 gpd each) during periods of significant rainfall exceeds 275 gpcd, the amount of inflow is considered excessive.

Infiltration Analysis

A review of treatment plant records indicate that a five day non-rainfall period during typically high ground water conditions from January 1-5, 1999, had a corresponding average daily flow of 100,000 gpd. Based on the Town's population of 785 people, a per capita flow of 127 gpd is calculated. This value slightly exceeds the USEPA criteria of 120 gpcd.

Inflow Analysis

A review of treatment plant records indicate that a seven day rainfall period (average daily rainfall of 0.6 inches) from January 12-18, 1999, had a corresponding average daily flow of about 129,000 gpd. Based on the Town's population of 785 people, a per capita flow of 164 gpd during this rainfall period is calculated. This value is well below the USEPA criteria of 275 gpcd.

I/I Contribution

For flow projections, an overall estimate of infiltration and inflow must be evaluated. For the period January 1998 to January 1999, the maximum monthly average flow occurred during the month of December 1998 and was about 123,000 gpd. The lowest monthly flow for this same period occurred in July 1998 and was about 56,000 gpd. Taking the difference between the highest and lowest monthly flow and subtracting out the amount of rainfall (13.6 inches) that fell on the lagoon, an I/I estimate of 57,000 gpd can be derived.

WASTEWATER TREATMENT SYSTEM

The Town of Concrete wastewater treatment facility (WWTF) consists of headworks with coarse bar screen, aerated lagoon, chlorine disinfection and effluent disposal via an outfall in the Baker River. Figure 4-2 shows the existing WWTF layout and provides a summary of key design criteria for the treatment plant. Figure 4-3 shows the WWTF process flow scheme. Figure 4-4 shows the existing hydraulic profile of the treatment plant and outfall. This section describes the WWTF in more detail.

Headworks

As shown in Figure 4-2, wastewater enters the treatment facility by two means. Flows from the Town west of the Baker River enter the plant via an 8-inch cast iron gravity line and then passes through a coarse bar screen prior to entering the lagoon. Flow from the

area east of the Baker River is pumped through a 4-inch PVC forcemain that goes directly to the lagoon without screening.

The gravity flow from West Concrete is sampled using an automatic sampler. Because there is no influent flow meter, sampling is done using a timer rather than flow-pacing. The flows from East Concrete are not sampled in any way.

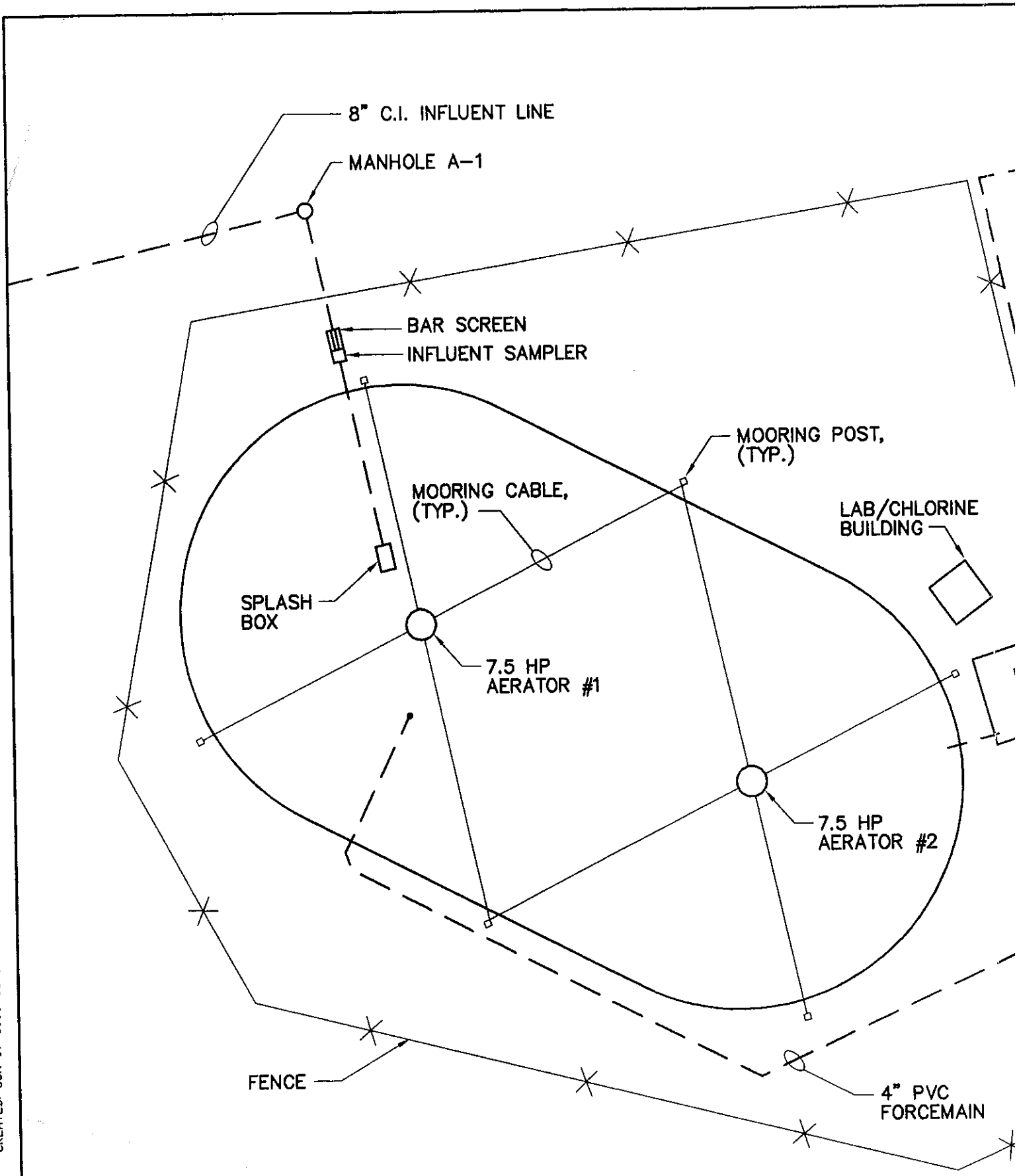
Aerated Lagoon

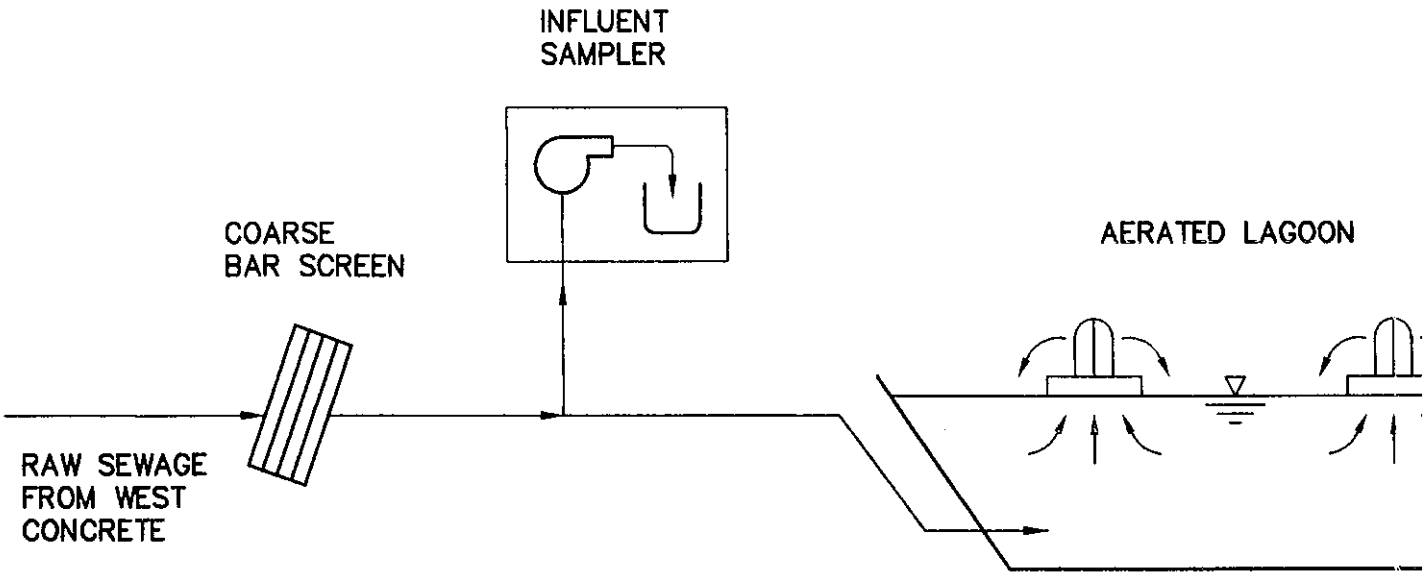
The Town of Concrete operates a single aerated lagoon that has an estimated volume of 1.8 million gallons (MG). The area of the lagoon water surface is approximately 0.7 acres. The lagoons have a total depth of 12 feet and a maximum operating depth of 10 feet.

The original design hydraulic capacity of the lagoon is 100,000 gal/day (0.1 MGD).

The lagoon was constructed with an exposed PVC liner. Evidence of significant deterioration of the liner was noted in October 1998 when the lagoon water level had been lowered to remove sludge from the lagoon. There were large cracks and tears in the portion of the liner that was exposed and detached pieces of the liner were observed floating on the lagoon surface during the sludge removal operation.

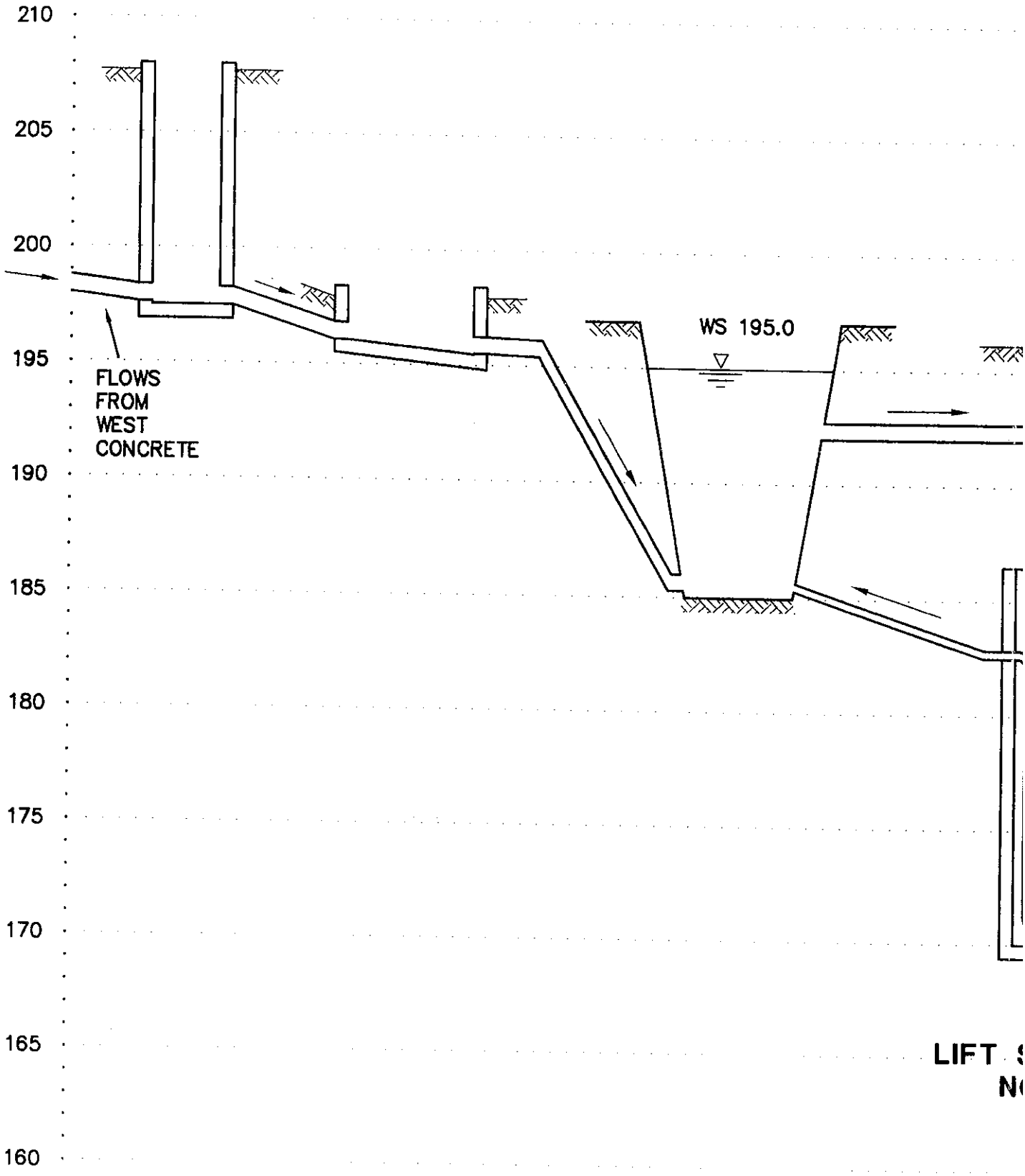
Soils underlying the lagoons were identified from Soil Conservation Service soil surveys as Pilchuck loamy sand (see Figure 2-4, Soil Map). These soils are described by SCS soil survey as excessively drained with permeabilities of 6 to 20 inches/hour in the upper 3-½ ft. There are no groundwater monitoring wells around the lagoon, therefore it is not possible to determine if significant leakage is occurring due to the breached liner.





EXISTING TREATMENT PLANT DESIGN CRITERIA

AVERAGE ANNUAL FLOW	100,000	GAL/DAY
5-DAY BOD LOADING	200	LB/DAY
COARSE SCREEN OPENING	1.5	INCHES
AERATED LAGOON		
VOLUME @ 2' FREEBOARD	1,720,000	GALLONS
DEPTH	10	FEET
AREA	1.2	ACRE
AERATORS		
NUMBER	2	
HORSEPOWER (EACH)	7.5	H.P.
CHLORINE CONTACT TANK		
VOLUME	5,528	GALLONS
DETENTION TIME @ AAF	80	MINUTES
DETENTION TIME @ 4x AAF	20	MINUTES



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The lagoon is aerated with two (2) 7.5 hp surface aerators. The design BOD_5 loading capacity of the lagoon is 200 lb/day.

The lagoon has an 8-inch outlet pipe which is connected to the chlorine contact tank.

Lagoon Performance

Appendix J provides a summary of discharge monitoring report data for the 5 year period of 1994 to 1998. Figures 4-5, 4-6 and 4-7 summarize plant loading and performance data for the parameters of flow, BOD_5 and total suspended solids (TSS) during the same 60-month period.

Based on data in the City's monthly discharge monitoring reports monthly average flow to the treatment plant ranged from 63,000 to 155,000 gal/day. As shown in Figure 4-5, the monthly average design flow of 100,000 gal/day to the plant was exceeded 15 out of 60 months.

Average monthly BOD_5 loadings to the lagoon from 1994-98 ranged from 97 lb/day to 514 lb/day. As shown in Figure 4-6, the current design BOD_5 loading rate of 200 lb/day was exceeded 10 out of 60 months. As also shown in Figure 4-6, the effluent BOD_5 limit of 30 mg/L was exceeded 23 out of 60 months. The minimum BOD_5 removal rate of 85 percent required by the Town's NPDES permit was not achieved 20 out of 60 months.

Effluent TSS limits of 75 mg/L were exceeded 5 out of 60 months as shown in Figure 4-7.

Evaluation of Organic Loading and BOD Removal

Department of Ecology (Ecology) has promulgated interim design standards for aerated lagoons (Department of Ecology Memorandum, s/Mike Llewelyn, March 17, 1994). Per DOE criteria, aerated lagoons are classified on the basis of mixing power per unit volume in the lagoon. A complete mix lagoon has a mixing power level of 50-60 hp/MG. A partial mix lagoon has a mixing power of 6-10 hp/MG.

The Town of Concrete has a mixing power of 8.7 hp/MG and is classified as a partial mix lagoon.

FIGURE 4-5
WWTF Effluent Flow Measurements
Town of Concrete
January 1994 - December 1998

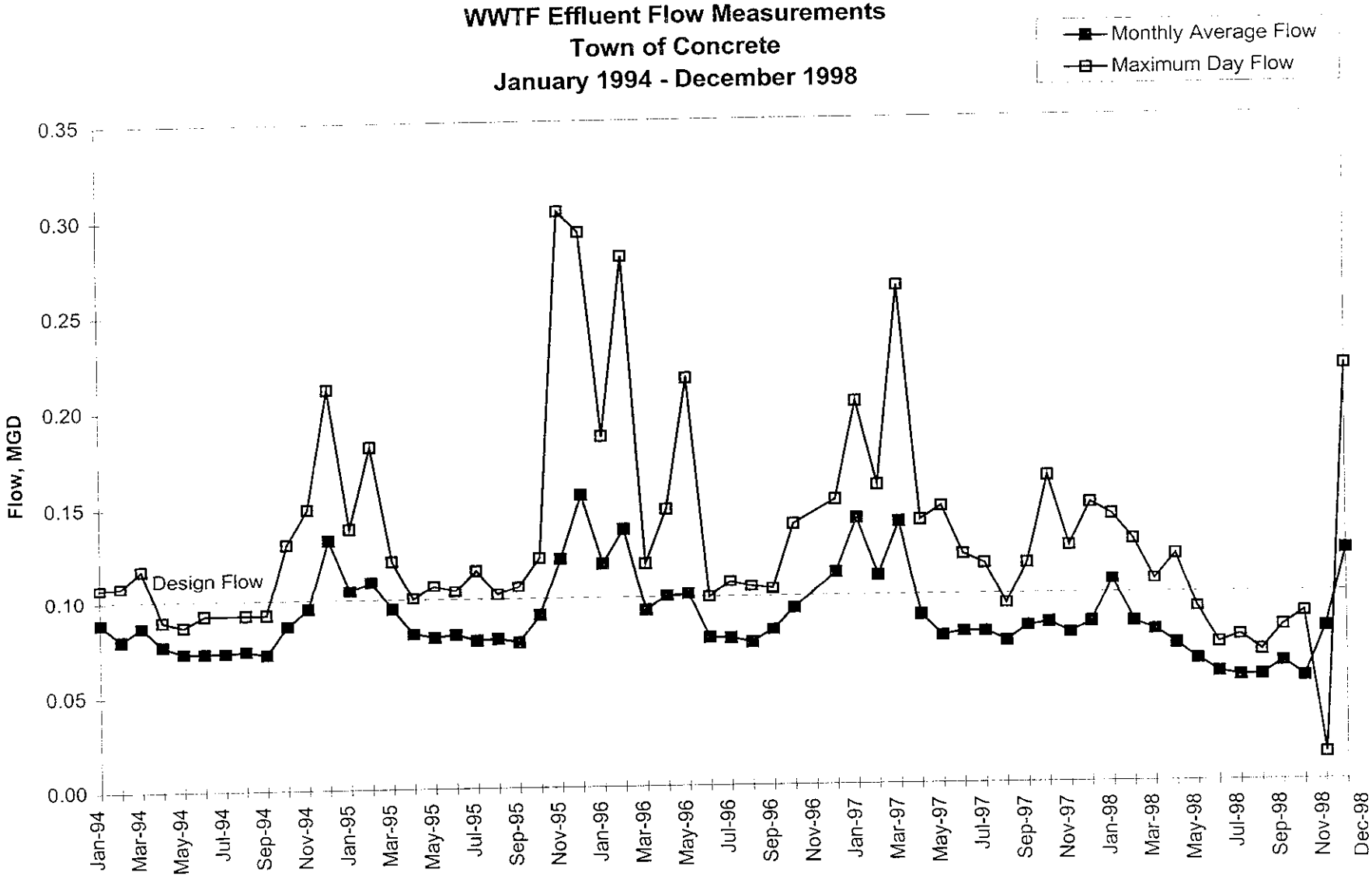


FIGURE 4-6
WWTF BOD Loadings and Effluent Concentrations
Town of Concrete
January 1994 - December 1998

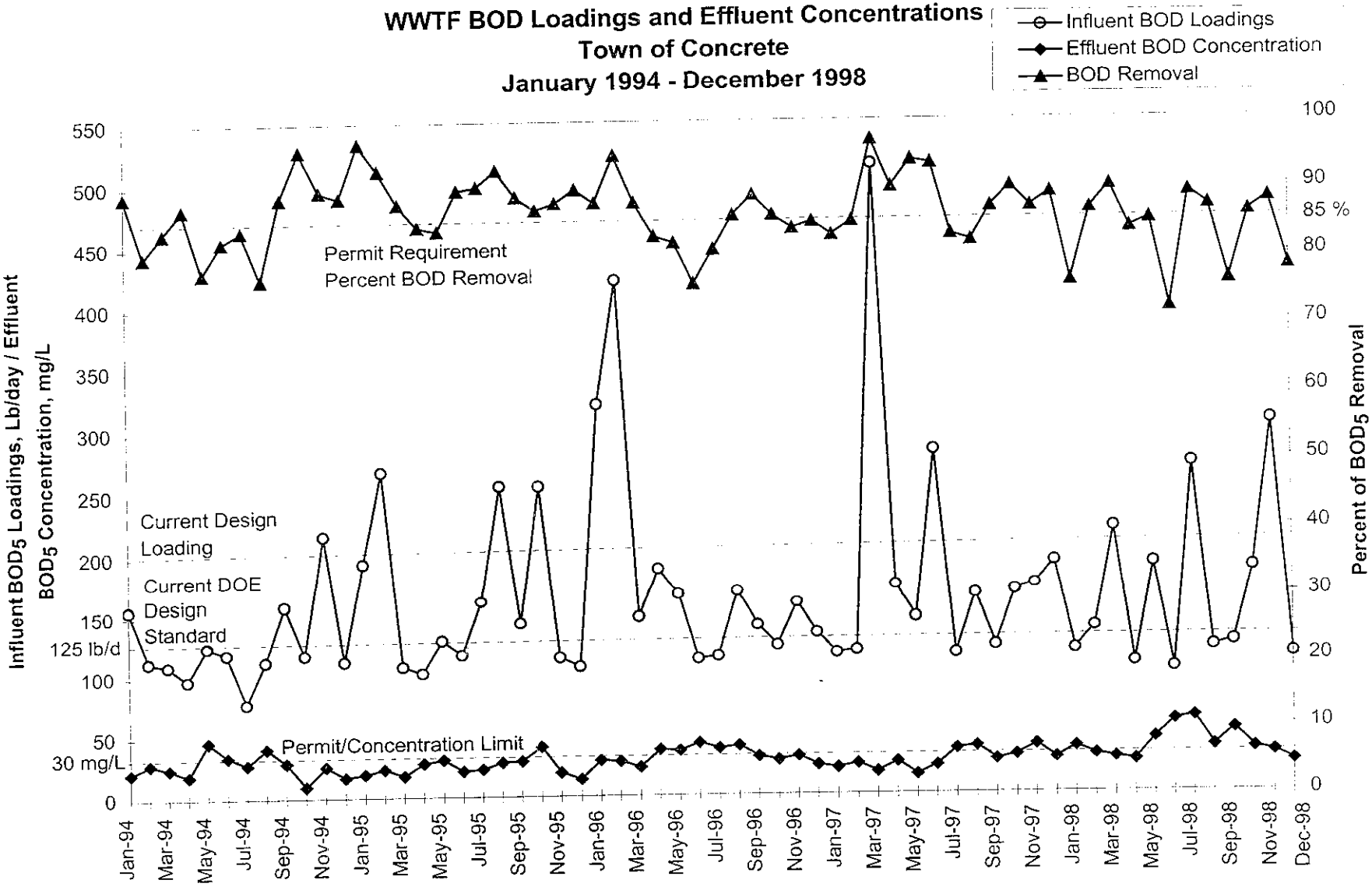
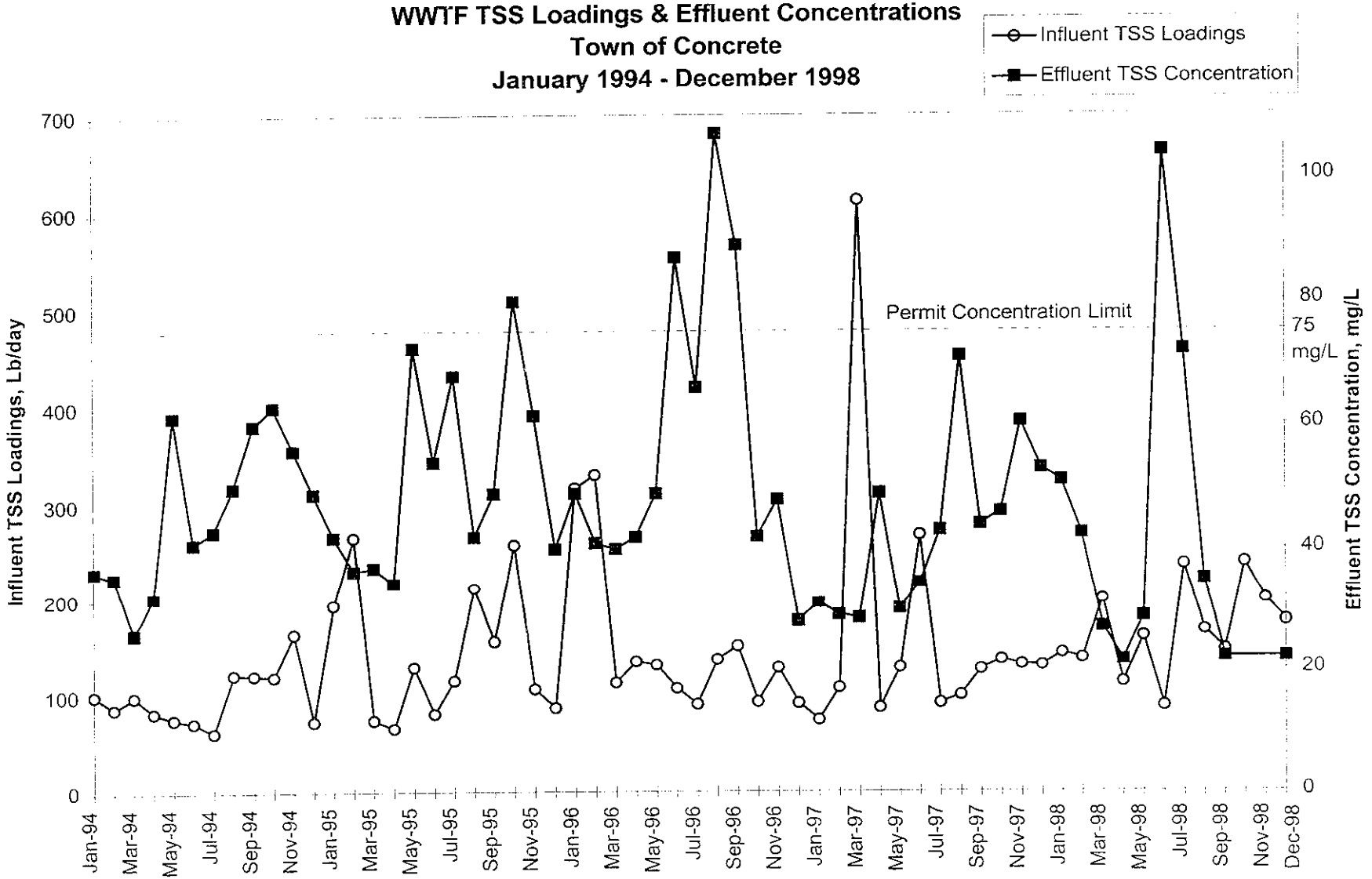


FIGURE 4-7
WWTF TSS Loadings & Effluent Concentrations
Town of Concrete
January 1994 - December 1998



The kinetics of a partial mix lagoon are described by equation 4-1.

$$S/S_o = 1 / (1 + 2.3k_T t) \qquad \text{Equation 4-1}$$

where

S = effluent BOD_5 (lb/day)
S_o = influent BOD_5 (lb/day)
k_T = BOD_5 oxidation constant at Temperature T (day^{-1})
T = Temperature of lagoon (°C)
t = detention time in lagoon (days) = V/Q
V = lagoon volume (gallons)
Q = flow rate (gallons/day)

Department of Ecology recommends using a k value of 0.1 day^{-1} for a design temperature (T) of 6 °C.

Using Ecology's design criteria the lagoon performance can be predicted as follows:

$$S/S_o = 1 / (1 + 2.3k_T t)$$

$$S/S_o = 1 / \{1 + [(2.3)(0.1)(1.72 \times 10^6/1 \times 10^5)]\}$$

S/S_o = 0.20 (translates to 80 percent BOD_5 removal)

Ecology's design criteria for an aerated lagoon are based on meeting secondary treatment standards for BOD_5 removal. This includes an effluent quality of 30 mg/L and 85 percent removal on an average monthly basis, the Town's current permit limits for effluent BOD_5 and BOD_5 removal respectively.

Combining the Town's permit limit for BOD_5 (30 mg/L) and permitted hydraulic capacity (100,000 gal/day), Ecology's current design criteria (Equation 4-1) would allow an influent BOD loading of 125 lb/day, which is significantly below the treatment plant's current design loading of 200 lb/day and a BOD_5 removal rate of 80 percent. Based on Figure 4-6, the plant has seen monthly average BOD_5 loadings greater than 125 lb/day 33 times between January 1994 and December 1998. As previously noted BOD_5 removal within the plant failed to meet the 85 percent removal criteria about a third of the time over the last five years.

There is a noticeable degradation of lagoon performance (as evidenced by high effluent suspended solids) during the spring-summer transition when a density inversion occurs causing turnover of the solids that have accumulated at the bottom of the lagoon. Because of this phenomenon the Town began removing accumulated solids in the lagoon to help improve the lagoon's performance.

Nonetheless, the treatment plant has exceeded its capacity. The overall performance of the lagoon is inadequate for current organic loadings and will continue to degrade with increased loadings.

Ammonia and Nitrogen Removal

Subsequent chapters of this report will evaluate the implications of and the potential for establishment of water quality based effluent limits at Concrete. Because water quality based limits for ammonia will be evaluated as part of this report, a brief discussion of ammonia removal in aerated lagoons is provided below. Due to heightened concerns about the impact of leaking wastewater lagoons on groundwater quality a brief discussion about nitrogen removal in lagoons is also provided.

Municipal wastewater contains organic and inorganic nitrogen. Typical total nitrogen concentrations in municipal wastewater ranges between 30 and 60 mg/L. (Influent nitrogen levels in the Town of Concrete's wastewater are unknown at this time.)

Lagoons remove ammonia and other nitrogen compounds in municipal wastewater by a combination of physical, chemical and biological action. Among these activities are:

- Gaseous ammonia stripping to the atmosphere
- Ammonia assimilation in alga mass
- Nitrate assimilation in algae mass
- Biological nitrification-denitrification
- Settling of biological matter
  (i.e. removal of organic nitrogen present in biological matter)

Attempts have been made to develop design equations that predict ammonia removal rates in lagoons which are based on pH, lagoon surface area and temperature. However, in actual practice ammonia removal rates in lagoons are difficult to predict. The EPA design manual for wastewater stabilization ponds report ammonia removal rates in actual treatment systems that vary between 46.5 percent and 97.3 percent (annual average).

Since there are no influent or effluent ammonia data for the Town of Concrete's wastewater lagoons, it is not possible to report on the actual performance of this system with regard to ammonia removal. However, it is very likely that Concrete experiences seasonal variations in ammonia removal in its lagoons due to temperature effects on the lagoon biology and pH fluctuations that occur when photosynthesis from algae blooms depletes dissolved carbon dioxide in the lagoon causing pH levels to rise significantly.

Because the lagoon liner has deteriorated, nitrogen removal in the lagoon will be an issue because of the potential for groundwater contamination by nitrate nitrogen. The existing lagoon system does not provide for nitrogen removal on a reliable basis.

Nitrogen removal in a lagoon occurs by both physical and biological actions. Physical removal of nitrogen occurs by volatilization of unionized ammonia to the atmosphere. High levels of ammonia volatilization are known to occur during high pH events brought on by algal photosynthesis.

Biological nitrogen removal is a multi-step process that begins with the hydrolytic decomposition of organic nitrogen to ammonia. Ammonia is biologically transformed by nitrification (oxidation of ammonia to nitrate) and denitrification (reduction of nitrate to nitrogen gas which escapes to the atmosphere). Both steps are mediated by a consortium of microorganisms which rely on completely different environments and food sources to function. Temperature is a significant factor in controlling the rate of these biological processes. Cold winter temperatures (5 - 6 °C) experienced with lagoons in this climate make biological nitrogen transformations slow down considerably.

Nitrification is an aerobic process that uses inorganic carbon as its carbon source while denitrification can only occur in the absence of oxygen by microbes that use organic carbon. Although a limited amount of nitrogen removal (5 to 10 percent) may occur due to the presence of an aerobic upper zone and an anaerobic lower zone, the lagoon operation does not permit the precise control needed to promote a significant level of nitrification/denitrification and provide the 80 to 90 percent nitrogen removal that would typically be required to meet Washington State groundwater standards for nitrate (10 mg/L).

Suspended Solids Removal

Another aspect of lagoon performance that is impacted by seasonal changes is suspended solids removal. The Town of Concrete has an effluent TSS limit of 75 mg/L. This is higher than the typical secondary standard for effluent TSS of 30 mg/L because it is recognized that lagoons produce higher effluent solids in the summer months when algae blooms occur. Based on five years of monitoring records (1994-98), the Town has generally been able to meet its current effluent limit for suspended solids.

Effluent Disinfection

The Town of Concrete WWTF disinfects effluent using a gas chlorination system located in the chlorine room next to the lab. The system draws gaseous chlorine into a water line by a venturi action. Chlorinated water is injected into the lagoon effluent at the head of a baffled chlorine contact tank.

This system provides a total contact time of 80 minutes based on the current design flow of 0.1 MGD. This is above Department of Ecology's *Criteria for Sewage Works Design* standard of 60 minutes of contact time. The contact tank is sized to provide the minimum 60-minute detention time up to a flow of 0.13 MGD. The treatment plant has often

experienced daily flows in excess of 0.13 MGD, therefore, Ecology disinfection criteria are not met on a consistent basis.

Effluent fecal coliform levels have only exceeded the 200 colonies/100 mL monthly average limit one time during the five year period of January 1994 -98

Department of Ecology's *Criteria for Sewage Works Design* requires that gas chlorination systems provide the following features:

1) Adequate reserve supply to meet demands and delay in delivery
2) Scales to accurately monitor inventory and usage rates
3) Manifolds to allow use of back-up equipment
4) Automatic switchover from empty cylinders
5) Alarms to alert operator or imminent loss of supply
6) Standby power (if required)
7) Spare parts

Two key elements for operational reliability are automatic switchover from empty cylinders and alarms for imminent loss of supply (items 4 and 5). These two features are lacking with the chlorination system at the Concrete WWTF.

Effluent Monitoring

Effluent exits the chlorine contact tank through a v-notch weir located between the contact tank and an effluent box. The contact tank is connected by a 2-inch PVC pipe to a stilling well located beneath the lab. The water level in the stilling well is approximately the same as the level in the contact tank next to the weir. A level sensor located in the stilling well measures the water surface and translates this level to a flow rate. Effluent exits the structure through the 8-inch outfall line.

There is no automated effluent sampling system. All effluent samples are taken as grab samples.

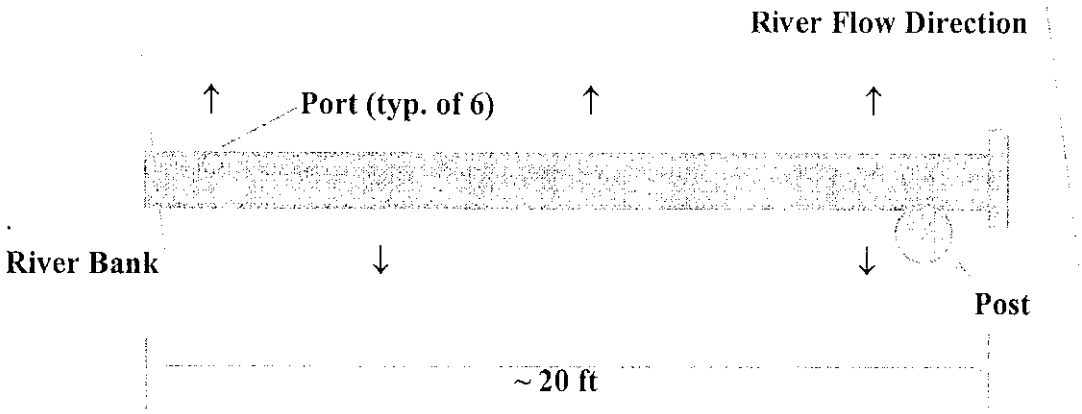
Effluent Disposal

The treated effluent is conveyed by gravity through an 8-inch cast iron pipe to an outfall in the Baker River. The outfall diffuser was observed during a low river event on October 8, 1998. The diffuser appeared to be approximately twenty feet in length (construction drawings indicate it is 18 feet in length). On the day the diffuser was in view, most of the diffuser ports were plugged. The operator used a rod to unplug the diffuser ports releasing various plastic materials that had become lodged in the ports. A total of six ports were observed, each 1-1/2 inches in diameter. The end of the diffuser had a blind flange and was held in place by a large post placed at an angle to prevent

downstream movement of the diffuser. The ports were oriented to release effluent parallel to the river flow. Figure 4-8 shows the approximate location and orientation of the ports on the diffuser.

FIGURE 4-8

Wastewater Outfall Diffuser
Town of Concrete



Department of Ecology conducted a preliminary mixing zone analysis which was discussed in Chapter 3 and summarized in Table 3-10. Based on Ecology's analysis and the expected ammonia and chlorine levels in the plant effluent, the location of the existing outfall could result in a violation of water quality standards for ammonia and chlorine during low flows in the Baker River.

Laboratory/Operations Building

The current laboratory is located in a 10 ft x 10 ft room with counter and a sink. Existing laboratory equipment allows for measurement of chlorine residual, pH and temperature. The effluent flow chart recorder is located in the laboratory. Testing for suspended solids, biochemical oxygen demand and fecal coliform are performed by the Seattle City Light laboratory at Newhalem.

Based on previous Department of Ecology criteria, minimum recommended space for a laboratory in a small treatment plant ranges from 150 to 180 square feet. This assumes that all analyses are performed at the treatment plant lab. If the Town elects to perform all of its wastewater analyses in-house, the existing lab would be insufficient to support the treatment plant operation.

CHAPTER 5

WASTEWATER FLOWS AND LOADINGS

INTRODUCTION

The purpose of this chapter is to identify existing hydraulic, organic and solids loadings to the Town's wastewater treatment facility and make projections of future flows and loadings during the twenty year planning period which ends in the year 2020.

Identifying existing flows and loadings to the plant is necessary to

(1) Determine where the existing wastewater collection, treatment and disposal systems are operating relative to their current capacities and

(2) Develop correlations that make it possible to project future flows and loadings which will be used to size and design upgrades to the collection and treatment systems to meet the demands of future growth.

The following analysis identifies actual flows and loadings based on historical data and then correlates these flows and loadings to the existing service population and land use to make projections based on expected population growth and commercial and industrial development.

To determine existing wastewater flows and loadings, data from the Town's discharge monitoring reports (DMR) were reviewed for the period January 1994 to December 1998. A summary of flows and loadings during that period is provided as Appendix J.

Average Annual Flow

Average annual flow (AAF) is the average daily flow over a one-year period. This flow rate is used to estimate operation and maintenance costs for collection systems and treatment plants and is the basis for developing flow rate ratios used in collection and treatment system designs. The annual average flow for the years 1994 to 1998 varied between 75,000 gpd and 98,000 gpd, and averaged 90,000 gpd.

Dividing by the 1998 population of 785 yields a flow of 115 gallons per capita per day (gpcd). The Department of Ecology (Ecology) *Criteria for Sewage Works Design* suggests 100 gpcd. As described earlier in Chapter 4, the contribution from

infiltration/inflow during the wet season has contributed 57,000 gpd flows to the wastewater treatment plant (WWTP).

For the purpose of projecting average annual flows, 100 gpcd will be multiplied by the projected residential population of the Town to determine the domestic sewage flows to the WWTP. From Chapter 2, the design (year 2020) residential population is 1,343 people. Multiplying 1,343 people by 100 gpcd yields an average annual domestic sewage flow rate equal to 134,300 gallons per day.

The Town's *Comprehensive Plan* did not report specific types of future commercial activities or population densities for commercial uses. Nonetheless, existing sewage flows for commercial land use can be determined using water consumption data. A review of the Town's water consumption records for the period April 1998 to March 1999 indicates that the average daily water use within the Town limits is about 4,500 gallons per day (gpd).

The Department of Ecology has established flow criteria for various types of commercial facilities (e.g. restaurants, gas stations, shops). Applying the Ecology criteria for estimating flows from commercial facilities to the existing commercial facilities within the Town limits, the commercial flows would be about 12,000 gpd. Therefore, current commercial flows experienced within the Town limits are about one-third of those predicted from the Ecology criteria.

For commercial areas outside of the Town limits but within the IUGA, water records were reviewed to determine future sewer flows to the treatment plant. For the period April 1998 to March 1999, available water use records in conjunction with Ecology criteria result in an estimated average daily water use by commercial water customers of about 9,000 gpd.

Based on information from the Town's planner (reference Appendix K), commercial growth can be reasonably expected along State Route 20 in the Grassmere area. However, the number of future commercial establishments was not possible to estimate. To account for potential flows from potential commercial growth, Ecology's flow criteria for commercial sources was applied to all existing commercial establishments assuming every establishment operated at its full capacity (e.g. if a restaurant has 25 seats flow projections were assumed as if all 25 seats were occupied every day). Therefore the total commercial flow projection from within the Town and the IUGA was estimated as 21,000 gpd (12,000 from Town plus 9,000 from the IUGA).

From Chapter 2, an estimated 509 people (students, staff, and teachers) will be attending Concrete schools from outside the Town limits by year 2020. Based on the Department of Ecology *Criteria for Sewage Works Design*, per capita sewage flows from schools

with showers and cafeterias is 16 gpd. Based on the Department of Ecology *Criteria for Sewage Works Design*, per capita sewage flows from schools without showers and cafeterias is 10 gpd. Multiplying 178 people (high school) by 16 gpcd provides a sewage flow rate equal to 2,848 gpd. Multiplying 331 people (junior high and elementary schools) by 10 gpcd provides a sewage flow rate equal to 3,310 gpd. Therefore, the future school contribution to the collection system will be about 6,200 gpd at the end of the planning period.

As described in Chapter 2, only one industrial entity, the hydroelectric plant (Puget Sound Energy), discharges domestic wastewater to the Town's treatment plant. Water consumption records for Puget Sound Energy are not available as they are currently not metered. Puget Sound Energy estimates that future peak flows to the treatment plant will be about 1,700 gpd (Appendix A). From Chapter 2, based on land use trends, an assumed 158 additional industrial employees will be contributing to the municipal sewer system by the year 2020. Based on the Department of Ecology *Criteria for Sewage Works Design*, per capita sewage flows for factories is 35 gpcd. At 35 gpcd, the 158 employees contribute 5,530 gpd. Thus, the total projected industrial flows are estimated as 7,300 gpd.

As discussed in Chapter 4, the current estimated rate of infiltration/inflow into the collection system is 57,000 gpd.

Adding the projected flows to the treatment facility from domestic contributions (134,300 gpd), commercial contributions (21,000 gpd), schools (6,200 gpd), industry (7,300 gpd), and infiltration/inflow (57,000 gpd) provides a design average annual flow rate of 226,000 gpd.

Maximum Month Flow

The maximum month flow (MMF) is defined as the average monthly flow during the month of maximum total flow. The maximum month flow is used to size most unit processes in a wastewater treatment plant and is used as the critical flow in determining effluent limits for toxic substances (e.g. ammonia, chlorine and heavy metals) on the basis of chronic toxicity for a surface water discharge. The maximum month flow is used by Ecology to establish what may be termed as the "permitted capacity" for the plant.

Although Ecology has largely discontinued the establishment of hydraulic limits in NPDES permits, the permitted capacity is used to determine when 85 percent of the plant capacity has been reached, at which time Ecology requires the permittee to develop a formal plan to maintain adequate capacity.

During the period January 1994 to December 1998, the ratio of MMF/AAF varied between 1.4 - 1.7 and averaged 1.6. The typical ratio from Metcalf and Eddy (*Wastewater Engineering, 3rd Edition, Figure 2-5, 1991*) for maximum month average flow to annual flow is 1.3 to 1.6. For the purpose of projecting the maximum month flow, a peaking factor of 1.6 will be applied to the wastewater fraction of the average annual flow, providing a maximum month flow equal to about 362,000 gpd.

Maximum Daily Flow

Maximum daily flow (MDF) is determined from the maximum total flow over a 24-hour period. The maximum daily flow is used to size unit processes within a treatment plant that rely on short term hydraulic detention time for proper performance (e.g. chlorine contact tanks and equalization basins). For surface water discharges, the maximum daily flow is also used as the critical flow in determining effluent limits for toxic substances (e.g. ammonia, chlorine and heavy metals) on the basis of acute toxicity. Published curves from Metcalf and Eddy (*Wastewater Engineering, 3rd Edition, Figure 2-5, 1991*) show typical maximum daily flows of 1.8 to 3.3 times the average daily flow rate.

Between January 1994 and December 1998, the ratio of MDF/AAF varied between 2.5 and 3.5, and averaged 3.0. The Town's average MDF/AAF ratio of 3.0 is within the range reported in Metcalf and Eddy. Therefore, a conservative peaking factor of 3.3 will be applied to the wastewater fraction of the average annual flow, providing a maximum day flow equal to 746,000 gpd.

Peak Hourly Flow

Peak hourly flow (PHF) is the peak sustained flow rate occurring during a one (1) hour period. The peak hourly flow is used for design of collection and interceptor sewers, pumping stations, piping, flow meters, and certain physical unit treatment processes such as grit chambers and sedimentation tanks, whose performance can be affected by sudden high hydraulic inputs.

Accurate historic records of peak hourly flow rates are not available for the period studied. Nonetheless, Metcalf and Eddy (*Wastewater Engineering, 3rd edition, Figure 5-1, 1991*) recommends a peaking factor of 4.0 for an average annual flow rate around 100,000 gpd. Therefore, for the purpose of estimating peak hour flow, a peaking factor of 4.0 will be applied to the wastewater fraction of the average annual flow, providing a peak hour flow equal to 904,000 gpd.

BOD_5 and TSS Loadings

BOD_5 and TSS are the primary contaminants of concern for designing a wastewater treatment plant. BOD loadings will control the sizing of the aeration systems for mechanical plants and in the case of passive/non-mechanical systems such as facultative lagoons and wetlands, BOD loadings will control land area requirements.

Using the DMR data for the time frames mentioned above, daily per capita loadings for BOD_5 and TSS were determined using monthly average influent flow rates and BOD_5 and TSS concentrations. The average BOD_5 loading varied between 0.10 and 0.65 lb/capita-day, and averaged 0.21 lb/capita-day. The average TSS loading varied between 0.08 and 0.78 lb/capita-day, and averaged 0.18 lb/capita-day. The Department of Ecology *Criteria for Sewage Works Design* recommends per capita solids loadings of 0.2 lb/day for both BOD_5 and TSS. The Town's historic average influent BOD_5 and TSS loadings are consistent with the recommended per capita organic and solids loading rates of 0.2 lb/day as recommended by Ecology. Therefore, using historic averages of 0.21 and 0.18 lb/capita-day respectively, the current monthly average BOD_5 and TSS loadings are estimated to be 165 and 141 lb/day.

For the purpose of projecting future BOD_5 and TSS loadings to the wastewater treatment facility, the domestic component will be estimated by multiplying 0.2 lb/capita-day by the design population of 1,343. The contribution from the public schools will be similarly estimated by multiplying the projected number of people attending the public schools from outside the city limits (509 people) by 0.04 lb/capita-day, as recommended by the Department of Ecology *Criteria for Sewage Works Design*.

Because there is no information available to ascertain historical BOD_5 and TSS loadings from commercial or industrial sources, a wastewater strength typical of commercial/industrial sources was assumed (300 mg/L). Thus, the BOD_5 and TSS loadings estimated for residential sources, commercial sources, public schools, and industries is 269 lb/day, 53 lb/day, 21 lb/day, and 19 lb/day, respectively, for a total of 362 lb/day. For planning purposes, 362 lb/day will be used to project both BOD_5 and TSS loadings to the treatment facility.

PROJECTED WASTEWATER FLOWS AND LOADINGS

A summary of the projected future wastewater flows and loadings for the Town of Concrete's wastewater treatment facility is presented in Table 5-1. For comparison, permitted plant capacity and current flows and loadings are also presented in Table 5-1.

TABLE 5-1

Current, Permitted, and Projected Wastewater Flows and Loadings
Town of Concrete

Parameter	Projected Design Flow or Loading (Year 2020)	Current Flow or Loading[1] (1994-1998)	Permitted Capacity
Average Annual Flow	226,000 gpd	90,000 gpd	--
Maximum Monthly Flow	362,000 gpd	155,000 gpd	100,000 gpd
Maximum Daily Flow	746,000 gpd	303,000 gpd	--
Peak Hourly Flow	904,000 gpd	N/A	--
Design BOD_5 Loading	362 lb/day	165 lb/day	200 lb/day
Design TSS Loading	362 lb/day	141 lb/day	--

[1] As reported on DMRs, N/A - Not Available

CHAPTER 6

WASTEWATER TREATMENT AND DISPOSAL ALTERNATIVES

BACKGROUND

This Chapter identifies and describes alternatives for wastewater treatment and disposal based on:

(1) Growth and environmental factors presented in Chapter 2
(2) Regulatory requirements identified in Chapter 3
(3) Evaluation of the existing treatment and disposal facilities presented in Chapter 4
(4) Projected flows and loadings identified in Chapter 5

This evaluation is presented in two stages. The first stage of the evaluation takes a broad approach to the problem and looks at three basic approaches to treatment and disposal:

(1) Treatment and effluent disposal to surface water
(2) Effluent disposal to land (land treatment)
(3) Water reuse

The first stage of the evaluation will compare advantages and disadvantages that identify key environmental and regulatory issues and general operational and cost considerations. Alternatives with issues significant enough to warrant their rejection will not be considered for more detailed (second stage) evaluation.

The second stage of the evaluation will provide a more detailed technical and costs analysis of the alternatives remaining after the first stage evaluation.

TREATMENT AND DISPOSAL TO SURFACE WATER

This alternative includes the following options:

1A Continued lagoon treatment and disposal to the Baker River via relocated outfall

1B Continued lagoon treatment and disposal to the Skagit River via new outfall

1C Upgrade treatment plant to remove ammonia and chlorine to "end-of-pipe" effluent standards, disposal to the Baker River via existing outfall

Alternative 1A Continued Lagoon Treatment and Disposal to the Baker River via New or Modified Outfall

Brief Description

This alternative retains the existing type of treatment (aerated lagoon), but the plant would need to be expanded to provide reliable levels of treatment for current and future flows to the plant. A second lagoon approximately two times the volume of the existing lagoon would be constructed to provide capacity for 20-year projected flows. The existing lagoon would be relined and a baffle installed down the middle to improve treatment efficiency in that lagoon. Insufficient land is available at the existing treatment plant site, therefore, it will be necessary to obtain additional land to construct a second new lagoon. A new headworks and larger chlorine contact tank would be constructed as well. The forcemain from sewage lift station No. 3 would be routed to the new headworks.

Advantages

- Retains relative simplicity and low operating cost of existing treatment and disposal system
- Less biosolids generation, lower biosolids disposal costs than other systems (e.g. activated sludge)

Disadvantages

- Will require replacement of existing deteriorated lagoon liner
- Lagoon cannot reliably remove ammonia, will require relocation of outfall
- Requires upgrade of headworks to improve influent screening and sampling
- Requires significant increase in lagoon volume to provide reliable treatment
- Additional land required to build additional lagoon(s), may require construction in 100-year flood zone
- Construction in 100-year Flood Zone ineligible for federal funding
- Requires increase in chlorine contact tank volume to provide adequate detention volume
- Requires dechlorination system to remove residual chlorine

- Outfall relocation will require hydraulic permit approval (HPA) from Washington Department of Fish and Wildlife as well as U.S. Army Corps of Engineers and Skagit County Shorelines permits

Alternative 1B Continued Lagoon Treatment (with New/Relocated Treatment Plant) and Disposal to the Skagit River via New Outfall

Brief Description

This alternative would involve relocation of the Town's wastewater treatment plant to a an undeveloped site south of SR 20 and northeast of the school. The new plant would consist of a new headworks, three aerated lagoons, a new chlorine disinfection facility with dechlorination, a new outfall line and diffuser in the Skagit River.

Advantages

- Retains relative simplicity and low operating cost of existing treatment and disposal system
- Less biosolids generation, lower biosolids disposal costs compared to other systems (e.g. activated sludge)
- Skagit River provides potential for greater dilution and less stringent effluent limits for ammonia and chlorine
- All new construction would be outside the FEMA flood zone

Disadvantages

- Will require Town to acquire and rezone approximately 2.5 - 3.0 acres of property currently zoned residential; may require additional land buffer to avoid residential encroachment; land availability and cost are unknown at this time
- Cannot reliably remove ammonia, mixing zone will be needed in perpetuity to avoid costly upgrades to new form of treatment
- Requires all new facilities, including new road and utility services; capital costs expected to substantially exceed those for expanding and upgrading existing lagoon facilities (see Alternative 1A)
- Continued use of chlorine required because non-chlorine alternatives are inadequate for relatively high TSS effluent from lagoon treatment facilities; will require dechlorination system to remove residual chlorine
- New outfall will require hydraulic permit approval (HPA) from Washington Department of Fish and Wildlife as well as U.S. Army Corps of Engineers and Skagit County Shorelines permits

- New outfall conveyance pipe will require easements to access Skagit River
- New outfall expected to cost more than any outfall to Baker River because of significant construction on land and construction in a larger water channel

Alternative 1C Upgrade Treatment Plant and Continued Disposal to Baker River via Existing Outfall

Brief Description

The existing outfall in the Baker River would be retained. To meet water quality-based effluent limits for ammonia and chlorine on an "end-of-pipe" basis and avoid the need to relocate the existing outfall, a new treatment plant would be constructed within the property boundaries of the existing treatment plant site. The new plant would provide ammonia removal in the biological treatment process and utilize ultraviolet (UV) light disinfection to replace the existing chlorine-based disinfection system.

Advantages

- Provides sufficient treatment to meet ammonia and chlorine effluent limits on "end-of-pipe" basis, no outfall modifications required
- Does not require acquisition of additional land
- Capable of future expansion without acquiring additional property
- Does not require hydraulic permit approval from Department of Fish and Wildlife or permits from Corps of Engineers and Skagit County
- Less risk of impact by stricter environmental regulations in future

Disadvantages

- Greater complexity and operating costs than lagoon system (alternatives 1B and 1C)
- Greater quantities of biosolids generated, higher biosolids disposal costs
- Biosolids treatment/disposal a continuous requirement

EFFLUENT DISPOSAL TO LAND (LAND TREATMENT)

Alternative 2A Land Treatment System

Brief Description

This alternative involves the acquisition of sufficient land to use the effluent to irrigate a managed crop such as trees or grass. Treatment is less than reuse quality, so application

at agronomic rates is required to avoid groundwater contamination. Setbacks sufficient to protect drinking water wells (500 ft) are assumed. Sufficient storage facilities, consisting of lined lagoons, will be provided to store effluent during the non-growing season when no effluent can be discharged.

Advantages

- If effluent applied at agronomic rates, lagoon treatment is sufficient
- Treatment process retains much of the operational simplicity of a lagoon treatment system
- Potential revenue from irrigated crop

Disadvantages

- Requires significant land area[1]
- Lack of sufficient land area in vicinity of Town, would require lengthy conveyance system to storage and irrigation facilities
- Potential high cost of land acquisition
- Requires hydrogeological study
- Requires groundwater monitoring system
- Low operating costs of lagoon treatment system likely offset by operating costs of effluent irrigation and groundwater monitoring systems
- Requires acceptance by landowners adjacent to the irrigation and storage areas

[1] Based on a net irrigation requirement of 11 inches/year (see Table 2-8, Chapter 2), and 500 ft setbacks, the land application area would need to be 370 acres, storage facilities would require another 15 acres, total area requirement would be on the order of 400 acres

WATER REUSE

Background

This alternative involves two basic methods of year round 100 percent water reuse, with other ancillary commercial uses possible (e.g. concrete manufacturing) depending on the demand. Year round commercial water reuse is not viewed as feasible at this time because it is considered unlikely that an industry with sufficient water demand would be located in the Concrete area in the near future.

The first reuse option is the augmenting streamflows in the Little Baker Creek (also known as the Little Baker River). The second reuse option is groundwater recharge.

Both options would involve a high level of treatment that meets Class A reuse standards as well as the applicable water quality standards for the receiving water as discussed in Chapter 3.

Alternative 3A Streamflow Augmentation with Ancillary Commercial/Institutional Uses

Brief Description

The Little Baker Creek is shown on the FEMA flood map as well as the original treatment plant design drawings as a stream that begins approximately 400 ft downstream of the treatment plant outfall. The FEMA flood map shows the stream flowing into the Skagit River approximately 2,000 ft downstream Baker and Skagit River confluence. Aerial photographs indicate that a small channel with the same approximate route shown on the FEMA map was present in July 1998.

A site visit on June 20, 1999 by Gray & Osborne determined that the upper 700-800 ft of the Little Baker Creek has been filled in from the Baker River to a point near the gravel/concrete pit on the southeast part of town. Water in the creek appears to be fed from stormwater runoff and may be an expression of the local groundwater table.

The Town has been approached by a local citizen regarding plans to restore Little Baker Creek as a fisheries resource, specifically for salmon habitat improvements. The streamflow augmentation concept is an option to consider as part of the Little Baker Creek enhancement project.

Advantages

- Year round beneficial use of reclaimed water
- Enhancement of fisheries resource
- Wide variety of other institutional/commercial uses possible, including irrigation of Town parks, concrete manufacturing, etc.

Disadvantages

- Greater complexity and operating cost than treatment systems for alternatives 1A, 1B, 1C and 2A
- Greater quantities of biosolids generated, higher biosolids disposal costs
- Biosolids treatment/disposal a continuous requirement

- Capital cost for treatment facilities will be higher than those for alternatives 1A, 1B, 1C and 2A
- Biomonitoring and water quality monitoring in stream may be required
- New outfall will require hydraulic permit approval (HPA) from Washington Department of Fish and Wildlife as well as U.S. Army Corps of Engineers and Skagit County Shorelines permits
- As a water reclamation project will require review and approval by Department of Health as well as Department of Ecology

Alternative 3B Groundwater Recharge with Ancillary Commercial/Institutional Uses

Brief Description

This option will treat the Town's wastewater to meet groundwater recharge standards for surface applied reclaimed water as described in Chapter 3.

The Town would need to purchase sufficient land to enable reclaimed water to be land applied and percolate to groundwater. Without a detailed hydrogeologic study to evaluate soil infiltration capacity and mounding potential, sizing of an infiltration area is difficult. For this preliminary evaluation it is assumed that a long-term infiltration rate of 1.4 inches/day is possible. For the annual average flow rate of 0.277 MGD, this requires a land area of 7.5 acres. Assuming a 50 ft setback from potable water wells (see Table 3-7), a total requirement of 8 acres is assumed for the infiltration system.

Advantages

- Year round beneficial use of reclaimed water
- Eliminates discharge to Baker River
- Wide variety of other institutional/commercial uses possible, including irrigation of Town parks, concrete manufacturing, etc.
- Does not require hydraulic permit approval from Department of Fish and Wildlife or permit from Corps of Engineers

Disadvantages

- Greater complexity and operating cost than treatment systems for alternatives 1A, 1B, 1C and 2A
- Greater quantities of biosolids generated, higher biosolids disposal costs
- Biosolids treatment/disposal a continuous requirement

- Capital cost for treatment facilities will be higher than those for alternatives 1A, 1B, 1C and 2A
- Requires a land area seven times that of current treatment plant site
- Cost of land acquisition
- Requires hydrogeological study to evaluate (1) groundwater mounding effects and (2) impacts to domestic wells in the area
- Requires groundwater monitoring system
- As a water reclamation project will require review and approval by Department of Health as well as Department of Ecology
- Will require approval from Skagit County

INITIAL SCREENING OF ALTERNATIVES

The following alternatives are considered impractical for the reasons described and will not be evaluated in greater detail.

Alternative 1B Continued Lagoon Treatment (with New/Relocated Treatment Plant) and Disposal to the Skagit River via New Outfall

This alternative would require construction of a completely new plant. None of the existing facilities would be suitable for relocation and reuse and the existing plant would be abandoned as a treatment facility. Although the potential exists for more relaxed effluent limits by retaining the lagoon treatment process, the Town would need to obtain a mixing zone in perpetuity to meet ammonia limits as well as a waiver for suspended solids limits above the standard limits applied to most municipal wastewater treatment plants. The only possible site for the facility is an area that is currently zoned residential. Rezoning the site and surrounding areas will be required to avoid encroachment by residential growth. The cost of the new treatment facilities and outfall is expected to make this alternative significantly more costly than either Alternative 1A or 1C.

Alternative 2A Land Treatment System

This alternative would involve a major shift in the method of managing the Town's wastewater. Although the environmental advantages of using effluent to irrigate a crop are significant, the potential for impacts to groundwater quality also exist with this option. The overriding issue with land treatment, however, is the need for a substantial land area for irrigation, setbacks and lined storage lagoons. When land acquisition, pipeline and storage lagoon construction costs are included, the total cost of such a system is expected to far exceed any of the other alternatives being evaluated. The availability of suitable property (an estimated 400 acres) has not been determined,

however, the likelihood that such a large tract of irrigable land would be available is considered extremely remote. Acceptance by the public and regulatory agencies is not expected to be as favorable as other options being evaluated.

Alternative 3B Groundwater Recharge with Ancillary Commercial/Institutional Uses

As with the land treatment alternative, groundwater recharge would shift the Town to a land-based method of managing their wastewater. By providing a high level of treatment prior to land application, agronomic application rates are not necessary and the land area requirements can be substantially reduced. However, groundwater quality will remain an issue and hydrogeological studies will be necessary to (1) design an infiltration system that will not cause groundwater mounding and (2) evaluate impacts to domestic wells in the area. The land area required to operate the total wastewater treatment and reuse system will be at least seven times greater than the land area currently under the Town's control and acquisition of sufficient suitable land would still be difficult. Compared to the other reuse option (streamflow augmentation), this method of reuse is expected to have less overall benefit to the environment and may not be viewed favorably by the regulatory agencies and the public.

TECHNICAL AND COST ANALYSIS OF TREATMENT ALTERNATIVES

The analysis presented below provides additional engineering and cost information to compare the remaining wastewater treatment and disposal alternatives being considered.

Alternative 1A Continued Lagoon Treatment and Disposal to the Baker River via Relocated Outfall

Description

As discussed in Chapter 4, the Town's existing aerated lagoon is overloaded. Using current design criteria for aerated lagoons (equation 4-1), a concept for an expanded lagoon system was developed. The new lagoon system would consist of two lagoons: the existing lagoon modified with a curtain baffle down the center and a second larger lagoon. The new lagoon would be baffled to aerate the first 2/3 of the lagoon and leave the remaining 1/3 unaerated to provide a quiescent zone for solids settling.

Upgrades to the headworks would include a new self-cleaning screen, along with a new Parshall flume to measure influent flow. The forcemain from lift station 3 will be re-

routed to the new headworks to allow this flow to be measured and sampled as part of a single influent to the plant.

The chlorine gas disinfection system would be expanded to accommodate the higher flows by constructing a new larger chlorine contact tank. The existing gas chlorination system would be replaced with a system that meets current Department of Ecology design standards, including a chlorine gas leak detection system with alarm. The new chlorine gas disinfection system would be located at the outlet of the new lagoon. The existing chlorine gas system would be removed to allow the lab to be expanded.

Solids generated by the treatment process would be handled as they are now by periodic pumping of the stabilized solids from the lagoon bottom and dewatering using the filter bag method (currently underway). The lab would be expanded by removing the wall between the existing lab room and the chlorine room. The expanded lab would be able to accommodate more storage facilities and a refrigerator to store influent and effluent samples. It is assumed that the Town would continue to have their samples analyzed by an outside lab, however, the Town may want to reconsider this after reviewing the number and type of analysis that will be required under a new NPDES permit.

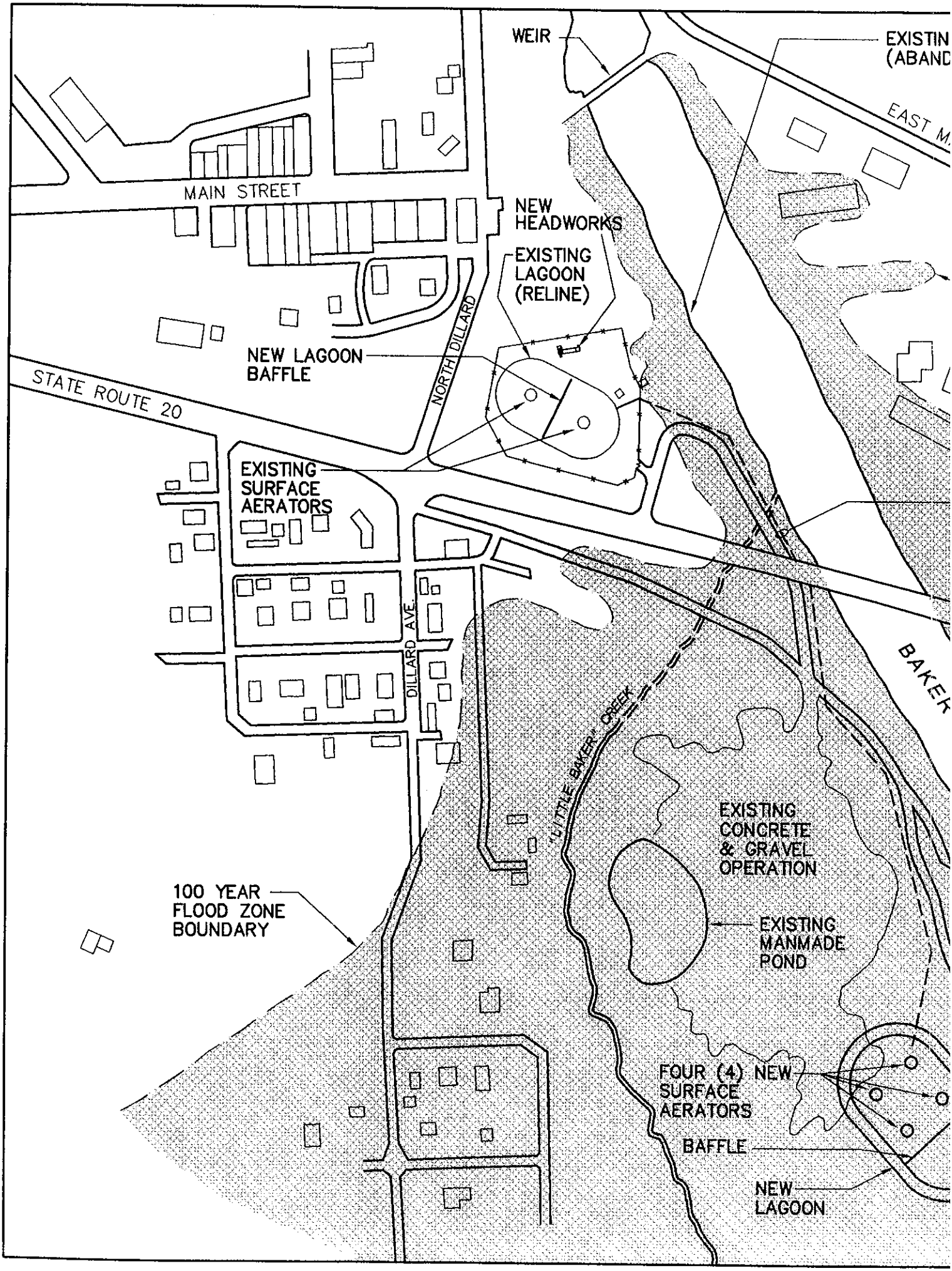
Figure 6-1 shows a possible layout for the expanded lagoon system. Table 6-1 provides pertinent design criteria and Table 6-2 provides a preliminary cost estimate for capital and operating costs for this option.

The availability of suitable sites for constructing additional lagoon facilities is limited. Figure 6-1 shows a possible site for the new lagoon constructed outside the City's UGA boundaries and within the 100-year flood zone.

No suitable location within the Town's UGA boundary appears to exist for the construction of a second lagoon large enough to handle future flows/loadings. To locate the second lagoon outside of the 100-year flood zone would appear to be difficult and could require the entire plant to be relocated. Accordingly, the availability of land to construct a second lagoon has not been factored into this evaluation nor has a cost for land acquisition been included in the preliminary cost estimate.

To construct a second lagoon within the 100-year flood zone would require that the facilities be built to a height that prevents flooding. The USGS topographic map and FEMA flood map are not clear with respect to the elevation of the area for the proposed lagoon shown in Figure 6-1, however, it is assumed that an effluent lift station would be needed to pump effluent to the river when there is insufficient head to flow by gravity

from the chlorine contact tank to the outfall. A survey of the area would be needed to verify design requirements for an effluent lift station.



BY: RDNM CREATED: JUN 18 1999 12:15:14 UPDATED: JUL 06 1999 16:59:52 PLOTTED: JUL 08 1999 09:04:28 FILE: L:\CONCRETE\98749\FIG6-1.DWG

One of the potential funding agencies for this project, USDA Rural Development, was contacted regarding the acceptability of receiving funding for a project involving construction in a flood zone. According to discussions with USDA RD Environmental Specialist, construction in flood zones is strongly discouraged unless there are not other options (Laurel Andrews, USDA RD, July 1999). USDA RD further advised that current federal policy is to discourage construction within the 500-year flood zone. With the exception of a small sloped area on the east side of the plant, the existing treatment plant site lies outside of the 100-year flood zone, but much of the treatment plant is within the 500-year flood zone.

Other issues to consider with the construction of a second lagoon would be the potential presence of wetlands and protected wildlife habitat within the proposed construction area. A wetlands survey and determination of the presence of any protected wildlife habitat in the area would be required before siting a new wastewater facility in the proposed construction area.

TABLE 6-1

Preliminary Design Criteria
Expanded Lagoon System
Town of Concrete

Influent Criteria	Current	Future
Average Annual Flow (GPD)	90,000	226,000
Maximum Month Flow (GPD)	155,000	362,000
Maximum Day Flow (GPD)	303,000	746,000
Peak Hour Flow (GPD)	-	904,000
BOD_5 Loading (lb/day)	165	362
TSS Loading (lb/day)	141	362

Effluent Criteria	Average Month	Average Weekly
BOD_5 (mg/L)	< 30	< 45
TSS (mg/L)	< 75	< 110
Fecal Coliform (#/100 mL)	< 200	< 400
	Average Month	**Maximum Day**
Ammonia (mg/L)	< 45	< 90
Residual Chlorine (mg/L)	< 0.116	< 0.304

TABLE 6-1
(continued)

Preliminary Design Criteria
Expanded Lagoon System
Town of Concrete

Treatment System		
Unit Process	**Number - Type**	**Criteria**
Headworks		
Influent Screen	One - Self-Cleaning	¼-inch Screen Opening
Grit Removal System	Two - Gravity Horizontal channel	
Secondary Treatment System		
Number and Type	Two - Aerated Lagoon	
Lagoon No. 1 (Existing)		
Total Volume		1.76×10^6 gal
1st Cell Volume		0.88×10^6 gal
2nd Cell Volume		0.88×10^6 gal
Water Surface Area		30,820 ft^2
Liner	Single Liner - PVC	40 mil
1st Cell Aerator	One - Surface	7.5 hp
2nd Cell Aerator	One - Surface	7.5 hp
Lagoon No. 2 (New)		
Total Volume		3.6×10^6 gal
1st Cell Volume		2.4×10^6 gal
2nd Cell Volume		1.2×10^6 gal
Water Surface Area		48,500 ft^2
Liner	Single Liner - PVC	40 mil
1st Cell Aerator	Four	7.5 hp
2nd Cell Aerator	None	n/a
Design rate constant, k_T		0.1 day^{-1}
Design Temperature, T		6.0 °C

TABLE 6-1
(continued)

Preliminary Design Criteria
Expanded Lagoon System
Town of Concrete

Disinfection System		
Type	Chlorine Gas	150 lb cylinders
Contact Time @ 0.362 MGD		60 minutes
Contact Time @ 0.904 MGD		20 minutes
Tank Dimensions		
No. of Tanks / Volume Each	Two	2,100 ft^3
Depth - Total		6 ft
Sidewater Depth		4 ft
Length/Width Ratio		40
Overall Dimension per Tank		15 ft x 36 ft
Chlorine Usage @ MDF		50 lb/day
Chlorine Usage @ AAF		5,475 lb/yr
Dechlorination System		
Type	Sodium Bisulfite Liquid	38% solution
Sodium Bisulfite Usage @ MDF		12.5 lb/day
Sodium Bisulfite Usage @ AAF		1,400 lb/yr

TABLE 6-2

Preliminary Cost Estimate
Expanded Lagoon System
Town of Concrete

Item	Cost
1. Mobilization/Earthwork/Dewatering/ Clearing & Grubbing	$500,000
2. Headworks w/Fine Screen, Influent Flow Meter & Sampler	$100,000
3. New Lagoon Aeration Equipment	$40,000
4. New Chlorine Disinfection (Chlorine Contact Tank, Gas Chlorination) and Dechlorination Systems	$120,000
5. MCC/Equipment Bldg. at New Lagoon	$30,000
6. Pipeline between Lagoons	$120,000
7. Effluent Lift Station	$100,000
8. Effluent Flow Meter & Sampler	$10,000
9. Plant Piping/Valves	$150,000
10. Electrical & Instrumentation (includes auxiliary generator)	$200,000
11. New Outfall	$30,000 **(NOTE 1)**
12. Lagoon Liners and Baffles	$200,000 **(NOTE 2)**
13. Modify Existing Lab	$10,000 **(NOTE 3)**
SUBTOTAL	$1,610,000
20% Contingency	$322,000
7.8% WA Sales Tax	$151,000
ESTIMATED CONSTRUCTION COST	$2,083,000
22% Legal, Administration, Engineering	$458,000
Permitting (DOT, HPA, Skagit County, SEPA, Corps of Engineers), Rights of Way and Easements	$50,000
TOTAL ESTIMATED CAPITAL COST	$2,591,000
SAY	**$2,600,000 (NOTE 4)**
NOTE 1	**Does not include significant mitigation for fish habitat protection**
NOTE 2	**Does not include sludge removal/disposal costs for existing lagoon**
NOTE 3	**Assumes no major lab equipment purchases**
NOTE 4	**Does not include land acquisition costs**

TABLE 6-2
(continued)

Preliminary Cost Estimate
Expanded Lagoon System
Town of Concrete

Operations/Maintenance Item	**Annual Cost**
Labor (One Full-time Operator)	$40,000
Utilities	$20,000
Chemicals	$10,000
Maintenance and Repair	$20,000
Laboratory Services/Supplies	$10,000
Professional Services	$2,000
Miscellaneous	$1,000
Total Annual O&M	**$103,000**
Biosolids Disposal over 20 years[1]	**$400,000**
20-year Present Worth of O&M (i = 5%)	**$776,414**
Total Capital Cost (Year 2000)	**$2,600,000**
Total 20-year Project Present Worth	**$3,376,414**
[1] Based on cleaning the two lagoons every five years	

Alternative 1C Upgrade Treatment Plant and Continued Disposal to Baker River via Existing Outfall

Description

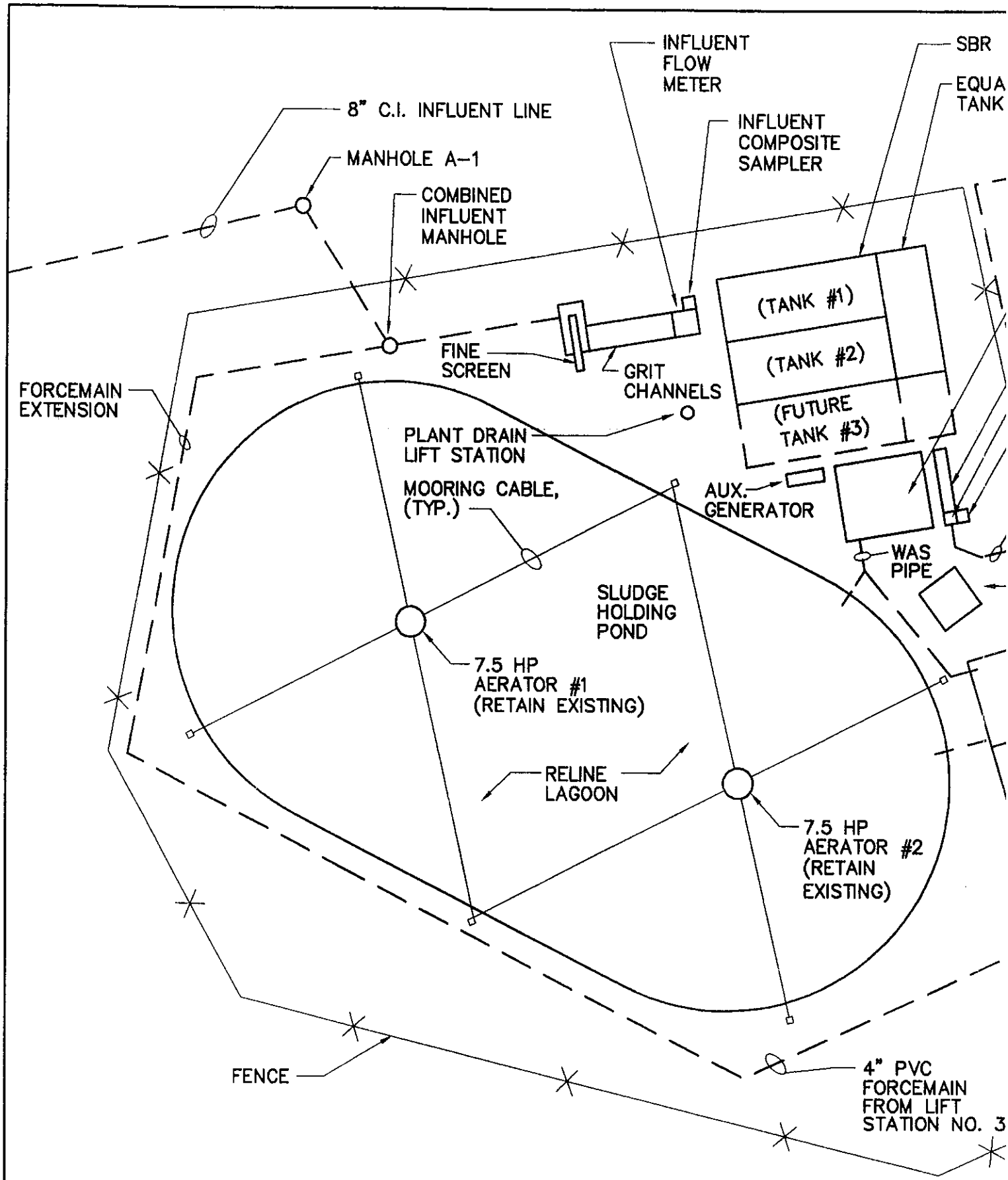
This alternative would replace the existing lagoon treatment facility with a treatment process than can reliably remove ammonia. Headworks improvements would consist of a new self-cleaning screening, new influent flow meter, and a flow-paced sampling system.

The forcemain from lift station No. 3 would be routed to the new headworks to provide a single influent to the plant. The chlorine gas disinfection system would be replaced with an ultraviolet (UV) light system to eliminate chlorine from the effluent.

Figure 6-3 shows the layout for the upgraded plant. Due to site constraints, a sequencing batch reactor (SBR) was chosen for this evaluation. Other common treatment processes for small plants were considered, including an oxidation ditch and activated sludge with external clarifiers, but these other options would not fit within the available land area.

Solids generated by the new treatment process would be stored in the relined lagoon and dewatered using a small screw press. The existing surface aerators would be retained for odor control within the lagoon. The lagoon would provide sufficient holding time to stabilize the solids to Class B pathogen reduction requirements and could be land applied as a fertilizer and soil conditioner.

Design criteria for the SBR treatment facility are presented in Table 6-3. A preliminary cost estimate for capital and O&M costs is presented in Table 6-4.



BY: RONM CREATED: JUN 18 1999 12:15:14 UPDATED: JUL 08 1999 17:16:36 PLOTTED: JUL 12 1999 15:30:06 FILE: L:\CONCRETE\98749\FIG6-2.DWG

TABLE 6-3

Preliminary Design Criteria
Upgrade WWTF and Retain Existing Outfall
Town of Concrete

Influent Criteria	Current	Future
Average Annual Flow (GPD)	90,000	226,000
Maximum Month Flow (GPD)	155,000	362,000
Maximum Day Flow (GPD)	303,000	746,000
Peak Hour Flow (GPD)	-	904,000
BOD_5 Loading (lb/day)	165	362
TSS Loading (lb/day)	141	362
TKN Loading (lb/day)	-	94
Effluent Criteria	**Average Month**	**Average Weekly**
BOD_5 (mg/L)	< 30	< 45
TSS (mg/L)	< 30	< 45
Fecal Coliform (#/100 mL)	< 200	< 400
	Average Month	**Maximum Day**
Ammonia (mg/L)	< 1.29	< 5.7
Residual Chlorine (mg/L)	< 0.011	< 0.019
Treatment System		
Unit Process	**Number - Type**	**Criteria**
Influent Screen	One - Self-Cleaning	¼-inch Screen Opening
Grit Removal	Two - Gravity Horizontal channel	
Secondary Treatment System		
Type	Sequencing Batch Reactor (SBR)	Two-Tanks Expandable to Three
Individual Tank Volume		175,000 gal
Individual Tank Dimensions		25 ft x 63 ft x 17 ft
Sidewater Depth		15 ft
Maximum Decant Depth		4 ft
No. Cycles		4/day

TABLE 6-3
(continued)

Preliminary Design Criteria
Upgrade WWTF and Retain Existing Outfall
Town of Concrete

Design Mixed Liquor Suspended Solids		2500 mg/L
F/M		0.05 lb/(lb-day)
Assumed Yield		0.9 lb/lb
Aerated SRT		15 days
Design Temperature		10° C
Aeration System Blowers	Three - Positive Displacement (Two Operating, One Standby)	15 hp each
Disinfection System		
Type	Low Pressure Ultraviolet (UV) Light	Single Horizontal Channel
No. Banks	Two (One Operating One Standby)	
Lamps Per Bank	20	
Minimum UV Dose @ MMF		30,000 μW-sec/cm^2
Solids Handling & Treatment Systems		
Solids Production @ design BOD loading		326 lb/day
Sludge Holding Pond	One - PVC Lined	500,000 gal
Maximum Sludge Holding Time @ design BOD loading		90 days
Solids Dewatering System	One - Screw Press	
Maximum Solids Feed Rate		750 lb/hr
Maximum Liquid Feed		30 gal/min
Minimum Solids in Feed		0.5 %
Maximum Solids in Cake		8.0 %

TABLE 6-4

Preliminary Cost Estimate
Upgrade WWTF and Retain Existing Outfall
Town of Concrete

Item	Cost
1. Mobilization/Earthwork/Clear & Grub	$130,000
2. Headworks w/Fine Screen	$100,000
3. Aeration Basin w/Equalization Tank	$300,000
4. SBR Equipment (blowers. decant system, controls)	$350,000
5. Operations Bldg. (MCC, blower room)	$50,000
6. UV Disinfection System	$60,000
7. Plant Drain Lift Station	$30,000
8. Plant Piping/Valves/Appurtenances	$160,000
9. Electrical & Instrumentation (includes auxiliary generator)	$220,000
10. Remove and Replace Existing Lagoon Liner for Sludge Aeration/Storage	$50,000
11. Biosolids Dewatering System (w/new Building)	$150,000
12. Modify/Equip Existing Lab	$40,000
SUBTOTAL	$1,640,000
20% Contingency	$328,000
7.8% WA Sales Tax	$154,000
ESTIMATED CONSTRUCTION COST	**$2,122,000**
22% Legal, Admin, Engineering	$466,000
TOTAL ESTIMATED CAPITAL COST	**$2,588,000**
SAY	**$2,600,000**

TABLE 6-4
(continued)

Preliminary Cost Estimate
Upgrade WWTF and Retain Existing Outfall
Town of Concrete

Operations/Maintenance Item	Annual Cost
Labor (One Full-Time, One Part-Time Operator)	$50,000
Utilities	$12,500
Chemicals	$500
Maintenance and Repair	$20,000
Laboratory Services/Supplies	$10,000
Professional Services	$2,000
Miscellaneous	$1,000
Biosolids Disposal[1]	$14,000
Total Annual O&M	**$110,000**
20-year Present Worth of O&M (i = 5%)	**$829,180**
Total Capital Cost (Year 2000)	**$2,600,000**
Total 20-year Project Present Worth	**$3,429,180**
[1] Based on contracted haul at $25/wet ton	

Note: Although they have become popular again in recent years due to their low initial capital costs, ***proprietary package treatment processes were not considered in this evaluation****. Because of their proprietary design and limited performance information from objective third party evaluations, accepted engineering design criteria typically do not exist for proprietary wastewater systems. Manufacturers often utilize empirical data for critical components of their designs in lieu of accepted engineering design standards. As a result designs are often predicated on highly optimistic biological kinetic rates, exceptional sludge settleability characteristics and low ratios of peak to average flow. Such design assumptions are not consistent with accepted design standards found in Department of Ecology's Criteria for Sewage Works Design and other widely accepted municipal wastewater design references such as Metcalf and Eddy (WASTEWATER ENGINEERING Treatment Disposal and Reuse, 3rd Ed., 1991.) and WEF/ASCE (Design of Municipal Wastewater Treatment Plants, 1991).* ***Of particular concern is the lack of performance and maintenance information for the full design life of these systems.*** *While a community must finance a project for 20 to 40 years, few of the package wastewater systems currently being marketed have been operating for greater than 10 years. The construction of a proprietary wastewater treatment system using limited operating information and design assumptions that lack appropriate levels of conservatism presents a significant risk to a small community that typically incurs significant debt to finance their wastewater improvement project.*

Alternative 3A Streamflow Augmentation with Ancillary Commercial/Institutional Uses

Description

The same headworks and biological treatment processes described in Alternative 1C would be installed. A chemical coagulation and filtration system would be added after the SBR and a UV disinfection system sized to meet pathogen removal levels required for Class A reclaimed water standards. A new outfall would be constructed to discharge to Little Baker Creek.

Figure 6-3 shows the layout for a water reclamation facility with streamflow augmentation as the primary reuse method. Table 6-5 presents the pertinent design criteria for this alternative and Table 6-6 provides a preliminary cost estimate for capital and O&M costs.

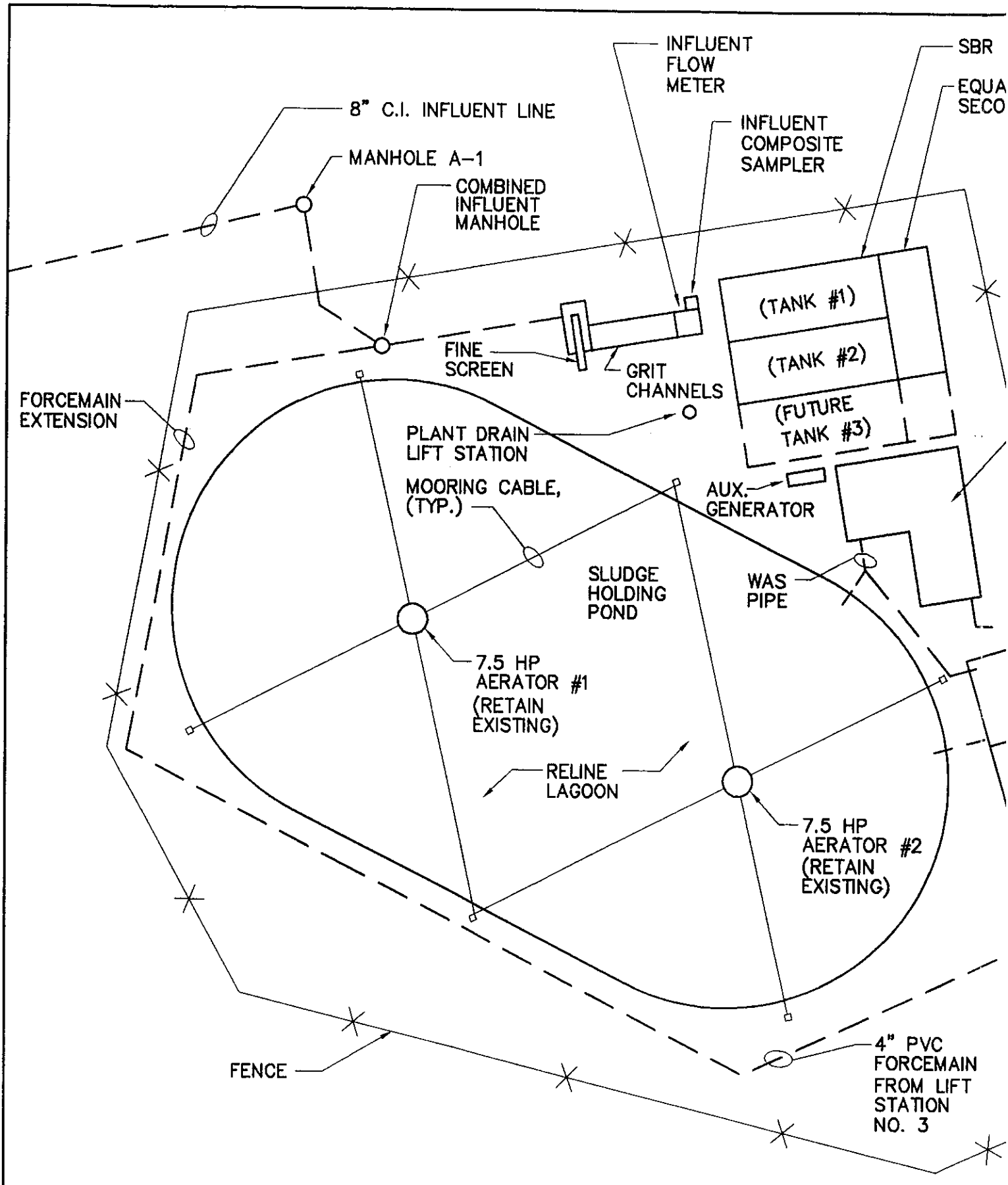


TABLE 6-5

Preliminary Design Criteria
Water Reclamation Facility with Streamflow Augmentation
Town of Concrete

Influent Criteria	Current	Future
Average Annual Flow (GPD)	90,000	226,000
Maximum Month Flow (GPD)	155,000	362,000
Maximum Day Flow (GPD)	303,000	746,000
Peak Hour Flow (GPD)	-	904,000
BOD_5 Loading (lb/day)	165	362
TSS Loading (lb/day)	141	362
TKN Loading (lb/day)	-	94
Effluent Criteria	**Average Month**	**Average Weekly**
BOD_5 (mg/L)	< 30	< 45
TSS (mg/L)	< 30	< 45
	Single Sample	**Mean of Last 7-days of Samples**
Total Coliform (#/100 mL)	< 23	< 2.2
	Average Month	**Maximum Day**
Ammonia (mg/L)	< 1.29	< 5.7
Residual Chlorine (mg/L)	< 0.011	< 0.019
Treatment System		
Unit Process	**Number - Type**	**Criteria**
Influent Screen	One - Self-Cleaning	¼-inch Screen Opening
Grit Removal	Two - Gravity Horizontal channel	
Secondary Treatment System		
Type	Sequencing Batch Reactor (SBR)	Two-Tanks Expandable to Three
Individual Tank Volume		175,000 gal
Individual Tank Dimensions		25 ft x 63 ft x x17 ft
Sidewater Depth		15 ft
Maximum Decant Depth		4 ft
No. Cycles		4/day

TABLE 6-5
(continued)

Preliminary Design Criteria
Water Reclamation Facility with Streamflow Augmentation
Town of Concrete

Design Mixed Liquor Suspended Solids		2500 mg/L
F/M		0.05 lb/(lb-day)
Assumed Net Yield		0.9 lb/lb
Aerated SRT		15 days
Design Temperature		10° C
Aeration System Blowers	Three - Positive Displacement (Two Operating, One Standby)	15 hp each
Chemical Coagulation System		
Type	Two - Polymer Feed w/ One - In-Line Static Mixer & One-Flocculating Chamber	
Filtration System		
Type	One - Fabric Disk	600 gal/min
Disinfection System		
Type	Low Pressure Ultraviolet Light (UV)	Single Horizontal Channel
No. Banks	Four (Three Operating One Standby)	
Lamps Per Bank	28	
Minimum UV Dose @ PHF		100,000 μW-sec/cm^2
Solids Handling & Treatment Systems	See Table 6-3	

TABLE 6-6

Preliminary Cost Estimate
Water Reclamation Facility with Streamflow Augmentation
Town of Concrete

Item	Cost
1. Mobilization/Earthwork/Clear & Grub	$130,000
2. Headworks w/Fine Screen	$100,000
3. Aeration Basin w/Equalization Tank	$300,000
4. SBR Equipment (blowers. decant system, controls)	$350,000
5. Lab/Operations Bldg. (MCC, filter, blower room)	$200,000
6. Chemical Coagulation/Flocculation and Filtration Systems	$400,000
7. UV Disinfection System	$180,000
8. Plant Drain Lift Station	$30,000
9. Plant Piping/Valves/Appurtenances	$200,000
10. Electrical & Instrumentation (includes auxiliary generator)	$270,000
11. Remove and Replace Existing Lagoon Liner for Sludge Aeration/Storage	$50,000
12. Biosolids Dewatering System (w/new Building)	$100,000
13. Lab Equipment	$30,000
14. Outfall to Little Baker Creek	$50,000
SUBTOTAL	$2,390,000
20% Contingency	$478,000
7.8% WA Sales Tax	$224,000
ESTIMATED CONSTRUCTION COST	**$3,092,000**
22% Legal, Admin, Engineering	$680,000
TOTAL ESTIMATED CAPITAL COST	**$3,772,000**
SAY	**$3,800,000**

TABLE 6-6
(continued)

Preliminary Cost Estimate
Water Reclamation Facility with Streamflow Augmentation
Town of Concrete

Operations/Maintenance Item	Annual Cost
Labor (One Full-Time, One Part-Time Operator)	$60,000
Utilities	$15,000
Chemicals	$3,500
Maintenance and Repair	$25,000
Laboratory Services/Supplies	$15,000
Professional Services	$4,000
Miscellaneous	$2,000
Biosolids Disposal[1]	$14,000
Total Annual O&M	**$138,500**
20-year Present Worth of O&M (i = 5%)	**$1,044,013**
Total Capital Cost (Year 2000)	**$3,800,000**
Total 20-year Project Present Worth	**$4,844,013**
[1] Based on contracted haul at $25/wet ton	

COMPARISON OF ALTERNATIVES

Table 6-7 summarizes costs for the three alternatives evaluated in detail.

TABLE 6-7

Comparison of Treatment System Alternatives
Town of Concrete

Alternative	Preliminary Capital Cost Estimate	Preliminary 20-Year O&M Cost Estimate	Preliminary 20-Year Present Worth Cost Estimate
1A Expanded Lagoon WWTF & Disposal to Baker River via New Outfall	$2,600,000	$2,060,000	$3,376,414
1C Upgrade WWTF & Disposal to Baker River via Existing Outfall	$2,600,000	$2,200,000	$3,429,180
3A Water Reclamation Facility with Streamflow Augmentation to Little Baker River	$3,800,000	$2,770,000	$4,844,013

Table 6-8 presents a comparison of all six original alternatives that were evaluated based on the factors described below. Each alternative was ranked 1 to 6. When no discernible difference was readily apparent between alternatives, an equal ranking was given. Rankings are totaled, with each criteria given equal weight. The alternative with the lowest total is considered the most acceptable in terms of the rating method.

Effluent Quality

Higher ranking was given for higher effluent quality.

Adaptability to Higher Levels of Treatment

The ranking is based on the ability to readily modify the system to achieve higher levels of treatment due to more stringent environmental or public safety regulations in the future.

Operational Considerations

Ranking is based on process stability, simplicity of operation and maintenance and operational flexibility.

Projects Costs

Both capital and maintenance costs were considered in this ranking. Higher ranking is given to lower overall cost.

Public Acceptance

Higher ranking was given to projects perceived to have a higher acceptance level due to environmental, aesthetic, land use and financial impacts to (1) sewer rate payers, (2) adjacent property owners, (3) potentially interested environmental stakeholder groups and (3) other local citizen groups.

Aesthetics

The ranking is based on immediate aesthetic aspects of the project, including noise, odor and visual impacts.

Phasing and Expansion Capability

The relative ease and ability to phase the project within the 20-year planning horizon is the basis for this ranking.

Need for Additional Technical & Feasibility Studies

The need for additional technical and feasibility studies will impact costs and project schedule and may be basis for acceptance by regulatory agencies and potential environmental stakeholder groups. Examples of additional studies include environmental assessments beyond a SEPA (e.g. an Environmental Impact Statement), biological assessments of streams, geotechnical or hydrogeologocal studies, land use/availability studies and property value assessments. Higher ranking was given to alternatives expected to have fewer requirements or more limited scope for such studies

Based on the rankings in Table 6-8, the alternatives are ranked in the following order:

1C Upgrade Wastewater Treatment Facility and Discharge to Existing Baker River Outfall

Alternative with lowest overall cost. Will require the fewest additional studies. Has potential for expansion for greater capacity and higher levels of treatment.

3A Water Reclamation Facility with Streamflow Augmentation to Little Baker Creek

Has higher overall cost than 1A, 1B and 1C, but unlike 1A and 1B, can be constructed entirely within existing property boundaries of treatment plant and remain outside the 100-year flood zone.

1A Expanded Lagoon System with Discharge to New Baker River Outfall

Overall cost may be lower than all but alternative 1C (assuming existing lagoon treatment facilities are retained and land acquisition costs are not extremely high). However, will require relocation of treatment plant facilities and a new outfall in the Baker River. Preliminary evaluation indicates construction in flood zone would be required unless plant is relocated. Flood zone construction may be ineligible for federal funding. Availability and cost of additional land unknown at this time. Significant delays likely to assess land availability and cost. New outfall will require a number of permits as well as biological assessment to meet ESA requirements.

Alternative 1B Continued Lagoon Treatment (with New/Relocated Treatment Plant) and Disposal to the Skagit River via New Outfall

This alternative would involve greater permitting requirements and substantially more cost to relocate the treatment facility and outfall to a new locations. Treatment plant would be relocated to an area now zoned as residential creating potential for concern by neighboring residences. Levels of treatment would be lower than Alternative 1C, which is expected to cost less, therefore, support from regulatory and funding agencies would be difficult to obtain.

3B Water Reclamation Facility with Groundwater Recharge

Changes the method of treatment and effluent disposal to a land-based system. Significant issues will need to be addressed regarding acquiring sufficient suitable land for infiltration systems. Design of infiltration system will require extensive hydrogeologocal studies to avoid groundwater mounding problems and verify no

negative impacts on domestic water wells. Expected to be more expensive than all alternatives except 2A.

2A Land Treatment System

As with 3B, this presents an entirely new approach to wastewater treatment and disposal. Expected to be the most costly of all alternatives due to the need for vast tracts of property to apply effluent at agronomic rates and provide adequate setbacks and groundwater monitoring systems for public health protection. Would very likely exceed threshold for a SEPA determination of nonsignificance (DNS)and could require an Environmental Impact Statement (EIS) to obtain regulatory agency approval and public acceptance.

The ability to finance the project will be a significant factor in making the project feasible. Eligibility for financing is based on a number of factors that will vary between funding agencies. A more detailed discussion of financing options are presented in the final Chapter of this Plan. All factors that are considered significant by the potential funding agencies have been given included in the evaluation, however, individual agencies will place greater value on certain issues than others. Accordingly it is not possible to create a matrix that applies appropriate weight to each factor because the value placed on certain factors is higher for some agencies more than others.

Cost is a major factor in the project's acceptability to the funding agencies. The recommended alternative is the least cost alternative on a 20-year present worth basis and it is expected that even if cost were given significantly more weight than any of the other factors, the recommended alternative would remain as the Town's most acceptable option.

TABLE 6-8

Comparison of Wastewater Treatment and Disposal Alternatives
Town of Concrete

Alternative No. Description	Effluent Quality	Adaptable to Higher Treatment	Operations	Cost	Public Acceptance	Aesthetics	Phasing & Expansion Capability	Need for Additional Studies	TOTAL
1A Expanded Lagoon New Baker River Outfall	4	4	1	1	3	4	3	2	**22**
1B New Lagoon New Skagit River Outfall	4	4	1	3	4	4	3	4	**27**
1C Upgrade WWTF Retain Existing Outfall	3	1	3	1	1	2	1	1	**13**
2A Land Treatment	4	4	6	6	6	6	6	6	**44**
3A Water Reclamation Streamflow Augmentation	1	2	4	4	2	1	2	2	**18**
3B Water Reclamation Groundwater Recharge	1	2	4	5	5	3	5	5	**30**

CHAPTER 7

COLLECTION SYSTEM IMPROVEMENTS AND EXPANSION

INTRODUCTION

This Chapter identifies and describes recommended short-term and long-term improvements for the Town's existing sewage collection system (within the Town limits) as well as a plan for providing sewer service to the IUGA. The recommendations are based on the following information:

(1) Growth and planning considerations presented in Chapter 2
(2) Regulatory requirements identified in Ecology's *Criteria for Sewage Works Design*
(3) Evaluation of the existing collection system presented in Chapter 4 and;
(4) Projected flows and loadings identified in Chapter 5

GENERAL

The wastewater collection system requirements for the Town of Concrete will depend on the amount of residential and commercial growth that occurs within the interim urban growth area (IUGA) over the duration of the 20-year planning period. Improvements within the existing service area required to increase capacity, serve growth, or correct existing I/I problems are usually funded by user fees such as rate charges or local improvement district assessments. Utility Local Improvement Districts (ULIDs) involve an assessment made against properties who benefit by the sewer improvements. ULID bonds are guaranteed by revenues and are financed by the issuance of revenue bonds. Developers may fund the construction of extensions to the sewer collection system to property within new plats.

A discussion of the design criteria used to evaluate the existing and future collection system is presented below.

DESIGN CRITERIA

Information from the *Town of Concrete Comprehensive Plan,* field inspections, interviews with Town personnel, aerial photographs, and topographic maps were used during the evaluation. The technical reference used to evaluate the collection system improvements was the *Criteria for Sewage Works Design*, published by the Washington State Department of Ecology (Ecology), 1998 edition.

SHORT-TERM COLLECTION SYSTEM IMPROVEMENTS

The following paragraphs discuss short-term improvements recommended for the existing sewer service area as defined by the current Town limits. Cost estimates are in 1999 dollars. The recommended improvements are shown in Figure 7-1 at the end of this chapter.

Improvement 1: Conduct Smoke Testing of Remaining Portion of Collection System

As described in Chapter 4, Town personnel conducted smoke testing on approximately 7% of the collection system in September 1997. In order to fully comply with the stipulation in the Town's Consent Order (DE 98WQ-N103) from the Department of Ecology, smoke testing of the remaining portions of the collection system should be completed. It is recommended that the smoke testing be accomplished in late summer or early fall of 1999. In addition, it is recommended that the Town's Small Town Environmental Program (STEP) provide the labor to accomplish this task. By undertaking the smoke testing and implementing a disconnection program for illegal connections, the Town would be proactively reducing I/I in the sewer collection system. This effort is an important step to take in order to qualify for grant and/or loan packages from state agencies.

Improvement 2: Grout Points of Infiltration at Manholes R-2 and R-3

Manhole inspections conducted in January 1999 indicated points of infiltration at manholes R-2 and R-3 where the inlet pipe enters the manhole. It appears that the annular space where the inlet pipe comes into the manhole was not properly grouted. It is recommended that the points of infiltration be grouted by a certified contractor. The estimated cost for these repairs is approximately $1,500 per manhole.

Improvement 3: Investigate and/or Repair "Possible Broken Line or Cleanout" at 427 Duffy Street

The field notes during the smoke testing event (Appendix H) indicated that there may exist a "possible broken line or cleanout" at 427 Duffy Street. At a minimum, the Town should re-examine this area through smoke testing. Based on the results of the re-examination, corrections, if necessary, should be implemented.

Improvement 4: Disconnect By-Pass Line to Creek from Manhole M-1

Based on interviews with Town personnel, site visits by Gray & Osborne, and a review of as-built drawings of the collection system, it appears that an existing by-pass line is present and runs from manhole M-1 near Lift Station No. 1 to Little Baker Creek. According to Department of Ecology criteria, bypasses of raw sewage to ground or receiving streams are not allowed. Therefore, Town personnel possibly with the

assistance of STEP team members should excavate down to the bypass pipe and cut and plug it to eliminate any potential future by-passes.

LONG-TERM COLLECTION SYSTEM IMPROVEMENTS

Improvement 1: Provide Electrical Modifications to the Existing Three Lift Stations

As discussed in Chapter 4, electrical modifications to the three existing lift stations need to be made in order to meet Department of Ecology criteria for providing auxiliary power in the event of a power outage and alarm annunciation to alert the operator when a malfunction occurs. In addition, the deteriorated control panels at each of the three lift stations need to be replaced. The control panel upgrades should include programmable logic controllers with autodialers, ultrasonic level sensors, safety disconnect switches, emergency generator receptacles, soft starters, and associated control wiring. In addition, the heavily-corroded access hatch at lift station No. 3 needs to be replaced as well as the guide rail supports at each of the lift stations. Since one new pump and one rebuilt pump were recently installed at lift stations No. 1 and No. 2, future lift station pump replacement would be on an "as-needed" basis and would be funded under an operation and maintenance reserve fund.

Improvement 2: Provide an Additional, Parallel Sewer Line from Manhole A-4 to Manhole A-1

Pipe surcharging (pipes flowing full) is generally regarded as undesirable by Ecology. Surcharging of pipes can lead to the formation of septic conditions and/or the formation of hydrogen sulfide, a corrosive, poisonous gas. Pipes carrying 90 percent or more of its full-flow capacity at full build-out, should be increased in size. The projected peak hour flow in the year 2020 is estimated to be 904,000 gpd. The Town's collection system consists of 8-inch diameter gravity sewer lines. An 8-inch diameter sewer pipe laid at minimum slope and appropriate pipe roughness can handle approximately 500,000 gpd. Therefore, a portion of the 8-inch trunk line entering the treatment plant needs to be either increased in size or a new parallel line must be installed adjacent to it.

The installation of a parallel 8-inch line is considered the most cost effective method of increasing the capacity of the trunk line entering the treatment plant. Existing customers can be kept in service while the new parallel line is under construction, allowing construction to proceed more easily than if by-pass pumping were required for construction of a larger replacement line.

SEWER SERVICE TO GRASSMERE AREA (IUGA)

As discussed in Chapter 2, the Growth Management Act mandates that communities plan for growth over a twenty year planning horizon within their IUGA. The development of sewers for existing homes in the IUGA is predicated on the financial ability of the Town

to serve those areas. A general plan to serve the IUGA with sewer service is described in the following improvements.

Improvements required for future sewer service within the ultimate UGA are based on preliminary information contained in aerial photographs, topographic maps and site visits. The recommended method to provide sewer service to the existing residential and commercial developments in the Grassmere area would consist of a combination of gravity sewer lines, one forcemain, and one lift station located in the southwest corner of the IUGA. In addition, two (2) underground crossings of SR 20 will be required.

Improvement 1: Provide a New Lift Station No. 4 to Serve Area Within IUGA

Based on a preliminary survey of the IUGA area and topographic maps, a new lift station will be required to serve future flows within the IUGA (see Figure 7-1). Due to the southerly sloping landscape in the southern portion of the IUGA, a pump station would need to be located in the southwest portion of the IUGA. This new pump station would receive flows from the northwestern portion of the IUGA (north of SR 20) as well as flows from the western portion of the IUGA (south of SR 20). The forcemain from the associated lift station would discharge to a new manhole located along SR 20, which would then flow by gravity to Lift Station No. 2. The estimated cost of this new lift station is approximately $140,000.

Improvement 2: Provide New Forcemain and Sewer Lines to Serve Area Within IUGA

Sewer service is not currently provided within the IUGA. In order to provide sewer service to the IUGA, new gravity sewer lines and an associated forcemain from Lift Station No. 4 need to be constructed. Based on the location of existing residences within the IUGA, approximately 13,850 feet of 8-inch gravity sewer line and approximately 1,000 feet of 6-inch sewer forcemain needs to be constructed. In addition, two underground crossings of SR 20 would be required. The estimated cost of this improvement is $2,750,000.

Improvement 3: Provide and Install New Pumps at Lift Station No. 2 to Accommodate Flows from IUGA

Since lift station No. 4 will discharge into an upstream manhole which eventually flows into Lift Station No. 2, the capacity of Lift Station No. 2 needs to be increased to accommodate the additional flows from the IUGA area. The timing of increasing the lift station capacity will depend on when Lift Station No. 4 is constructed. The estimated cost for installing two (2) new pumps into Lift Station No. 2 is $30,000.

Financing for providing sewer service to the IUGA may be possible through a combination of developer extensions, grants and loans, local improvement districts, and/or system development charges (i.e. connection charges). A more detailed discussion of possible financing arrangements is presented in Chapter 9.

SUMMARY - COLLECTION SYSTEM IMPROVEMENTS

The recommended improvements for the wastewater collection system as described above are presented in Table 7-1 with estimated project costs and a suggested schedule for completion. With the exception of STEP projects, costs are based on the assumption that the projects will be undertaken by a general contractor. The estimated costs shown include 7.8 percent for state sales tax, a 20 percent construction contingency, a 22 percent administrative, fiscal, legal, and engineering allowance. All costs are in 1999 dollars. The location of the recommended improvements is shown in Figure 7-1. Detailed cost estimates for each improvement project are contained in Appendix L.

TABLE 7-1
Town of Concrete
Summary of Collection System Improvements

Improvement	Year Completed	Estimated Project Cost (1999 Dollars)
Short-Term		
1. Smoke Testing	1999	$500*
2. Grout MH R-2 & R-3	2000	$3,000
3. Investigate 427 Duffy Street	2000	Depends on Outcome of Investigation, $3,000
4. Disconnect By-Pass Line to Creek from Manhole M-1	1999	$200*
Long-Term		
1. Provide Electrical Modifications to Existing Lift stations	Before Year 2005**	$155,000
2. Provide an additional sewer line MH A-4 to MH A-1	Before Year 2005**	$243,000
Service to Grassmere Area (IUGA)		
1. Install Lift Station No. 4	***	$140,000
2. New Forcemain and gravity lines for UGA	***	$2,750,000
3. New Pumps at Lift Station No. 2	***	$30,000

* - Assumes that the STEP members and Town maintenance staff will provide the labor - remaining costs is the material cost only.
** - Based on obtaining financing and scheduling improvements concurrent with wastewater treatment plant upgrades which will need to be completed by the end of the next permit cycle (assumed January 2000 - January 2005).
*** - These improvements will be dependent upon requirements for further development of this area.

BY: MZ CREATED: MAR 27 1997 10:31:57 UPDATED: FEB 10 2000 14:03:17 PLOTTED: FEB 10 2000 14:11:23 FILE: L:\CONCRETE\98749\FIG7-1.DWG

CHAPTER 8

RECOMMENDED COLLECTION SYSTEM AND WASTEWATER TREATMENT PLANT IMPROVEMENTS

COLLECTION SYSTEM IMPROVEMENTS

Improvements to the collection system are included in the improvement program identified in Chapter 7 (Table 7-1). This program includes short-term and long-term sewer system improvement activities scheduled to be completed during the period of 1999 - 2005. The short-term improvements include efforts to reduce infiltration and inflow such as smoke testing the remaining portion of Town, grouting actively leaking manholes, and investigating a suspected broken side sewer or cleanout at a residence. The short-term improvements also include eliminating an overflow to the Little Baker Creek upstream of lift station No. 1.

The long-term improvements include providing electrical modifications to all three of the Town's existing lift stations in order to provide auxiliary power in the event of a power outage and a remote paging/dial-up system to alert the operator when a lift station malfunction occurs. In addition, the deteriorated control panels at each of the three lift stations need to be replaced. The control panel upgrades will include programmable logic controllers (PLCs) with autodialers, ultrasonic level sensors, safety disconnect switches, emergency generator receptacles, soft starters, and associated control wiring. In addition, the heavily-corroded access hatch at lift station No. 3 will be replaced, as well as the guide rail supports at each of the three lift stations. The estimated cost for these improvements is $155,000.

Another recommended long-term improvement is the installation of a parallel 8-inch trunk line entering the treatment plant to handle the projected increase in flows. The estimated cost for these improvements is $243,000.

The development of a sewer system for existing homes in the IUGA is predicated on the financial ability of the Town to serve those areas. A general plan to serve the IUGA with sewer service is described in Chapter 7. The recommended method to provide sewer service to the existing residential and commercial developments in the Grassmere area would consist of a combination of gravity sewer lines, one forcemain, and one lift station located in the southwest corner of the IUGA. In addition, two (2) underground crossings of SR 20 will be required. The estimated cost for providing sewer service to the IUGA is $2,900,000.

RECOMMENDED TREATMENT AND DISPOSAL ALTERNATIVE

Replacing the existing aerated lagoon treatment plant with an activated sludge treatment system using a sequencing batch reactor is the recommended wastewater treatment alternative. Continued disposal of treated effluent to the existing outfall in the Baker River is the recommended disposal alternative.

The new treatment plant will employ a long solids retention time to provide reliable ammonia removal in the biological treatment process and utilize ultraviolet (UV) light disinfection to replace the existing chlorine-based disinfection system. This level of treatment will meet water quality standards on an "end-of-pipe" basis and it will not be necessary to move or modify the existing outfall to meet water quality requirements. However, to handle projected higher flows, it will be necessary to drill additional ports in the existing diffuser to pass the higher projected flows.

Solids generated by the new treatment process will be stored in the existing aerated lagoon which will need to be relined. Solids form the lagoon will be dewatered using a small screw press. The existing surface aerators would be retained for odor control within the lagoon. The lagoon will provide sufficient holding time to stabilize the solids to Class B pathogen reduction requirements and allow the dewatered solids to be land applied as a fertilizer and/or soil conditioner.

Design criteria for the new treatment facility are presented in Table 8-1.

A preliminary layout for the plant is shown in Figure 8-1. Figure 8-2 shows the hydraulic profile of the new plant. Figure 8-3 presents a process schematic and mass balance for the proposed process. The proposed treatment plant will utilize several new treatment processes and facilities.

New treatment facilities include:

- Mechanical fine screen
- Gravity grit removal channels
- Influent flow meter
- Influent composite sampler
- Sequencing Batch Reactor
- UV disinfection
- Operations Building to house blowers and WAS pumping system
- Aerobic sludge holding pond
- Dewatering screw press

TABLE 8-1

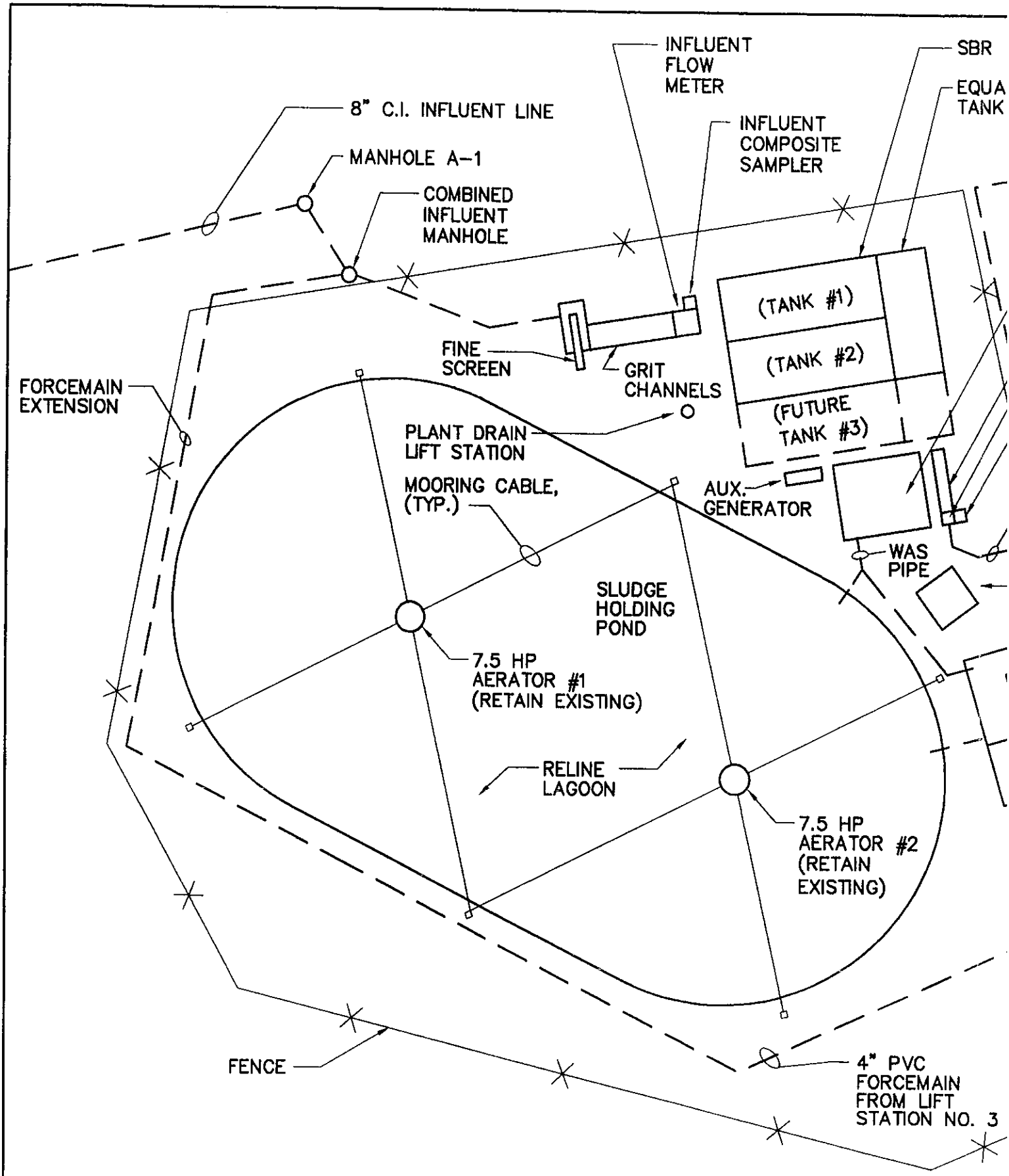
Design Criteria
Wastewater Treatment Facility

Influent Criteria	Current (Year 1999)	Future (Year 2020)
Average Annual Flow (MGD)	90,000	226,000
Maximum Month Flow (MGD)	155,000	362,000
Maximum Day Flow (MGD)	303,000	746,000
Peak Hour Flow (MGD)	-	904,000
BOD_5 Loading (lb/day)	165	362
TSS Loading (lb/day)	141	362
TKN Loading (lb/day)	-	94
Effluent Criteria	**Average Month**	**Average Weekly**
BOD_5 (mg/L)	< 30	< 45
TSS (mg/L)	< 30	< 45
Fecal Coliform (#/100 mL)	< 200	< 400
	Average Month	**Maximum Day**
Ammonia (mg/L)	< 1.29	< 5.7
Treatment System		
Unit Process	**Number - Type**	**Criteria**
Influent Flow Meter	One - Parshall Flume	6-inch
Influent Screen	One - Self-Cleaning	¼-inch Screen Opening
Grit Removal	Two - Gravity Horizontal channel	
Secondary Treatment System		
Type	Sequencing Batch Reactor (SBR)	Two-Tanks Expandable to Three
Individual Tank Volume @ 15' side water depth		175,000 gal
Individual Tank Dimensions		25 ft x 63 ft x 17 ft
Sidewater Depth		15 ft
Maximum Decant Depth		4 ft
No. Cycles		4 / day

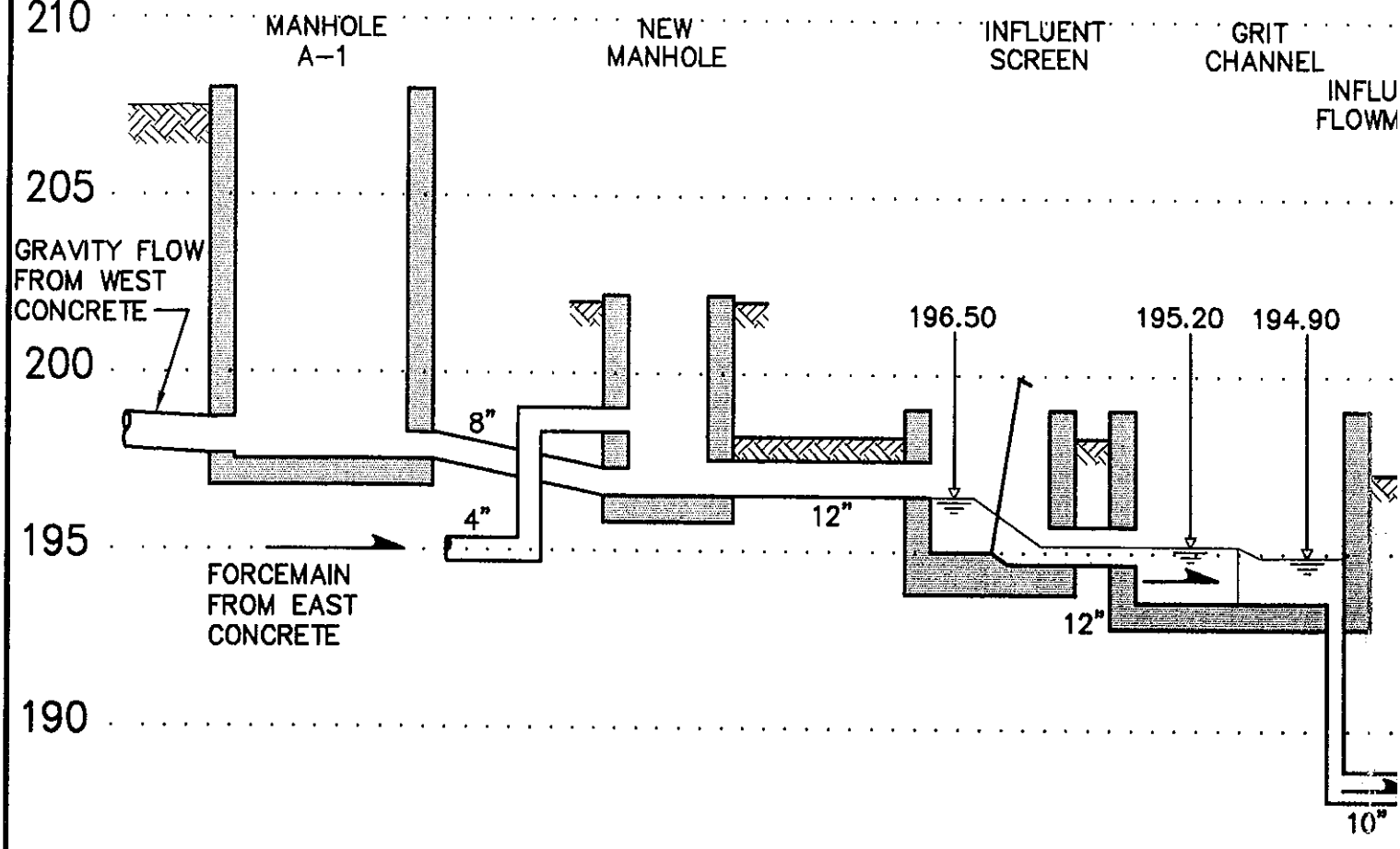
TABLE 8-1
(continued)

Design Criteria
Wastewater Treatment Preferred Alternative

Design Mixed Liquor Suspended Solids Concentration		2,500 mg/L
F/M		0.05 lb/(lb-day)
Assumed Yield		0.9 lb/lb
Aerated SRT		15 days
Design Temperature		10° C
Aeration System Blowers	Three - Positive Displacement (Two Operating, One Standby)	15 hp each
Equalization Tank		
Overall Volume		100,000 gal
Volume @ 8 ft sidewater depth		50,000 gal
Secondary Effluent Pumps	Two Submersible Centrifugal	425 gpm 7.5 hp
Disinfection System		
Type	Low Pressure Ultraviolet (UV) Light	Single Horizontal Channel
No. Banks	Two (One Operating One Standby)	
Lamps Per Bank	20	
Minimum UV Dose @ MMF		30,000 μW-sec/cm^2
Effluent Flowmeter	One - Parshall Flume	6-inch
Solids Handling & Treatment Systems		
Solids Production @ design BOD loading		326 lb/day
Sludge Holding Pond	One - PVC Lined	500,000 gal
Maximum Sludge Holding Time @ design BOD loading		90 days
Solids Dewatering System	One - Screw Press	
Maximum Solids Feed Rate		750 lb/hr
Maximum Liquid Feed		30 gal/min
Minimum Solids in Feed		0.5 %
Maximum Solids in Cake		8.0 %



BY: M. S. CREATED: JUN 18 1999 12:15:14 UPDATED: AUG 18 1999 15:00:25 PLOTTED: AUG 18 1999 15:00:29 FILE: L:\CONCRETE\98749\FIG8-1.DWG



NOTE:

1. HYDRAULIC PROFILE UPSTREAM OF SBR IS BASED ON PROJECTED PEAK HOUR FLOW (904,000 GPD).
2. HYDRAULIC PROFILE DOWNSTREAM OF EQUALIZATION TANK IS BASED ON PROJECTED MAXIMUM DAY FLOW (746,000 GPD).

HYDRAULIC PROFIL

SCALE: VERT. 1"=5'
HORIZ. NOT TO SCALE

INFLUENT (YEAR 2020)

Q_{TOTAL} = 362,000 GAL/DAY
BOD_5 = 362 LB/DAY
TSS = 362 LB/DAY
TKN = 75 LB/DAY

PLANT DRAIN (RECYCLE STREAMS)

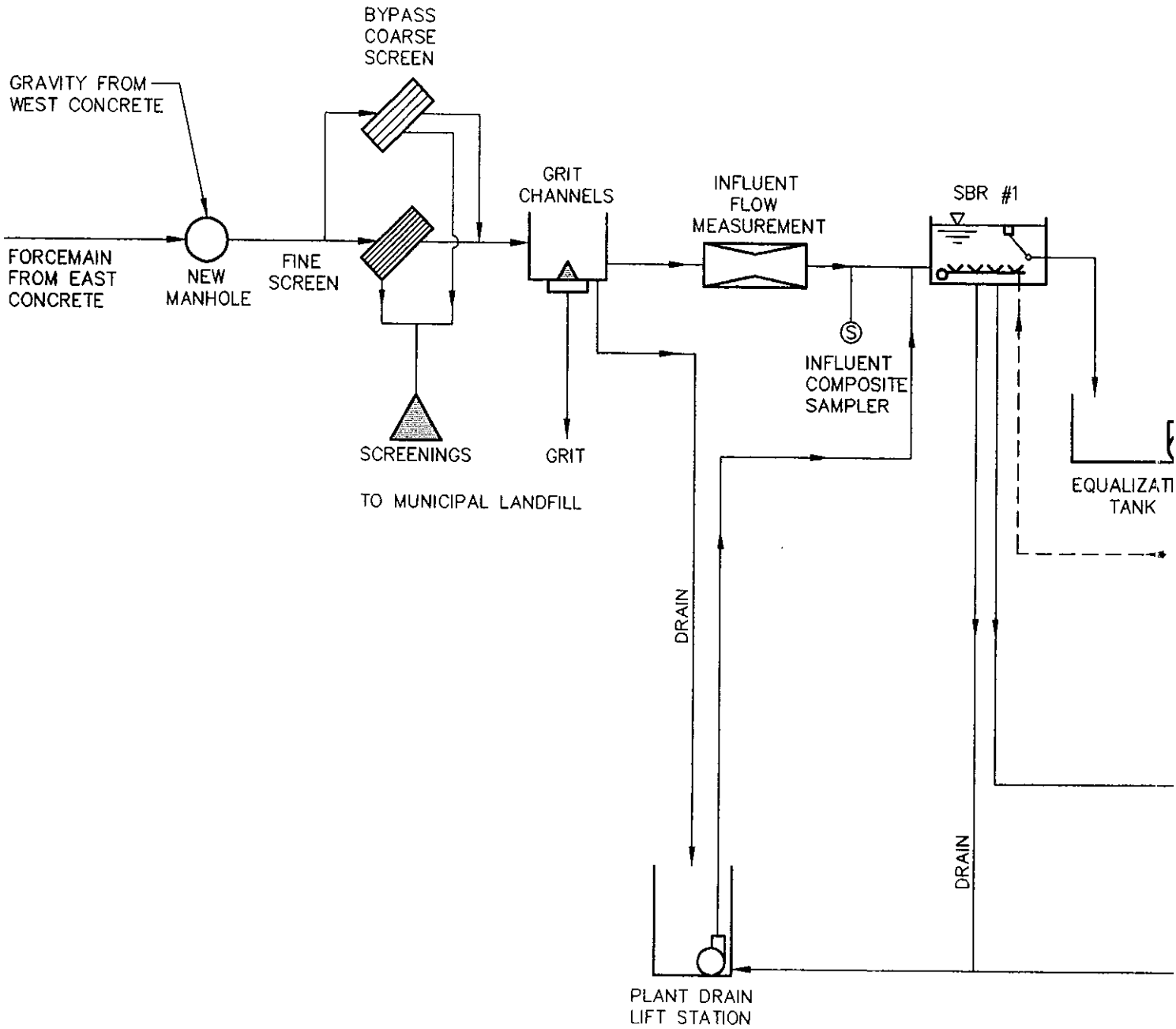
Q_{TOTAL} = 3,000 GAL/DAY
BOD_5 = 12.5 LB/DAY
TSS = 12.5 LB/DAY
TKN = 2.5 LB/DAY

EFFLUENT (YEAR 2020)

Q_{TOTAL} = 362,000 GAL/DAY
BOD_5 = 30 LB/DAY
TSS = 45 LB/DAY
TKN = 10 LB/DAY

WASTE

Q_{TOTAL} =
% TS=
M_{WAS} =



NOTES:

(1) NET LIQUID EVAPORATION FROM LAGOON=12 INCHES/YEAR (ACCOUNTS FOR PRECIPITATION GAIN)
(2) ASSUME 55 LB/DAY INERT SOLIDS IN INFLUENT
(3) ASSUME 500 MG/L BOD_5 & TSS IN RECYCLE STREAMS

Raw wastewater from the Town of Concrete will continue to be conveyed to the existing treatment plant site via the existing influent pipelines. The existing influent line from lift station No. 3 will be re-routed and combine with the influent gravity line from the north and jointly discharge to the new headworks structure.

The new headworks structure will consist of a new self-cleaning screen, gravity grit removal channels, new influent flow meter, and a flow-paced sampling system. The headworks will be constructed to handle the 2020 year peak hour flow of 904,000 gpd.

Effluent from the new headworks will flow by gravity to the sequencing batch reactor. The biological removal of organic material will be performed in the new sequencing batch reactor process. Suspended microbial growth in the basins will be aerated to oxidize organic pollutants and ammonia nitrogen in the wastewater. Aeration and mixing will be accomplished using a jet aeration system. Air will be supplied to the jet aeration system with positive displacement blowers located in a new operations building south of the SBR tanks. The blowers will be located inside a new building and shall be equipped with inlet and discharge silencers to reduce noise.

After the SBR cycle (fill-react-settle-draw-idle) is completed, the effluent from the SBR basins will be pumped to the UV disinfection system using submersible pumps installed in the equalization tank following the SBR. The disinfected secondary effluent will then pass over the effluent weir and enter the outfall pipe line. Effluent flow will be measured using a new effluent flow meter installed just downstream of the UV disinfection system. Treated effluent will flow by gravity to the existing outfall in the Baker River. To handle higher flows through the outfall it will be necessary to drill four (4) additional 1½-inch ports in the existing diffuser pipe.

During power outages the power requirements of the key process components will be met by the output of a new generator located next to the new blower building. The generator will be used to run the headworks, aeration, effluent pumping and disinfection equipment during power outages.

Sludge Treatment System

Waste solids from the sequencing batch reactor will be pumped to the sludge holding pond for further digestion. Sludge digestion will be achieved aerobically using the existing lagoon aerators. Digested sludge will be pumped back to the sludge dewatering facility and dewatered using a new dewatering screw press. Polymer will be added to the dewatering screw press as a flocculant to enhance solids capture and improve dewatering. Centrate from the dewatering screw press will then be conveyed back to the sludge

holding pond. The dewatered sludge cake (biosolids) will be then be transported by truck to a permitted beneficial use facility.

Preliminary cost estimates for the collection system repair and improvement projects and the new wastewater treatment facility are summarized in Table 8-2.

Project Phasing

Three phases are recommended for the collection system improvements. Initial short term improvements will be locally funded. Long term improvements will be done in two phases. The first phase, to include the lift station repairs and the trunk line should coincide with the treatment plant upgrade. The second phase of the long term improvements, constructing a sewer for the IUGA, does not need to be done as part of the treatment facility upgrade and can be done as growth policies dictate the need for these facilities.

The treatment plant must be constructed as a single project. There will be no phasing of the treatment facility construction.

The key to construction of the collection system improvements and treatment facility upgrades will be the Town's ability to finance the project through a combination of local revenues (monthly rates, general facility charges), low interest loans and grants. Chapter 9 presents a financing plan for the proposed project.

Plant Staffing

To properly operate the plant will require one full-time operator. A second part-time operator will be needed to operate the plant during the operator's absence due to vacation, training and illness. Based on WAC 173-230, Certification of Operators of Wastewater Treatment Plants, the expected classification of the plant will be Class II, however, Ecology will have final decision-making authority regarding the plant classification.

Budgeting for a full time operator and part-time assistant operator will present a significant challenge to the Town. Therefore, the Town may wish to investigate sharing the services of another treatment plant operator from a neighboring community to reduce operating costs. However, based on the need to have a certified operator at the plant 40 hours per week including anticipated absences due to vacation, sickness, training, etc., it is recommended that the Town budget for one full-time and one quarter-time employee to operate the plant.

TABLE 8-2

Preliminary Cost Estimates
Recommended Wastewater Collection System Projects
Town of Concrete

Improvement	Estimated Project Cost (1999 dollars)
Collection System Improvements	
SHORT TERM IMPROVEMENTS	
1. Smoke testing	$500
2. Grout Manholes	$3,000
3. Investigate 427 Duffy Street	$3,000
4. Disconnect By-Pass Line to Creek from Manhole M-1	$200
SUBTOTAL	$6,700
LONG TERM IMPROVEMENTS	
1. Modifications to Existing Lift Stations	$155,000
2. Additional Trunk Line	$243,000
SUBTOTAL	$398,000
SERVICE TO IUGA	$2,900,000
TOTAL -COLLECTION SYSTEM	**$3,304,700**
Wastewater Treatment System	
1. Mobilization/Earthwork/Clear & Grub	$130,000
2. Headworks w/Fine Screen	$100,000
3. Aeration Basin w/Equalization Tank	$300,000
4. SBR Equipment (blowers. decant system, controls)	$350,000
5. Operations Bldg. (MCC, blower room)	$50,000
6. UV Disinfection System	$60,000
7. Plant Drain Lift Station	$30,000
8. Plant Piping/Valves/Appurtenances	$160,000
9. Electrical & Instrumentation (includes auxiliary generator)	$220,000
10. Remove and Replace Existing Lagoon Liner for Sludge Aeration/Storage	$50,000
11. Biosolids Dewatering System (w/new Building)	$150,000
12. Modify/Equip Existing Lab	$40,000
SUBTOTAL	$1,640,000
Contingency	$328,000
7.8% WA Sales Tax	$154,000
ESTIMATED CONSTRUCTION COST	**$2,122,000**
Legal, Admin, Engineering, Permitting	$478,000
TOTAL - WASTEWATER TREATMENT SYSTEM	**$2,600,000**

Plant Expansion Capability

The SBR will permit future expansion of the plan to treat an additional 50 percent over the design maximum flow (362,000 gpd) by providing space to build a third tank. Ultimate build-out capacity with a third SBR tank will be 543,000 gpd.

The UV channel will be built in a channel with reduction baffles that can be removed at a later time to add lamps and disinfect higher flows. The baffles will be designed to allow a 50 percent increase over the design maximum month flow (362,000 gpd) to allow disinfection of an ultimate flow of 543,000 gpd.

Environmental Review Requirements

Chapter 10 provides an environmental review of the project. Documentation required by the State Environmental Policy Act (SEPA) for this project is provided in Appendix M.

Because the Town will apply for State Revolving Fund (SRF) dollars for this project, State Environmental Review Process (SERP) documentation is required. The SERP documentation is provided as Appendix N.

CHAPTER 9

FINANCING

INTRODUCTION

This Chapter describes a financial plan for implementing the recommended capital improvements while meeting existing and future operation, maintenance and debt service requirements for the domestic sewer collection and wastewater treatment systems. The Town's past and present financial status, potential funding sources, allocation of revenue sources and the impact of the recommended capital improvements on sewer rates are reviewed.

AVAILABLE CAPITAL PROJECT FUNDING SOURCES

A discussion of available capital project funding sources is included in Appendix 0 together with information on the following methods of capital project financing:

Grants:	Community Development Block Grant Centennial Clean Water Fund USDA Rural Development (formerly FmHA)
Loans:	Public Works Trust Fund USDA Rural Development (formerly FmHA) State Revolving Fund
Bonds:	Revenue Bonds General Obligation Bonds
Other:	Utility Local Improvement Districts Developer Financing System Development Charges Small Town Environmental Program (STEP)

The Washington Community Economic Revitalization Team (WA-CERT) is a federally funded organization that can potentially coordinate sewer utility capital project funding for the Town. WA-CERT does not provide direct capital project funding, but they can be a valuable resource for the Town to obtain funding. The Town has a WA-CERT application on file which is sufficient for the wastewater system improvements recommended in this report.

STATUS OF EXISTING UTILITY

CURRENT RATES AND CHARGES

Town Ordinance No. 380 sets sewer rates and new sewer customer connection charges. The ordinance was adopted and became effective December 28, 1994. The ordinance detailed a schedule of rate increases that took effect in the years 1995, 1996 and 1997. In addition to the sewer rates, the Town adds a 6% sales tax. Table 9-1 presents current sewer rates and connection charges for the Town.

TABLE 9-1

Current Sewer Rates

Customer Classification	Monthly Rates
Churches & Single Housing Units (1)	$21.00 (plus 6% tax)
Commercial/Business	$25.00 (plus 6% tax)
Commercial/Businesses with Water Meters	$25.00 for the first 500 cf of water per month, plus $1.25 for each additional 100 cf of water used (plus 6% tax)
School District	$550.00 for Sept-May and $150.00 for June-Aug (plus 6% tax)

(1) A housing unit is defined as one or more rooms intended for occupancy as separate living quarters by one or more persons as a place of residence, whether it be a house, apartment unit, condominium or rooms rented on month to month tenancy.

The connection charge is $1,000 for each housing unit new hook-up to the public sewer. The charge does not depend on any mechanical or other costs except basic inspection fee associated with such a hook-up.

HISTORICAL EXPENSES

The Town of Concrete operates a general sewer fund #406 and a sewer reserve fund #306. Table 9-2 is a summary of expenses for the general sewer fund #406. As can be seen from the data, for the three years presented the majority of expenses have remained stable. The only significant change in the three years is the increase from $7,811 to $30,442 in the capital & repair account from 1997 to 1998, which explains the corresponding overall total spending increase from $81,499 to $101,664. There have been some minor expenses charged to the sewer reserve fund #306. From 1996 through 1998 there was a total of $8,601 charged to capital outlays in fund #306.

TABLE 9-2

Sewer Fund #406 Expenses

Expenditures	1996	1997	1998
Salary Superintendent	$ 5,212	$ 5,760	$ 5,408
M/R Super	$ 2,235	$ 3,744	$ 3,899
Salary Clerk/Treasurer	$ 6,515	$ 2,880	$ 2,966
Salary Utility Clerk	$ 2,794	$ 3,909	$ 4,026
Week-End/Holidays	$ 1,254	$ 1,254	$ 1,431
Grounds Keeper	$ 221	$ 285	$ 315
Office Help	$ 1,653	$ 1,861	$ 2,532
Planner/Engineer	$ 0	$ 0	$ 0
Total Salaries	**$19,884**	**$19,693**	**$ 20,577**
Social Security	$ 1,521	$ 1,429	$ 1,492
Retirement	$ 1,435	$ 1,254	$ 1,243
Labor & Industries	$ 393	$ 350	$ 338
Unemployment	$ 597	$ 236	$ 39
Medical & Dental	$ 3,854	$ 4,032	$ 3,782
Retirement Retro	$ 0	$ 0	$ 0
Total Personnel Benefits	**$ 7,800**	**$ 7,301**	**$ 6,894**
Training & Mileage	$ 117	$ 111	$ 12
State Audit	$ 0	$ 3,256	$ 0
Total Other Services	**$ 117**	**$ 3,367**	**$ 12**
Equipment M/R	$ 920	$ 1,338	$ 945
Gas & Diesel	$ 305	$ 822	$ 345
Total M/R & Supplies	**$ 1,225**	**$ 2,160**	**$ 1,290**
Equipment (Sewer Plant)	$ 1,921	$ 1,532	$ 1,201
Capital & Repair	$15,188	$ 3,946	$ 28,372
Dump Truck	$ 0	$ 2,333	$ 869
New Equipment	$ 0	$ 0	$ 0
Total Capital Outlay	**$17,109**	**$ 7,811**	**$ 30,442**
Miscellaneous Expense	$ 382	$ 1,268	$ 658
Office Supplies	$ 880	$ 1,455	$ 1,067
Clothing Allowance	$ 240	$ 240	$ 230
Treatment Plant Supplies	$ 2,447	$ 3,546	$ 2,425
ASP Support Agreement	$ 0	$ 137	$ 138
Total General Operations	**$ 3,949**	**$ 6,646**	**$ 4,518**
Planner/Engineer	$ 810	$11,929	$ 16,422
Discharge Permit	$ 591	$ 548	$ 738
Sewer Testing	$ 4,511	$ 2,900	$ 0
Power	$ 6,522	$ 6,609	$ 5,170
Utilities	$ 771	$ 447	$ 736

Expenditures	1996	1997	1998
Legal Fees	$ 0	$ 0	$ 0
Insurance & Bonds	$ 6,000	$ 3,357	$ 4,000
Utility Tax	$ 3,068	$ 3,731	$ 2,790
Insurance Reserve	$ 0	$ 0	$ 0
Infrastructure Meetings	$ 0	$ 0	$ 0
Total Other Services & Charges	**$22,273**	**$29,521**	**$ 29,856**
Grant/Loan	$ 0	$ 0	$ 0
Interfund to Sewer Reserve	$ 5,000	$ 5,000	$ 8,075
Total Sewer Transfers	**$ 5,000**	**$ 5,000**	**$ 8,075**
Total Uses Sewer Fund	**$77,357**	**$81,499**	**$101,664**

HISTORICAL REVENUES

Revenues for 1996 through 1998 are presented in Table 9-3. Both the sewer reserve fund #306 and the general sewer fund #406 are presented since general sewer rate revenues are collected in fund #406 and connection fee revenues and utility taxes are collected in fund #306. As can be seen from the table, there was a significant increase from 1996 to 1997 in total sewer revenues. This was the result of a rate increase that was authorized in 1994 by Ordinance No. 380.

TABLE 9-3

Sewer Revenues

Sewer Revenues	1996	1997	1998
Fund #406			
Sewer Service Charges	$79,350	$97,312	$ 97,373
Miscellaneous Income (Interest & Petty Cash)	$ 859	$ 966	$ 1,098
Total #406 Revenues	**$80,209**	**$98,278**	**$ 98,471**
Fund #306			
Utility Tax	$ 4,777	$ 5,879	$ 5,749
Sewer Hook-Ups	$ 5,000	$ 9,000	$ 4,000
Investment Interest	$ 1,010	$ 1,235	$ 1,621
Street Interfund Loan	$ 0	$ 0	$ 0
Total #306 Revenues	**$10,787**	**$16,114**	**$ 11,370**
Total Sewer Revenues	**$90,996**	**$114,392**	**$109,841**

RESERVES

As of the end of the year 1998, the Town had reserve balances of the following:

- General sewer fund # 406 - $29,824
- Sewer reserve fund # 306 - $67,710

PROJECTED REVENUES AND EXPENSES

PROJECTED EXPENSES

Expenses were projected using a 4% annual inflationary growth factor and a customer growth of 2% per year. There is an outstanding interest free loan of $60,000 from the Department of Ecology for preparing the Comprehensive Sewer Plan. Repayment of the loan starts with two payments totaling $13,333 in the year 2000, and finishes with a single payment of $6,667 in the year 2004. Even though expenses are projected to increase at 4% per year, because the state auditor's charge occurs every other year, total expenses can be lower in alternative subsequent years. Additionally, sewer interfund transfers from the general sewer fund to the sewer reserve fund have been stopped after the year 2000 to maximize the funds available for meeting increased operating expenses caused by the capital improvements. Table 9-4 details projected sewer expenses for the years 1999 through 2005. Expenses related to the capital improvements will be addressed later in the CAPITAL IMPROVEMENT FINANCING section.

TABLE 9-4

Projected Expenses

Expenditures	1999	2000	2001	2002	2003	2004	2005
Salary Superintendent	$6,000	$6,240	$6,490	$6,749	$7,019	$7,300	$7,592
M/R Super	$3,972	$4,131	$4,296	$4,468	$4,647	$4,833	$5,026
Salary Clerk/Treasurer	$3,056	$3,178	$3,305	$3,438	$3,575	$3,718	$3,867
Salary Utility Clerk	$4,147	$4,313	$4,485	$4,665	$4,851	$5,045	$5,247
Week-End/Holidays	$1,267	$1,318	$1,370	$1,425	$1,482	$1,541	$1,603
Grounds Keeper	$400	$416	$433	$450	$468	$487	$506
Office Help	$3,510	$3,650	$3,796	$3,948	$4,106	$4,270	$4,441
Planner/Engineer	$210	$218	$227	$236	$246	$255	$266
Total Salaries	**$22,562**	**$23,464**	**$24,403**	**$25,379**	**$26,394**	**$27,450**	**$28,548**
Social Security	$1,805	$1,877	$1,952	$2,030	$2,112	$2,196	$2,284
Retirement	$1,492	$1,552	$1,614	$1,678	$1,745	$1,815	$1,888
Labor & Industries	$537	$558	$581	$604	$628	$653	$679
Unemployment	$271	$282	$293	$305	$317	$330	$343
Medical & Dental	$4,321	$4,494	$4,674	$4,861	$5,055	$5,257	$5,467
Retirement Retro	$0	$2,000	$0	$0	$0	$0	$0
Total Personnel Benefits	**$8,426**	**$10,763**	**$9,114**	**$9,478**	**$9,857**	**$10,252**	**$10,662**
Training & Mileage	$300	$312	$324	$337	$351	$365	$380
State Audit	$5,000	$0	$5,500	$0	$6,000	$0	$6,500

Expenditures	1999	2000	2001	2002	2003	2004	2005
Total Other Services	**$5,300**	**$312**	**$5,824**	**$337**	**$6,351**	**$365**	**$6,880**
Equipment M/R	$1,000	$1,040	$1,082	$1,125	$1,170	$1,217	$1,265
Gas & Diesel	$500	$520	$541	$562	$585	$608	$633
Total M/R & Supplies	**$1,500**	**$1,560**	**$1,622**	**$1,687**	**$1,755**	**$1,825**	**$1,898**
Equipment (Sewer Plant)	$5,000	$5,000	$5,200	$5,408	$5,624	$5,849	$6,083
Capital & Repair	$17,467	$10,000	$10,400	$10,816	$11,249	$11,699	$12,167
New Equipment	$800	$1,000	$1,040	$1,082	$1,125	$1,170	$1,217
Total Capital Outlay	**$23,267**	**$16,000**	**$16,640**	**$17,306**	**$17,998**	**$18,718**	**$19,466**
Miscellaneous Expense	$1,000	$1,040	$1,082	$1,125	$1,170	$1,217	$1,265
Office Supplies	$2,300	$2,392	$2,488	$2,587	$2,691	$2,798	$2,910
Clothing Allowance	$240	$250	$260	$270	$281	$292	$304
Treatment Plant Supplies	$3,000	$3,120	$3,245	$3,375	$3,510	$3,650	$3,796
ASP Support Agreement	$200	$208	$216	$225	$234	$243	$253
Total General Operations	**$6,740**	**$7,010**	**$7,290**	**$7,582**	**$7,885**	**$8,200**	**$8,528**
Planner/Engineer	$5,000	$5,200	$5,408	$5,624	$5,849	$6,083	$6,327
Discharge Permit	$1,000	$1,040	$1,082	$1,125	$1,170	$1,217	$1,265
Sewer Testing	$0	$500	$520	$541	$562	$585	$608
Power	$7,200	$7,488	$7,788	$8,099	$8,423	$8,760	$9,110
Utilities	$1,000	$1,040	$1,082	$1,125	$1,170	$1,217	$1,265
Legal Fees	$0	$0	$0	$0	$0	$0	$0
Insurance & Bonds	$4,000	$4,160	$4,326	$4,499	$4,679	$4,867	$5,061
Utility Tax	$3,887	$3,956	$4,035	$4,114	$4,194	$4,273	$4,353
Insurance Reserve	$2,000	$2,080	$2,163	$2,250	$2,340	$2,433	$2,531
Infrastructure Meetings	$2,271	$2,362	$2,456	$2,555	$2,657	$2,763	$2,874
Total Other Services & Charges	**$26,358**	**$27,826**	**$28,860**	**$29,932**	**$31,044**	**$32,197**	**$33,394**
Grant/Loan	$0	$13,333	$13,333	$13,333	$13,333	$6,667	$0
Interfund to Sewer Reserve	$5,000	$0	$0	$0	$0	$0	$0
Total Sewer Transfers	**$5,000**	**$13,333**	**$13,333**	**$13,333**	**$13,333**	**$6,667**	**$0**
Total Uses Sewer Fund	**$99,153**	**$100,268**	**$107,086**	**$105,034**	**$114,617**	**$105,674**	**$109,376**

PROJECTED REVENUES

Table 9-5 shows a summary of projected revenues from both the sewer reserve fund and the general sewer fund. Increased revenues from new connections fees and from the increases in monthly charge revenue due to growth were projected by assuming a 2% growth in customers which reflects the OFM/county projections for average annual growth rates from 1995 to 2115. Interest income was based on a interest rate of 3%. Utility tax revenues are based on an additional 6% surcharge applied to customer's monthly bills in addition to the monthly sewer charges. These revenue projections do not assume any rate increases.

TABLE 9-5

Projected Revenues

Sewer Revenues	1999	2000	2001	2002	2003	2004	2005
Fund #406 Revenues							
Sewer Service Charges	$100,968	$102,761	$104,811	$106,866	$108,926	$110,991	$113,060
Miscellaneous Income (Interest & Petty Cash)	$895	$976	$1,080	$1,044	$1,131	$994	$1,183
Total #406 Revenues	**$101,863**	**$103,737**	**$105,892**	**$107,911**	**$110,057**	**$111,984**	**$114,243**
Fund #306 Revenues							
Utility Tax	$6,058	$6,166	$6,289	$6,412	$6,536	$6,659	$6,784
Sewer Hook-Ups	$6,000	$6,000	$7,000	$7,000	$7,000	$7,000	$7,000
Investment Interest	$2,031	$2,583	$2,845	$3,329	$3,832	$4,353	$4,893
Total #306 Revenues	**$8,031**	**$8,583**	**$9,845**	**$10,329**	**$10,832**	**$11,353**	**$11,893**
Total Sewer Revenues	**$109,894**	**$112,320**	**$115,737**	**$118,240**	**$120,888**	**$123,337**	**$126,136**

FINANCING CAPITAL IMPROVEMENTS

As was described in earlier chapters, the recommended capital improvement projects for the next six years are the construction of a new WWTF, upgrading of existing lift stations and construction of a new trunk line to the new WWTF. The costs and dates associated with these major projects and several smaller projects are summarized in Table 9-6 below. The schedule for the WWTF and pump station modifications are based upon the Town receiving 5 years to complete the upgrades under a yet to be drafted compliance schedule in the Town's next NDPES permit.

TABLE 9-6

Capital Expenditures

(Excludes Minor Repairs Funded From #406 Fund)

Capital Expenditures	1999	2000	2001	2002	2003	2004	2005
Smoke Test	$500						
Grout MH R-2 & R-3		$3,000					
Investigate 427 Duffy Street		$3,000					
Disconnect By-pass Line to Creek from Manhole M-1	$200						
Project Costs for WWTF and Pump Station Modifications				$240,000	$1,379,000	$1,379,000	
Total Capital Expenditures	**$700**	**$6,000**		**$240,000**	**$1,379,000**	**$1,379,000**	

The Town is continuing to work with regulatory and funding agencies to secure a funding package for this project. The Town should anticipate that capital project financing will come from several agencies. It is anticipated that USDA RD will be a major funding source, perhaps in conjunction with CDBG, US Forest Service, and the Dept. of Ecology's SRF/CCWF program. The Town should also pursue funds from agencies such as CTED that are related to documented economic growth resulting from the project. A schedule for grant and loan applications is included at the end of this chapter.

For planning purposes in developing rate impacts, USDA RD funding is projected in a series of alternatives employing varying amounts of grant funding. The primary intent of these alternatives is to show how rate impacts will vary with different levels of grant funding. This will assist the Town, regulatory agencies, and funding agencies in developing funding packages, strategies, and schedules.

The USDA RD loan funding is available only after the project is complete. With a USDA RD loan, interim financing is required to pay construction costs. The USDA RD loan is available at the end of the project to repay the interim financing. The projected interim financing interest rate is 5%. USDA RD grants and other grant funds are typically available on a reimbursement basis, so interim financing for grants is not required. Furthermore, it is assumed that the total money needed for any given year will be apportioned half at the beginning of the year and the remaining half in July. For example, in 2002 an interim loan for $120,000 will be required at the start of the year and an additional $120,000 will be required in July 2002.

The projected completion of the projects by the year 2005 will initiate the repayment of the interim loans by the issuance of the USDA RD loan. Therefore beginning in 2005, the Town will start debt repayment of the USDA RD loan and will also be required to fund a bond reserve by saving an additional 10% of their annual debt service amount each year. Furthermore, beginning in the year 2005, there will be additional operation and maintenance costs associated with operating the new WWTF. These additional O&M costs were summarized in Table 6-4, Chapter 6. The total added O&M costs are estimated to be $109,400 per year.

To account for the uncertainty regarding the exact amount of funding that will be supplied from either grants or loans, the following three scenarios are presented for relative planning purposes:

- Scenario A - 100% of needed funds are provided from the USDA RD loan.
- Scenario B - 50% of needed funds are from the USDA RD loan and the remaining 50% are from grants.
- Scenario C - 20% of needed funds are from the USDA RD loan and the remaining 80% are from grants.

Each of the scenarios involve different levels of expenses due to the costs associated with the amount of debt issued, the amount of interim financing required, and reserve requirements. In order to fund these additional costs, additional sewer rate revenues will need to be generated.

Tables 9-7, 9-8 and 9-9 show summaries of the financial status of the sewer utility for each of the scenarios. Revenues generated from the 6% surcharge on sewer rate charges are assumed to remain within sewer utility funds. Additional revenues from rate increases have been set such that the total revenues from sewer rates fund all costs associated with financing the new debt issues. The additional sewer rate revenues are projected, for the purposes of this report, from across-the-board percentage rate increases. Rates for a single housing unit after the percentage increase are shown in Tables 9-7, 9-8 and 9-9.

TABLE 9-7

Scenario A - 100% Loan, 0% Grant

Scenario A	1999	2000	2001	2002	2003	2004	2005
Sewer Rate Revenues (Existing Rates)	$100,968	$102,761	$104,811	$106,866	$108,926	$110,991	$113,060
Additional Revenues (New Rates)	$0	$0	$0	$10,178	$72,617	$132,132	$166,899
Sewer Hook-ups	$6,000	$6,000	$7,000	$7,000	$7,000	$7,000	$7,000
Miscellaneous (Taxes, Interest)	$8,984	$9,725	$10,214	$11,396	$15,897	$20,291	$23,311
Total Revenue	**$115,952**	**$118,486**	**$122,026**	**$135,440**	**$204,440**	**$270,413**	**$310,270**
Existing Expenses	$99,153	$86,935	$93,753	$92,093	$104,080	$104,094	$115,802
Minor Capital Improvements	$700	$6,000	$0	$0	$0	$0	$0
Interim Financing Costs	$0	$0	$0	$9,000	$63,713	$132,663	$0
New Debt Service (1)	$0	$13,333	$13,333	$13,333	$13,333	$6,667	$162,921
USDA RD Bond Reserve (2)	$0	$0	$0	$0	$0	$0	$16,292
Total Expenses	**$99,853**	**$106,268**	**$107,086**	**$114,426**	**$181,125**	**$243,424**	**$295,015**
End of Year Cash & Investments (2)	**$113,633**	**$130,851**	**$145,790**	**$166,804**	**$190,119**	**$217,109**	**$232,364**
Single Housing Unit Rate ($ per month, excludes 6% tax)	**$21.00**	**$21.00**	**$21.00**	**$23.00**	**$35.00**	**$46.00**	**$52.00**

Note (1): The new debt service values shown in the years 2000 through 2004 are due to the $60,000 Dept. of Ecology loan. The new debt service of $162,921 in 2005 is due to the USDA RD loan financing 100% of the needed funds.

Note (2): The USDA RD requires that an additional 10% of each years debt service payments be saved in a bond reserve fund. Since these funds cannot be withdrawn for other uses they have not been included in the end of year cash and investments totals.

TABLE 9-8

Scenario B - 50% Loan, 50% Grant

Scenario B	1999	2000	2001	2002	2003	2004	2005
Sewer Rate Revenues (Existing Rates)	$100,968	$102,761	$104,811	$106,866	$108,926	$110,991	$113,060
Additional Revenues (New Rates)	$0	$0	$0	$5,089	$41,496	$63,423	$80,757
Sewer Hook-ups	$6,000	$6,000	$7,000	$7,000	$7,000	$7,000	$7,000
Miscellaneous (Taxes, Interest)	$8,984	$9,725	$10,214	$11,091	$14,008	$16,149	$18,006
Total Revenue	**$115,952**	**$118,486**	**$122,026**	**$130,046**	**$171,430**	**$197,563**	**$218,824**
Existing Expenses	$99,153	$86,935	$93,753	$91,897	$102,882	$101,449	$112,485
Minor Capital Improvements	$700	$6,000	$0	$0	$0	$0	$0
Interim Financing Costs	$0	$0	$0	$4,500	$31,856	$66,331	$0
New Debt Service (1)	$0	$13,333	$13,333	$13,333	$13,333	$6,667	$81,460
USDA RD Bond Reserve (2)	$0	$0	$0	$0	$0	$0	$8,146
Total Expenses	**$99,853**	**$106,268**	**$107,086**	**$109,730**	**$148,071**	**$174,447**	**$202,092**
End of Year Cash & Investments (2)	**$113,633**	**$130,851**	**$145,790**	**$166,106**	**$189,465**	**$212,581**	**$229,313**
Single Housing Unit Rate ($ per month, excludes 6% tax)	**$21.00**	**$21.00**	**$21.00**	**$22.00**	**$29.00**	**$33.00**	**$36.00**

Note (1): The new debt service values shown in the years 2000 through 2004 are due to the $60,000 Dept. of Ecology loan. The new debt service of $81,460 in 2005 is due to the USDA RD loan financing 50% of the needed funds.

Note (2): The USDA RD requires that an additional 10% of each years debt service payments be saved in a bond reserve fund. Since these funds cannot be withdrawn for other uses they have not been included in the end of year cash and investments totals.

TABLE 9-9

Scenario C - 20% Loan, 80% Grant

Scenario C	1999	2000	2001	2002	2003	2004	2005
Sewer Rate Revenues (Existing Rates)	$100,968	$102,761	$104,811	$106,866	$108,926	$110,991	$113,060
Additional Revenues (New Rates)	$0	$0	$0	$0	$20,748	$21,141	$32,303
Sewer Hook-ups	$6,000	$6,000	$7,000	$7,000	$7,000	$7,000	$7,000
Miscellaneous (Taxes, Interest)	$8,984	$9,725	$10,214	$10,786	$12,689	$13,472	$14,854
Total Revenue	**$115,952**	**$118,486**	**$122,026**	**$124,652**	**$149,362**	**$152,604**	**$167,217**
Existing Expenses	$99,153	$86,935	$93,753	$91,701	$102,083	$99,821	$110,620
Minor Capital Improvements	$700	$6,000	$0	$0	$0	$0	$0
Interim Financing Costs	$0	$0	$0	$1,800	$12,743	$26,533	$0
New Debt Service	$0	$13,333	$13,333	$13,333	$13,333	$6,667	$32,584
USDA RD Reserve	$0	$0	$0	$0	$0	$0	$3,258
Total Expenses	**$99,853**	**$106,268**	**$107,086**	**$106,834**	**$128,158**	**$133,020**	**$146,462**
End of Year Cash & Investments	**$113,633**	**$130,851**	**$145,790**	**$163,608**	**$184,812**	**$204,395**	**$225,150**
Single Housing Unit Rate ($ per month, excludes 6% tax)	**$21.00**	**$21.00**	**$21.00**	**$21.00**	**$25.00**	**$25.00**	**$27.00**

Note (1): The new debt service values shown in the years 2000 through 2004 are due to the $60,000 Dept. of Ecology loan. The new debt service of $32,584 in 2005 is due to the USDA RD loan financing 20% of the needed funds.

Note (2): The USDA RD requires that an additional 10% of each years debt service payments be saved in a bond reserve fund. Since these funds cannot be withdrawn for other uses they have not been included in the end of year cash and investments totals.

RATE IMPACT ANALYSIS

In the following paragraphs rate increases are specified in terms of an increase to the single family monthly service rate. This is done to report the recommended rate increases in the most meaningful way to the most people affected. However, all monthly rates for all customer classes and volume charges will need to be raised the same percentage as that reflected in the increase in the single family rate to generate the revenues required to operate the sewer utility after completion of the wastewater improvements.

The Town recognizes that without a substantial amount of the project being funded from grants, as opposed to loans, monthly sewer rates will become unaffordable for the majority of the community's residents. The Town's goal, therefore, is to achieve a minimum of 80 percent grant funding for the capital portion of the project.

Scenarios A, B, and C all require additional sewer rate revenues to meet the additional costs of debt associated with financing construction of collection system and wastewater treatment facility improvements. The preferred funding method, scenario C, increases the monthly single family sewer rate from $21.00 per month to $27.00 per month to pay for the debt service caused from funding 20 percent of the project from loans. In addition to the increased costs associated with the new debt, there will be increased operation and maintenance costs associated with the planned wastewater improvements.

The majority of the new operating costs detailed in Table 6-4 (nearly 50 percent) are the result of planning for the labor required to operate and maintain the collection system, lift stations and wastewater treatment facility. There will also be additional labor costs as a result of the testing/monitoring required by the Town's new NPDES permit. Other expenses will result from the disposal of biosolids, increased electrical consumption, and additional repair and maintenance costs. The total additional operation and maintenance expenses have been estimated at approximately $110,000 per year. However, the costs specified in Table 6-4 reflect operation and maintenance costs for the improved wastewater facilities at their design capacity. Also, the Town is investigating several methods for reducing these operation and maintenance costs including the possibility of sharing operators with other communities and thereby avoiding the need to pay another individual to serve as a back-up operator. The Town is also evaluating biosolids use methods that will reduce biosolid disposal costs.

Taking these factors into account, it is possible that initial operation and maintenance costs will be lower during the first years of operating the new wastewater facilities. Currently, the Town records 37 percent of the cost of a supervisor's salary ($42,300 per year) and 32 percent of the cost of an assistant's salary ($35,400 per year) under sewer expenses. It is estimated that 75 percent of the time spent on sewer work of these two employees occurs at the wastewater treatment facilities. Therefore, a total labor cost of $20,200 (75%*(37%*$42,300+32%*$35,400)) is estimated as resulting from current operations at the existing wastewater treatment facility. Labor costs shown in Table 6-4 are $50,000 per year. Since the Town currently incurs $20,200 per year in wastewater treatment labor costs, the actual labor cost increase will be the difference, or $29,200 per year ($50,000 - $20,200). The other costs detailed in Table 6-4 (except for maintenance and repair and professional services) are variable costs that depend on the amount of wastewater flow being treated. The average annual flow at the current wastewater treatment plant is 90,000 GPD and the design capacity planned for the new wastewater treatment improvements in the year 2020 is 226,000 GPD. Therefore, for the first few years of operation, the new wastewater treatment facilities are only operating at 40 percent of the design capacity based on average annual flows. Utilizing this 40 percent on the variable costs in Table 6-4 results in a total estimated operating cost for utilities, chemicals, laboratory services/supplies, miscellaneous, and biosolids disposal of $15,200 (40 percent of $38,000).

The remaining two operation and maintenance costs listed in Table 6-4, professional services and maintenance and repair, are expected to be negligible during the first years of operation of the new wastewater facilities. This is due to the fact that the new facilities will be under warranty for the first two years of operation and the fact that professional services will also not be required

during the first years of operation. It is recommended that a reserve fund be built up for later repairs and maintenance on the new facilities. However, this is a policy decision that can be deferred by the Town. The benefit of initiating a repair fund at the start of operations is that repair funds are collected over a greater number of years and thus the annual expense to fund this reserve is less than if this practice is deferred for several years.

Therefore, increased operation and maintenance costs will depend on the success of the Town in limiting operation and maintenance costs and policy decisions regarding when a repair fund is initiated and its level of funding. So it is estimated that the total annual increase in operation and maintenance costs associated with the new wastewater facilities could range from $45,400 during the first few years of operation to $110,000 as the facilities ages and flows increase.

The total single family sewer rate needed to pay for current operating expenses, new debt associated with the construction of improvements using scenario C (80% grant and 20% loan), and increased operation and maintenance costs due to the new wastewater treatment facilities of $45,400 per year is $36 per month.

LOAN/GRANT APPLICATION SCHEDULE

The project schedule shown in Table allows for funding acquisition in 2000 and 2001. Two years have been allowed for funding acquisition because of the high cost of the required improvements and the anticipated difficulties in obtaining the required grant funding for this project.

There are three anticipated sources to provide the majority of project funding, and several other funding sources that are potentially available to provide gap financing. USDA RD offers loan financing that may include grants if user rates are sufficiently high. The Town should anticipate that RD will also prefer that other funding agencies participate in this project, particularly if USDA RD grant money is requested. RD will fund design and construction, but prefers that other funding sources be investigated first. The Department of Ecology's CCWF offers grants for construction funds that are typically accompanied by a SRF loan. However, the Department of Ecology does not administer grant funding for design. The Washington State Department of Community, Trade, and Economic Development (DCTED) administers grant funds through the CDBG and CIF programs. These sources may provide up to $750,000 - $1,000,000 in grant funding, but the programs are very competitive. Gap funding may be obtained from USDA Forest Service, and if specific job creation can be shown to result from project completion, then other DCTED programs may be applicable.

Funding of the design may present problems for the Town. If the Town decides to secure construction funding prior to proceeding with the design, the Town would most likely need to secure total project funding from a combination of USDA RD and DCTED grant programs. Ecology grant funding is not available for design, and Ecology grant funding is only available for construction after an "approvable" design is complete. Therefore, if USDA RD and DCTED funds are not available, the Town may need to fund design with a SRF loan (perhaps augmented by a small USDA FS grant) prior to securing any construction funding.

Table 9-11 presents a proposed schedule for obtaining funding. It includes a funding agency scoping meeting and multiple applications for construction funding.

TABLE 9-10

Proposed Schedule for Funding Applications

Funding Program	Type of Funding	Project/Components Funded	Application Dates
USDA RD	Grant & Loan	Design & Construction	Begin application Feb. 2000 for FY 2001
SRF	Loan	Design	Design loan Feb. 2000
USDA FS	Small Grant	Partial Design	Ongoing; apply in Feb. 2000
CCWF/SRF	Grant & Loan	Construction	After design completion Feb. 2001 or 2002
CERB	Grant & Loan	Partial Design & Construction	Apply if conditions change (i.e. specific jobs are identified)
CDBG or CIF	Grant	Partial Design & Construction	Nov. 2000 (CDBG), await direction from DCTED (CIF)

CHAPTER 10

ENVIRONMENTAL EVALUATION

INTRODUCTION

The purpose of this chapter is to evaluate potential adverse effects of the proposed collection system and wastewater treatment plant improvements to the environment. Potential beneficial results of the project are also addressed. Completed Washington State Environmental Policy Act (SEPA) and State Environmental Review Policy (SERP) checklists are included in Appendices M and N, respectively.

Chapter 2 includes a description of the environmental characteristics of the study area. This chapter only addresses the potential environmental impacts associated with the upgrade of the existing treatment facility and improvements to the collection system.

EXISTING ENVIRONMENT

The wastewater treatment plant (WWTP) is located on Lagoon Avenue, within the Town limits of Concrete, Washington. The outfall discharges into the Baker River at latitude 48°32'14"N and longitude 122°44'28"W. The Baker River flows into Skagit River which eventually flows into Puget Sound.

The proposed improvements to the WWTP will occur within the existing plant boundary and will not require additional property. Collection system improvements are expected to occur within existing rights-of-way, easements or Town properties, or in new easements.

The properties adjacent to the WWTP include vacant Town land to the north and south, the Baker River to the east, and North Dillard Avenue to the west.

The outfall of the WWTP is at latitude 48°32'14"N and longitude 122°44'28"W of the Baker River. According to WAC 173-201A, the Baker River is classified as Class AA (extraordinary). Characteristic uses of Class AA waters include, but are not limited to: water supply (domestic, industrial, agricultural); stock watering; fish and shellfish; wildlife habitat; recreation; commerce and navigation.

The WWTP is not situated in the immediate vicinity of any agricultural land, historic buildings, or wetlands. The Baker River is a tributary to the Skagit River. The Skagit River in the vicinity of the Baker River is considered a wild and scenic river. The Washington State Department of Fish and Wildlife has classified the Chinook Salmon as

a candidate for listing in Washington state. The Chinook Salmon currently holds a federal designation of threatened for the Puget Sound.

A review of the flood insurance rate map for the Town of Concrete indicates that the treatment plant site lies just outside of the 100-year flood plain. The 100-year flood elevation is about 190 feet mean sea level.

SHORT-TERM IMPACTS

Construction of the proposed facilities will result in a temporary increase in traffic, noise, dust, and particulate emissions in the immediate vicinity of the WWTP and at collection system project sites. These effects are common to all construction and are not expected to be more severe for this project than for any other of similar size.

The Town of Concrete will minimize adverse impacts by requiring the use of standard construction mitigation techniques including (1) site watering to control dust, and (2) covering exposed soil with tarps to reduce erosion. Also, construction will be scheduled during normal working hours on weekdays to reduce any impact on nearby residences.

LONG-TERM IMPACTS

Earth

Modifications to the WWTP will require approximately 0 yds^3 of fill and 300 yds^3 of cut. The primary need for the earthwork is to prepare the site for construction of the sequencing batch reactor tanks, the operations building, and the ultraviolet light disinfection system.

Sewer system expansion projects will require minor amounts of fill and cut.

Air

A few odor complaints were received when the lagoon's aerators were turned off temporarily for the initiation of the sludge removal project.

The upgraded WWTP will operate aerobic treatment processes for both liquid and solid wastes; therefore, odors generated by the new treatment processes are expected to be minimal.

Surface Water

The proposed WWTP expansion and collection system improvement projects should not require any surface water withdrawals. No modifications to the existing outfall in the Baker River will be required for the project.

The WWTP will continue to discharge wastewater effluent that has been treated to meet the water quality standards set by the Department of Ecology at the boundaries of the effluent mixing zones in the Baker River. The results of dilution modeling of the outfall discharge are included in Appendix F. Chlorine residual in the WWTP effluent will be eliminated through the use of a new UV disinfection system.

The projected average annual flows for year 2020 is 226,000 gpd. The year 2020 flow is the 20-year planning horizon for the Comprehensive Sewer and Wastewater Facility Plan.

Ground Water

Ground water will not be withdrawn, nor will water or waste materials be discharged to ground water during the operation of the facility.

Water Runoff

The main source of runoff at the site is, and will continue to be, storm water from overland flow. The WWTP does not currently have a storm water collection system and the expanded WWTP will not include catch basins.

Approximately 10 percent of the existing WWTP site is currently covered with impervious surface associated with the operations building. After the upgrade is constructed, about 25% of the site will be covered. This calculation assumes that the lagoon surface is not considered an impervious surface.

Plants

Minimal amounts of landscaping at the WWTP may be removed for new structures.

Animals

Operation of the expanded WWTP will result in an increase in effluent flow but should maintain the effluent quality and therefore should not degrade fish habitat.

Energy and Natural Resources

Electricity will be the primary source of energy used to meet the upgraded plant's needs. The energy will power the equipment for the plant and heat the operator's building.

Environmental Health

A small amount of liquid sodium hypochlorite will be stored at the plant and used to disinfect effluent that will be used as non-potable water at the upgraded treatment plant.

Noise

The main noise sources at the expanded WWTP will be 1) the aeration basin blowers in the blower building and 2) the standby generator. All of these noise sources could operate at any time of the day. The generator is for emergencies only.

Land and Shoreline Use

The site is currently used for the Concrete Wastewater Treatment Plant. The adjacent properties are undeveloped Town property on the north and south, the Baker River to the east, and North Dillard Avenue to the west. The site is zoned Public Use as designated by the 1998 Concrete *Comprehensive Plan.*

There will most likely be 2 employees at the upgraded facility. No one will be displaced by the completed project.

Housing

Implementation of the proposal will not directly affect housing. No housing will be eliminated.

Aesthetics

The tallest structure will most likely be the new blower building which will be approximately 16 feet high with a peaked roof. This is only a few feet higher than the existing laboratory structure that is the existing tallest structure. The principal building material will be masonry block and concrete.

Light and Glare

Area lighting will be provided at the upgraded treatment facility. Photocells will operate the lights to provide minimum required lighting in the event of emergency after hours visits by plant staff. Light or glare from the finished project will not be a safety hazard or interfere with views.

Recreation

Recreation will not be directly affected by implementation of the project.

Historic and Cultural Preservation

Implementation of the proposal will not affect any places or objects of historical/cultural significance.

Transportation

There will be one employee shift. The shift will begin at 6:30 a.m. and end at 3:30 p.m. and will involve up to 2 people.

No parking spaces will be eliminated.

After the WWTP project is operational, there will be between 21 and 35 truck trips per week generated by the site for sewer system and WWTP maintenance trips.

No new roads or road improvements will be required.

Public Services

The project itself is a result of an increased need for public services.

Utilities

No new utilities will be required.

MITIGATION MEASURES

Earth

Measures to mitigate short-term erosion for this project could include covering excavated soil stockpiles and erecting silt fences, as necessary.

Air

During construction, standard methods will be used to control dust including spraying roads with water or other dust suppressants.

Surface Water

During construction, silt fences and straw bales will be erected to prevent site run-off from reaching surface waters.

Ground Water

No mitigation measures are proposed. The proposed WWTP expansion should have no effect on the quality of the groundwater in the area, since all wastewater will be collected, treated and discharged to the Baker River. In addition, the WWTP expansion project includes installing a new liner in the lagoon. This will provide greater protection of the ground water than the existing liner.

Water Runoff

Water runoff from the treatment plant site will be via overland flow and should not be significant.

Plants

When construction is complete, the WWTP site will be minimally landscaped.

Animals

Effluent quality will meet water quality standards in the Baker River outside the authorized outfall mixing zone, thereby preventing injury to aquatic life or endangering human health.

Energy and Natural Resources

Construction of the WWTP expansion and collection system improvements will require the expenditure of materials, energy and labor. These resources will be permanently committed; however, they are commonly used materials and resources, and their use will not have any significant adverse environmental impacts. Proper construction techniques and activities will ensure the acceptable use of these resources.

Environmental Health

The chlorine gas disinfection system will be removed and replaced with an ultraviolet light disinfection system that eliminates chlorine in the effluent discharged to the Baker River and greatly reduces risk of exposure to harmful levels of chlorine gas at the WWTP.

Noise

Temporary noise from construction could be mitigated by one or more of the following measures:

- Limiting construction to normal working hours on weekdays;
- When possible, placing small, portable acoustical screens around particularly noise equipment;
- Using mufflers on all internal combustion engine-driven equipment;
- If pneumatic tools are used, using those fitted by the manufacturers with mufflers, or adding mufflers, and;
- Turning off all idling equipment.

Noise levels at the WWTP and at pump stations in the collection system are not expected to measurably increase due to the expansion. The new blowers will be housed inside a building and will be equipped with discharge silencers.

Land and Shoreline Use

One of the purposes of the Comprehensive Sewer and Wastewater Facility Plan is to increase the capacity of the WWTP and collection system to meet the service area needs

identified in the 1998 *Comprehensive (Land Use) Plan.* The projects are necessary so that the land use plans that have been adopted can be implemented.

Housing

No mitigation measures are proposed.

Aesthetics

No mitigation measures are proposed.

Light and Glare

No mitigation measures are proposed.

Recreation

No mitigation measures are proposed.

Historic and Cultural Preservation

No mitigation measures are proposed.

Transportation

The existing transportation system has the additional capacity to accommodate the traffic generated from the upgraded WWTP. No additional measures are necessary.

Public Services

No mitigation measures are proposed.

Utilities

No mitigation measures are proposed.

APPENDIX A

Puget Sound Energy Future Flows

Leonard, Boudinot & Skodje Inc.
PROFESSIONAL ENGINEERS & LAND SURVEYORS

JOHN E. LEONARD, JR., P.E. & P.L.S.
ROBERT C. BOUDINOT JR., P.E.
JEFFREY A. SKODJE, P.L.S.

September 30, 1998

Mr. Gary Sturdy
Sturdy Engineering
2204 Riverside Drive, Suite 240
Mount Vernon, WA 98273

Reference: Lower Baker Sewer Project

Dear Mr. Sturdy:

Your review of the Lower Baker Sewer Project with the City of Concrete identified a concern over the length of time between pump activation in the West Pump Station during the winter season. Since the City of Concrete does not meter water to the PSE site, no actual water use records are available. The PSE main administration office on site provided the employee, visitor, and seasonal employee counts for present summer and winter seasons, as well as anticipated future staffing levels. These values are tabulated in the attached charts:

1. Estimated Person Generating Wastewater Flows for West Pump Station Inflow Calculation.

2. Wastewater Flows: West Pump Station Inflow Calculations.

This information is used to calculate estimated summer, winter, and future wastewater volumes, which will inflow into the West Pump Station.

Estimated average summer flows will be 1695 gallons per day, resulting in the west pump station activating 3.5 times per day at a dose volume of 475 gallons.

Estimated average winter flows will be 1109 gallons per day, resulting in the west pump station activating 2.3 times per day at a dose volume of 475 gallons.

Estimated future full usage will be 1483 gallons per day, resulting in the west pump station activating 3.1 times per day at a dose volume of 475 gallons.

In order to increase the number of pump station activations during the winter season from 2.3 to 3.0, we propose to decrease the dose volume to 370 gallons. The pump run time will decrease to 2.66 minutes, but this is still acceptable. A 370-gallon dose will displace approximately 80 percent of the effluent in the force main, and complete turnover will occur every 8 to 12 hours during the winter season . During the summer season complete turnover of effluent in the pump chamber will occur every 5 to 6 hours.

Mount Vernon Office: 603 South First Street, Mount Vernon, WA 98273, (360) 336-5751/FAX (360) 336-3981
Mailing Address: P.O. Box 1228, Mount Vernon, WA 98273 • *E-mail Address:* lbs1@sos.net

Based on a reduced dose volume of 370 gallons, we do not feel that biological degradation of the effluent will cause odor problems for the PSE site or the City of Concrete.

We will show the liquid level float switches adjusted to reduce the West Pump Station dose volume to 370 gallons. This will provide a pump station with potential capacity for unanticipated future growth, and still function properly at initial installation.

Sincerely,

C LARSON

Cyril Larson, Project Manager

\cgl
Enclosures

Puget Sound Energy
Operations Site, Concrete, WA
Estimated Persons Generating Wastewater
Flows for West Pump Station Inflow Calculation
September 25, 1998

	Summer (Current)			Winter (Current)			Future (Full Staffing)			Resident Occupants	
Location	Visitors	Permanent Employees	Seasonal Employees	Visitors	Permanent Employees	Seasonal Employees	Visitors	Permanent Employees	Seasonal Employees	Current	Future
House 1										6	6-10
House 2										8	6-10
Visitors Center	64*	6	4	10/wk	6		30-40	12		N/A	N/A
Truck Shelter		15	10		15			15-20	10-20	N/A	N/A
Shop Building		15	10		15			15-20	10-20	N/A	N/A
TOTALS	64	36	14	1.4/day	36	0	30-40	42	20	14	12+

* Average daily visitors June, July, August 1998

Wastewater Flows: West Pump Station Inflow Calculations

Source	Type of Person/Unit	Average Sewage Flow
House 1	3 bedroom	120 gal/bedroom/day
House 2	3 bedroom	120 gal/bedroom/day
Visitor Center	Employee	10.6 gal/person/day
Visitor Center	Visitor	5.3 gal/person/day
Shop Building	Employee	10.6 gal/person/day
Truck Shelter	Employee	10.6 gal/person/day

Note: Shop and truck shelter employees will leave the truck and shop buildings on an hourly basis to perform maintenance activities at other PSE sites as required.

Estimated Peak Summer Flow

Source	Unit	Flow/Unit	# of Units	Total Flow
House 1	Bedroom	120 gal/bedroom	3	360 gal/day
House 2	Bedroom	120 gal/bedroom	3	360 gal/day
Visitor Center	Employee	10.6 gal/day	10	106
Visitor Center	Visitor	5.3 gal/day	64	339
Shop Building	Employee	10.6 gal/day	25	265
Truck Shelter	Employee	10.6 gal/day	25	265
			TOTAL	1695

Estimated Low Winter Flow

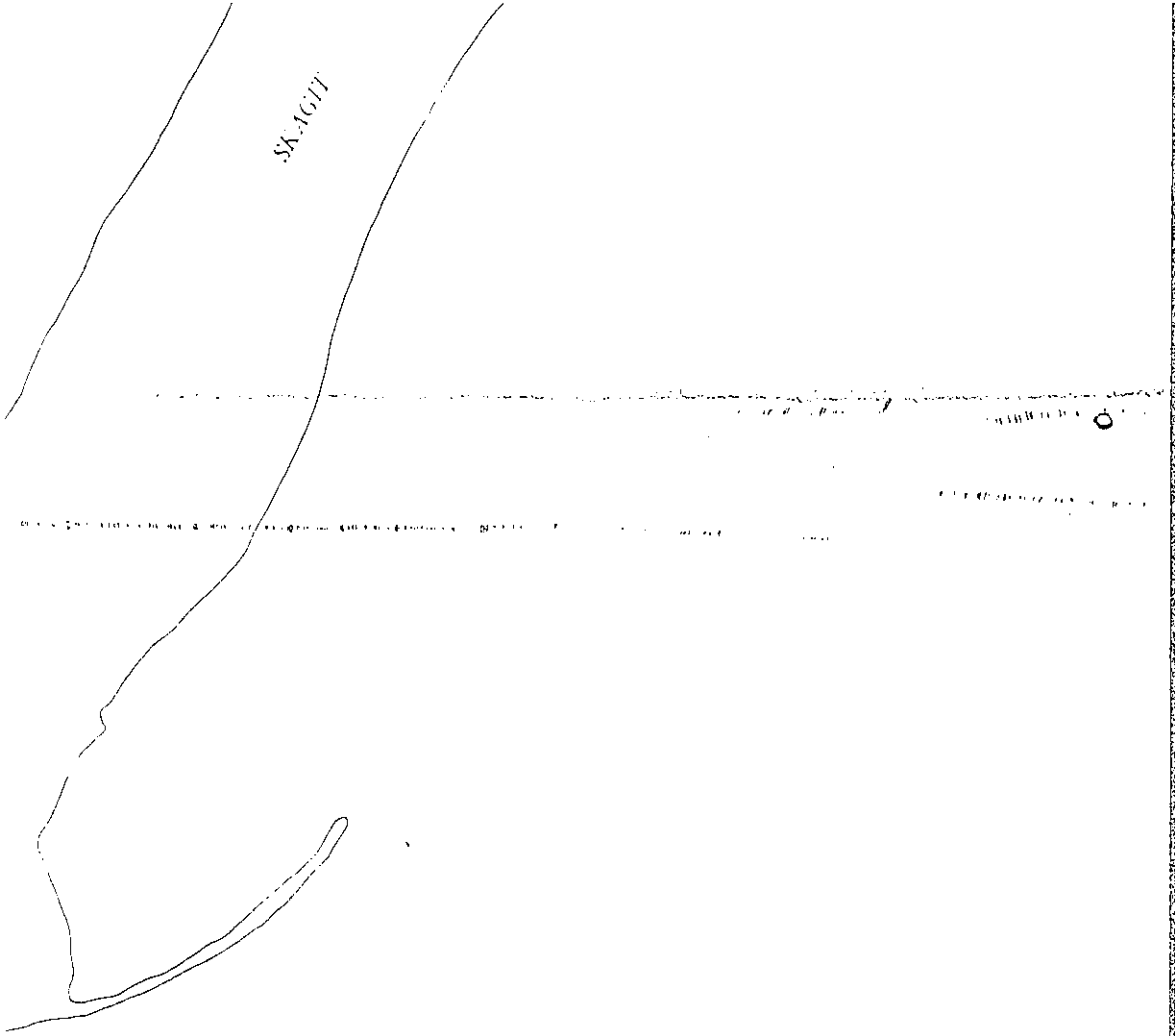
Source	Unit	Flow/Unit	# of Units	Total Flow
House 1	Bedroom	120 gal/bedroom	3	360 gal/day
House 2	Bedroom	120 gal/bedroom	3	360 gal/day
Visitor Center	Employee	10.6 gal/day	6	64
Visitor Center	Visitor	5.3 gal/day	1.4	7
Shop Building	Employee	10.6 gal/day	15	159
Truck Shelter	Employee	10.6 gal/day	15	159
			TOTAL	1109

Estimated Future Full Usage Level

Source	Unit	Flow/Unit	# of Units	Total Flow
House 1	Bedroom	120 gal/bedroom	3	360 gal/day
House 2	Bedroom	120 gal/bedroom	3	360 gal/day
Visitor Center	Employee	10.6 gal/day	12	127
Visitor Center	Visitor	5.3 gal/day	40	212
Shop Building	Employee	10.6 gal/day	20	212
Truck Shelter	Employee	10.6 gal/day	20	212
			TOTAL	1483.00

APPENDIX B

Flood Insurance Rate Map



Refer to the FLOOD INSURANCE RATE MAP EFFECTIVE date shown on this map to determine when actuarial rates apply to structures in the zones where elevations or depths have been established.

To determine if flood insurance is available in this community, contact your insurance agent, or call the National Flood Insurance Program, at (800) 638-6620.

APPROXIMATE SCALE

400 0 400 FEET

NATIONAL FLOOD INSURANCE PROGRAM

FIRM B10

FLOOD INSURANCE RATE MAP

TOWN OF
CONCRETE,
WASHINGTON
SKAGIT COUNTY

APPENDIX C

Sludge Removal Program

Sludge Removal Program
for
The Town of Concrete
Permit No. WA-2085-1

Intent

The Town of Concrete has chosen to land apply biosolids from the waste water lagoon operated by the town. The intent of this document is to supply the Town of Concrete with guidelines for the handling and disposal of sewage sludge biosolids to meet Washington State Administrative Code 173-308 WAC Biosolids Management.

Definition of Biosolids

Solid, semi-solid, or liquid residue generated during the treatment of domestic sewage in a treatment works. Sewage sludge includes scum or solids removed in primary, secondary, or advanced wastewater treatment processes and any material derived from sewage sludge (e.g., a blended sewage sludge/fertilizer product) but does not include grit and screenings or ash generated by the firing of sewage sludge in an incinerator. 173-308 WAC considers domestic septage as sewage sludge and sets separate requirements for domestic septage applied to agricultural land, forests, or reclamation sites.

Removal Requirements:

Even though there are no specific rules for removal of biosolids precautions must be taken to not contaminate surroundings and affect effluent quality from the waste treatment system. A later section of this document shall specifically address removal of the biosolids.

Disposal - Overview of the 173-308 WAC

As required by the Clean Water Act Amendments of 1987, the United States Environmental Protection Agency (EPA) developed a new regulation to protect public health and the environment from any reasonably anticipated adverse effect of certain pollutants that might be present in sewage sludge biosolids. This regulation, **The Standards for the Use or Disposal of Sewage Sludge** Title 40 of the Code of Federal Regulations [CFR], Part 503 became effective on March 22, 1993. The State of Washington has since established 173-308 WAC Biosolids Management - last updated 2/18/98.

The 173-308 WAC rule includes five subparts: general provisions and requirements for land application, surface disposal, pathogen and vector attraction reduction, and incineration. For each of the regulated use or disposal practices 173-308 WAC standard includes general requirements, pollution limits, management practices,

operational standards, and requirements for the frequency of monitoring, record keeping, and reporting.

The following document addresses the requirements for removal and disposal of biosolids from the sewage lagoon operated by the Town of Concrete under permit number WA - 2085-1.

Removal of Biosolids from Lagoon

The Town of Concrete will remove biosolids from the lagoon using a technology which has been around for several years, but is now being tested and gaining acceptance as an effective method to dewater biosolids. This technology, consisting of sewing geomembranes into tubes has been used successfully in the application of dewatering dredged solids from waterways. The technology has also been tested and used successfully in several similar applications for dewatering of biosolids from wastewater facilities within the United States. The sewn geomembranes are called geotubes.

The dewatering involves preparing a smooth, slightly sloped site, on which a layer of 30 mil or greater plastic (pvc) is laid over the surface to catch filtered liquid from the geotubes. This liquid is drained to the headworks of the lagoon. The site will be bermed adequately to contain the contents of one geotube in case of catastrophic failure. Geotubes approximately 30 feet in circumference and 60 feet long are laid out on the surface. They consist of either one or two layers of plastic, the outer layer of weave is for strength and the inner layer with an AOS of less than 100 is for filtration. The geotubes are connected to the downstream side of a 0.25" steel mesh gravity filter system. An overflow mechanism will insure there is not excessive hydraulic pressure in the geotube. A maximum pressure of 5 psi will be placed on the tubes. The geotubes are then pumped full of biosolid liquids and allowed to dewater over time. The geotubes can be refilled periodically (weekly or greater) to obtain cost savings in the geotubes. The dewatering time to 25% solids is about 160 days. At that time it is anticipated the dewatered sludge will meet the definition of **Pollutant Concentration** biosolids in accordance with part 173-308 WAC.

The following is a cost breakdown for the different alternatives that were considered viable for the Town of Concrete:

Sludge Removal Options
for the
Town of Concrete

Item	Unit measure	Quantity	Each	Total
Centrifuge, Haul 3 miles, Spread/Incorporate		70		
Dredge & Centrifuge cost	dry ton	70	$ 550.00	$ 38,531

Loading onto truck	hour	8	$	65.00	$	520
Dumping cost	hour	2.7	$	70.00	$	192
Hauling to site	hour	6.6	$	70.00	$	461
Spreading on site	hour	6.9	$	70.00	$	480
Land rental	acre	20	$	150.00	$	3,000
			Total Cost		**$**	**43,185**
Haul to Mt. Vernon						
Dredge cost	day	8	$	600.00	$	4,800
Liquid hauling	mile	5,167	$	1.30	$	6,717
Treatment cost-Mt. Vernon @ 8%	gal	240,000	$	0.120	$	28,800
Concrete employee	hour	64	$	18.00	$	1,152
			Total Cost		**$**	**41,469**
Geotube Removal/Haul 3 miles/Spread						
Sand for geotube underlayment	yard	80	$	8.00	$	640
Geotube site preparation-gravel	yard	250	$	5	$	1,250
Shaping of site	hour	24	$	65	$	1,560
Dredge	day	4	$	600	$	2,400
Geotube cost 30' circumference X 60'	each	4	$	2,000	$	8,000
Screening cost	day	4	$	120	$	480
Filling/overflow assembly	each	1	$	2,400	$	2,400
Labor to monitor geotube-Concrete	hour	40	$	18	$	720
Loading onto truck	hour	6.9	$	65	$	446
Hauling to site	hour	6.6	$	70	$	461
Spreading on site	hour	8	$	70	$	560
Land rental	acre	20	$	150.00	$	3,000
			Total Cost		**$**	**21,917**
Lagoon Storage/Geotube Dewater/Haul 3 miles/Spread						
Lined lagoon cost	each	1	$	14,000	$	14,000
Dredge	day	3	$	600	$	1,800
Geotube site preparation-gravel	yard	250	$	5	$	1,250
Sand for geotube underlayment	yard	80	$	8.00	$	640
Shaping of site	hour	24	$	65	$	1,560
Geotube cost	each	4	$	2,000	$	8,000
Filling setup	each	1	$	2,400	$	2,400
Mixing & pumping cost	hour	16	$	70	$	1,120
Screening cost	day	3	$	120	$	360
Labor to monitor geotube	hour	24	$	18	$	432
Loading onto truck	hour	6.9	$	65	$	446
Hauling to site	hour	6.6	$	70	$	461
Spreading on site	hour	8	$	70	$	560
Land rental	acre	20	$	150.00	$	3,000
			Total Cost		**$**	**33,029**

* Assuming biosolids can be pumped directly into tanker at 5% solids.

Requirements for Meeting Pollutant Concentration (PC) Biosolids

It is anticipated the biosolids will meet the following parameters, allowing them to be classified as **Pollutant Concentration (PC)** biosolids. These requirements are in three categories;

Pollutant limits - Applies to metals listed in **Table 1**.

Pathogen Reduction - Applies to pathogens reduction requirements listed in WAC 173-170. Based on information from the City of Everett, pathogen reduction may meet standards under WAC 173-308-170 (2) (f) Class A - Alternative 6. It should be noted the biosolids can be left in the geobags indefinitely. Theoretically, they could meet Exceptional Quality (EQ) biosolids if left in the geobags for a long enough period.

Vector Attraction Reduction - Biosolids from the lagoon when dewatered should meet WAC 173-308-180, Vector Attraction Reduction Requirements, as the volatile solids are assumed to be reduced by greater than 38 percent due to the age of the biosolids.

Biosolids Characteristics - Biosolids are characterized as Pollutant Limit (PC) biosolids for disposal purposes. Following is an explanation of each of the three areas which affect the biosolids rating for the Town of Concrete:

Pollution limits - The biosolids have been tested for pollution limits according to 173-308 WAC rules. Previous tests indicate no problems meeting any listed pollutant levels. There should be no restrictions relating to pollutants.

Vector attraction - The age of the biosolids (over 12 years average) exceeds the treatment provided by conventional anaerobic digestion. This equivalency was granted to the City of Everett for dredged biosolids in a similar situation. Vector attraction reduction has been accepted under an alternative process meeting WAC 173-308-180. This requires at least 38% reduction in volatile solids before application to land.

Pathogen reduction is acceptable under Alternative 6, WAC 173-308-170. This was granted to the City of Everett in a similar situation. Monitoring is not required.

Disposal of Biosolids

The biosolids can be contained in the geotextile bags indefinitely. Biosolids can be held until it meets **Exceptional Quality (EQ) Biosolids** if necessary. At this time the site chosen is a grass field bordering the Concrete Airport. SEPA and Public Notice is required for this site.

Disposal of Biosolids

Biosolids will be held on site, in the geotubes until they meet all requirements for PC biosolids and can be hauled without runoff from an unsealed hauling unit.

Target goals for Pollutants, Vector Attraction, and Pathogens

Ceiling Concentration for Pollutants, Table 3.

Vector attraction meets WAC 173-308-180 (reduction of mass of volatile solids by at least 38%).

Pathogens Alternative 6 meet fecal coliform bacteria or density of Salmonella SP bacteria, viable helmuth ova, and enteric viruses for Class A standards.

Testing Requirements for biosolids before disposal

Pollutant limits tests (metals and other contaminants) shall completed every two years. A record of such tests shall be kept by the Town of Concrete.

Vector Attraction tests shall be taken at the same time as pathogen reduction tests. A reduction of 38% in volatile solids is the anticipated benchmark.

Pathogen reduction tests shall be taken no more than 2 weeks before disposal/spreading of biosolids. These tests shall be taken for salmonella sp. (preferred) and/or fecal coliform, viable helmuth ova, and enteric viruses.

Nitrogen and phosphorus testing for agrinomic rate application shall be taken before application. Agrinomic rates shall not exceed those specified for a particular crop on a yearly basis.

Testing procedures: A sample will be taken in glass or plastic container. A composite sample from a minimum of 7 locations, shall be taken, with adequate lead time to allow results before application to a permitted site (2 weeks). A minimum composite sample container size is 1 liter.

A final test, before disposal, will be taken to check for pathogens, vector attraction and pollutants, to insure the biosolids are within required parameters

Site Specific Land Application Plan

A site-specific land application plan is required for every site where non-exceptional quality biosolids are applied. The following is the land application plan for the Town of Concrete Airport site for PC biosolids.

Hauling of Biosolids

Hauling of biosolids to the site shall be completed in a way that will insure there is no loss or contamination of public access areas between the site and the treatment area. This shall include, but not be limited to vehicles with sealed endgates and tarping to insure there is no loss due to air movement or seepage from the vehicle(s). All equipment used in the transport or handling of biosolids shall be cleaned to insure there is no biosolids left in or on the unit. Any spillage, other than at the wastewater treatment facility or at the site, shall be removed adequately to insure no adverse exposure to the public.

Site Management:

The Town of Concrete is using the 7.5 acres surrounding the Concrete airport property for disposal of sludge. This site is presently a combination of spotty grass sod and Knik-Knik and is not harvested for human or animal consumption. It is mowed periodically. There is no history of biosolids application at the site.

The soil maps show the ground to be of an SCS Birdsview soil type and examination of the site verified the type of soils. Birdsview soils are of Hydrologic Group A. These soils are typically low in fertility. Application of biosolids will increase the soil fertility.

The water table from well logs in the surrounding area show the distance to water on the site to be >6' below the ground level. Wells in the area are >500' in distance from the site. Due to the low application rates, there should be no impact on any existing water from the application of sludge at the site. In any case, no biosolids shall be applied to land within one hundred feet of a well or surface water.

Site Restrictions

The site is already restricted due to Federal Aviation Restrictions around airports. Public use of the land is minimal and further restrictions shall be imposed for a minimum of thirty days after the application of biosolids by posting of the site at significant points of access and around the perimeters of the site.

Annual Pollution Loading Rates

It is anticipated there shall be no pollutants affecting the application rates on the airport site. If, in the future a pollution limit becomes applicable, a formula consistent with the state Annual Pollutant Loading Rate Limit (APLR) and the Annual Whole Biosolids Application Rate (AWBAR) shall be used as expressed below.

APLR=C*AWBAR*0.001

Where:
APLR = Annual pollutant loading rate in kilograms per hectare per 365 day period.
C = Pollutant concentration in milligrams per kilogram of total solids (dry weight basis).
AWBAR = Annual whole biosolids application rate in metric tons per hectare per 365 day period (dry weight basis).
= conversion factor.

$$AWBAR = \frac{APLR}{C*0.001}$$

The procedure to determine AWBAR is as follows:

1. Analyze a sample of the biosolids to determine the concentration for each of the pollutants listed in Table 4 of WAC 173-308-160.
2. Using the pollutant concentrations from Step 1 and the APLRs from Table 4 of WAC 173-308-160 calculate an AWBAR for each pollutant.
3. The correct AWBAR is the lowest AWBAR calculated in Step 2.

Crops Grown and Agrinomic Application Rates:

Grass sod is grown at the site and is not used for feeding humans or domestic animals. Agrinomic application rates shall conform to Table 4 WAC 173-308-160.

Method of Application:

The biosolids shall be dumped on the site and spread by an agriculture type spreader manufactured for the purpose of evenly spreading equivalent materials. Biosolids shall not be stored on the site.

Timing of application:
The biosolids shall be spread only during the summer months when plants are actively growing. They shall not be spread during periods of high precipitation when excessive surface runoff is likely.

Site map:
- The means of access to the facility and location, if applicable: a copy of the assessor's plat map(s) with the application areas(s) clearly shown;
- An Assessor's map is included showing the existing rights-of-way to the Airport property;
- The number of acres in the site;
- Location and extent of any wetlands on the site;
- Adjacent properties and uses and their zoning classification;
- Any seasonal surface water bodies located on the site or perennial surface water bodies within ¼ mile of the site;
- The location of any wells within ¼ mile of the site that are listed in public records or otherwise known to the town, whether for domestic, irrigation, or other purposes;
- The width of buffer zones to surface waters, property boundaries and other features requiring buffers;
- The presence and extent of any threatened or endangered species or related critical habitat;
- The location of any critical areas on site, as required to be identified under Chapter 36.70A RCW in the county's growth management plan;
- Any portion of the site that falls within a wellhead protection area;
- The location and size of any areas which will be used to store biosolids.

TABLE 1 - CEILING CONCENTRATION LIMITS

POLLUTANT	CEILING CONCENTRATION*
Arsenic	75
Cadmium	85
Copper	43000
Lead	840
Mercury	57
Molybdenum	75
Nickel	420
Selenium	100
Zinc	7500

*Milligrams per kilogram - dry weight basis

TABLE 2 - CUMULATIVE POLLUTANT LOADING RATES

POLLUTANT	CUMULATIVE POLLUTANT LOADING RATE*
Arsenic	41
Cadmium	39
Copper	1500
Lead	300
Mercury	17
Nickel	420
Selenium	100
Zinc	2800

*Kilograms per hectare - dry weight basis

TABLE 3 - POLLUTANT CONCENTRATION LIMITS

POLLUTANT	LIMIT*	TOWN OF CONCRETE 12/97
Arsenic	41	11.6
Cadmium	39	10.8
Copper	1500	433
Lead	300	122
Mercury	17	0.5
Nickel	420	32.6
Selenium	100	12.0
Zinc	2800	1489.0

***Monthly average concentration in milligrams per kilogram - dry weight basis**

TABLE 4 - ANNUAL POLLUTANT LOADING RATES

POLLUTANT	ANNUAL POLLUTANT LOADING RATE*
Arsenic	2.0
Cadmium	1.9
Copper	75
Lead	15
Mercury	0.85
Nickel	21
Selenium	5.0
Zinc	140

***Kilograms per hectare per 365 day period**

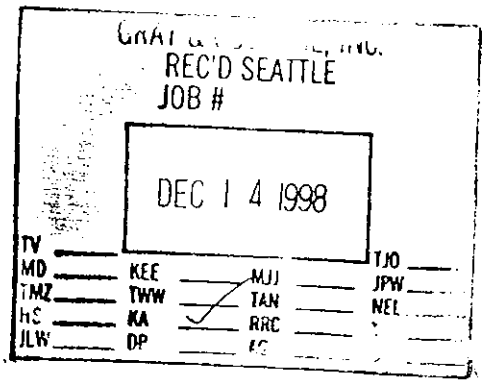
APPENDIX D

Department of Ecology Letter (12/14/98)

STATE OF WASHINGTON

DEPARTMENT OF ECOLOGY

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



December 14, 1998

The Honorable David Williams
Mayor Town of Concrete
PO Box 39 – 228D & Main Street
Concrete, WA 98237

Dear Mayor Williams:

Re: Concrete Comprehensive Sewer and Facility Plan
Meeting on December 7, 1998

On the evening of December 7, 1998 Gary Sturdy (Sturdy Engineering), Kenneth Alexander (Gray & Osborne, Inc.), Marc Henley (Gray & Osborne, Inc.), Alan Williams (Town of Concrete), Ralph Svrjcek (Ecology), and I met at the Concrete town council chambers to discuss issues regarding the Comprehensive Sewer and Facilities Plan for the sewer system and waste water treatment plant (WWTP). We met at 6:30 PM, and my notes show that you arrived at about 7:30 PM. Thank you for meeting with us. Mr. Sturdy stated that he is serving as the City Engineer. Mr. Alexander requested that we formally respond to some of his questions in writing. In addition, I need to request some documentation from the Town to update the NPDES permit application.

The major design issues we discussed at the meeting are as follows:

1. I have agreed to derive estimated effluent mixing factors for the treatment plant discharge before February, 1999. Gray and Osborne, Inc. will incorporate this work into the engineering documents.
2. Mr. Alexander asked me to verify that the permit limits for total suspended solids (TSS) for the treatment plant would remain the same after the lagoon is expanded. The current permit limitation for this parameter is 75 mg/L daily average and 110 mg/L weekly maximum. Washington Administrative Code (WAC) Chapter 173-221 specifically allows relaxed TSS limitations for waste stabilization ponds with capacities less than two million gallons per day (MGD). The treatment facility in Concrete is currently rated at 0.1 MGD, and thus qualifies for the relaxed limitation. WAC 173-221-050 (2) (b) allows discharge standards for TSS to be adjusted by the Department to "concentrations achievable with waste stabilization pond."

3. This determination is described in the Department of Ecology's Permit Writer's Manual on page V-13. I have enclosed a copy of that page and marked the relevant sections. The regulation and the guidance in the Permit Writer's Manual verify that the future TSS limitation will remain the same as it is now until the treatment system is designed to treat more than 2 MGD.

4. Mr. Alexander asked if a new lagoon liner is required in light of his observation that the old one is deteriorated. A new liner is required to assure compliance with the ground water standards per the requirements of the Department's Criteria for Sewage Design Works (the Orange Book). Lining the lagoon will not affect permit limitations.

5. Mr. Alexander asked if the Department would change any permit limits if a temporary mechanical system were leased to provide wastewater treatment during construction. The Department will not modify the permit for temporary treatment activities. We would require a plan of operation; a certified, knowledgeable operator; and proposed effluent goals appropriate for the temporary plant.

6. Mr. Alexander asked if the Department will allow the use of carbonaceous biochemical oxygen demand ($CBOD_5$) in place of biochemical oxygen demand (BOD_5). The Department requires parallel measure of these parameters for two years prior to granting this change to the permit limitations.

Mr. Alexander requested that we update the discharge data that we supplied for the Concrete WWTP. We will send computer files directly to Gray and Osborne, Inc. to fulfill this request.

The Department requires an update of the NPDES permit application for the Concrete WWTP. The application we have on file has both the previous Mayor listed as the responsible official and David Herring identified as the contact person. I have enclosed the original application Form 1 submitted in 1992 for renewal of the NPDES permit for the Concrete WWTP and a blank form 1. Please submit a new Form 1 with current information. For the facility contact person, you may write in Alan Wilkins or the title 'Public Works Administrator' as you deem appropriate. Your name, title, and signature are required at the bottom of the second page of Form 1.

Also write a brief letter identifying who may sign discharge monitoring reports submitted by the Town of Concrete. Signature authority for submittals required by the permit may be delegated to a specific individual (e.g. Alan Wilkins), to a position which is filled by a qualified individual (e.g. Public Works Director), or both. Please sign and submit this letter along with the updated permit application form.

As I discussed during our meeting, the Town of Concrete is required by the NPDES permit for the WWTP to provide an operator certified for a Class 1 sewage treatment plant. Hiring a certified operator needs to considered a high priority by the Concrete municipal government.

Please contact me at (425) 649-7215 to answer questions or for further assistance.

Sincerely,

Gerald Shervey

Gerald Shervey, P.E.
Water Quality Engineer
NWRO Water Quality Section

GS:gs:gm
Enclosures (3)

cc: NWRO central files NPDES
Ralph Svrjcek – Ecology NWRO WQ
Gary Sturdy, PE – Sturdy Engineering
Kenneth Alexander, PE (with attachment from Permit Writer's Manual and computer diskette)

APPENDIX E

Town of Concrete NPDES Permit

STATE OF WASHINGTON

DEPARTMENT OF ECOLOGY

4350 - 150th Ave N.E. • Redmond, Washington 98052 • (206) 885-1900

NOTICE: ANNOUNCEMENT OF APPLICATION FOR PERMIT RENEWAL TO DISCHARGE TO STATE WATERS

APR 28 1982

APPLICATION NO.: WA-002085-1 (I)

APPLICANT: TOWN OF CONCRETE
P.O. Box 39
Concrete, Washington 98237

PLANT LOCATION: Concrete, Washington

has applied for renewal of a National Pollutant Discharge Elimination System (NPDES) permit in accordance with the provisions of Chapter 90.48 Revised Code of Washington and the Clean Water Act, Public Law 95-217,as amended. The Town of Concrete discharges 104,000 gallons per day of treated municipal wastewater to the Baker River.

TENTATIVE DETERMINATIONS

On the basis of preliminary staff review, the department proposes to reissue the permit to the above listed applicant to discharge to public waters subject to certain effluent limitations and special permit conditions. These proposed determinations are tentative. A final determination will not be made until all comments received pursuant to this notice have been evaluated.

PUBLIC COMMENT AND INFORMATION

Interested persons are invited to submit written comments regarding the proposed permit. All comments should be submitted within 30 days of the date of this public notice if they are to be considered in the formulation of final determinations regarding this application. Comments should be sent to:

Washington State Department of Ecology
Northwest Regional Office
4350 - 150th Avenue N.E.
Redmond, Washington (8052
Attn: John H. Glynn

If the comments received indicate significant public interest in the proposed permit or if useful information could be produced, thereby, the director may hold a public hearing on the application. Public notice regarding any hearing will be circulated at least 30 days in advance of the hearing.

The application, proposed permit and related documents are available for inspection and copying between the hours of 8 a.m. and 4:30 p.m. weekdays at the aforementioned regional office of the department. A copying machine is available for use at a charge of 10 cents per copy sheet. Further information may be obtained by telephoning (206) 885-1900.

jhg
4/26/82 dt

JOHN SPELLMAN
Governor

DONALD A. MOOS
Director

STATE OF WASHINGTON
DEPARTMENT OF ECOLOGY
4350-150th Ave. N.E. • Redmond, Washington 98052 • (206) 885-1900

STATEMENT OF BASIS

APPLICANT: TOWN OF CONCRETE
P.O. Box 39
Concrete, Washington 98237

APPLICATION NO.: WA-002085-1

ACTIVITY: Treatment of Municipal Wastewater

RECEIVING WATER: Baker River

APPLICABLE WATER QUALITY STANDARDS: Class AA

BACKGROUND: The Town of Concrete has operated an aerated lagoon since June 1973.

WASTE SOURCES AND TREATMENT: The plant provides treatment for domestic and commercial wastes. There are no known significant industrial wastes. The design criteria are:

Average Daily Flow	380 m^3/d (100,000 gpd)
Design Population Equivalent	1,000
Design BOD Loading	90 kg/d (200 lb/d)
Design BOD Removal Efficiency	90%

The population currently served is 585 and monthly average flows are considerably below 100,000 gpd.

Effluent based on the requirements of the Clean Water Act and 40 CFR 133.103 (c) as adjusted by WDOE and approved by EPA are proposed. Loadings will be based on the design flow of 380 m^3/d.

JHG:11

4-20-82

Permit Number WA-002085-1 (M)

Issuance Date: February 25, 1983
Expiration Date: February 25, 1988

NATIONAL POLLUTANT DISCHARGE ELIMINATION SYSTEM
WASTE DISCHARGE PERMIT

State of Washington
DEPARTMENT OF ECOLOGY
Olympia, Washington 98504

In compliance with the provisions of
Chapter 90.48 Revised Code of Washington as amended
and
The Clean Water Act as amended
Public Law 95-217

TOWN OF CONCRETE
P.O. Box 39
Concrete, Washington 98237

Plant Location:

Highway 20 and Baker River

Receiving Water:

Baker River

Waterway Segment Number:

02-04-07

Discharge Location:

Latitude: 48° 32' 14" N

Longitude: 122° 44' 28" W

---

is authorized to discharge in accordance with the special and general conditions which follow.

B. A. Cameron

Bruce A. Cameron
Assistant Director
Department of Ecology (1)

SPECIAL CONDITIONS

S1. EFFLUENT LIMITATIONS

Beginning on the issuance date of this permit and lasting through the expiration date of this permit, the permittee is authorized to discharge treated municipal wastewater to the Baker River at the permitted discharge location subject to the following limitations:

	EFFLUENT LIMITATIONS	
Parameter	Monthly Average	Weekly Average
Biochemical Oxygen Demand* (5 day)	30 mg/l, 11 kg/d (25 lbs/day)	45 mg/l, 17 kg/d (38 lbs/day)
Suspended Solids	75 mg/l, 28 kg/d (63 lbs/day)	110 mg/l, 42 kg/d (92 lbs/day)
Fecal Coliform Bacteria	200/100 ml	400/100 ml
pH**	Shall not be outside the range 6.0 - 9.0	

*The monthly average effluent concentrations limitations for BOD_5 shall not exceed 30 mg/l or 15 percent of the respective influents concentrations, whichever is more stringent.

**Effluent values for pH shall not exceed the limits 6.0 - 9.0 where such values are attributable to inorganic chemical addition to the treatment process or to industrial contributions.

The monthly and weekly averages for BOD_5 and Suspended Solids are based on the arithmetic mean of the samples taken. The averages for Fecal Coliform are based on the geometric mean of the samples taken.

Total available residual chlorine shall be maintained which is sufficient to attain the Fecal Coliform limits specified above. Chlorine concentrations in excess of that necessary to reliably achieve the limits shall be avoided.

S3. MONITORING AND REPORTING

a. Reporting

A monthly report recording each required analysis shall be submitted no later than the 15th day of the following month. The monthly reporting form will be supplied to the permittee or approved by the department and sent to the Northwest Regional Office of the Washington State Department of Ecology, 4350 - 150th Avenue N.E., Redmond, Washington 98052.

Monitoring shall be started on the effective date of this permit and the first monthly report is due 45 days thereafter.

If the permittee monitors any pollutant any more frequently than required by the permit, he shall record and report such results.

b. Records Retention

The permittee shall retain for a minimum of three years all records of monitoring activities and results, including all reports of recordings from continuous monitoring instrumentation. 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, and time of sampling; (2) the dates the analyses were performed; (3) who performed the analyses; (4) the analytical techniques or methods used; and (5) the results of all analyses.

d. Representative Sampling

Samples and measurements taken to meet the requirements of this condition shall be representative of the volume and nature of the monitored discharge.

S3. MONITORING AND REPORTING (Continued)

e. Test Procedures

All sampling and analytical methods used to meet the monitoring requirements specified in this permit shall, unless approved otherwise in writing by the Department, conform to the Guidelines Establishing Test Procedures for the Analysis of Pollutants, contained in 40 CFR Part 136, as published in the Federal Register on December 1, 1976, or the latest revision thereof, which references the following publications:

1. American Public Health Association, Standard Methods for the Examination of Water and Wastewaters.

2. American Society for Testing and Materials, A.S.T.M. Standards, Part 31, Water, Atmospheric Analysis.

3. Environmental Protection Agency, Methods for Chemical Analysis of Water and Wastes.

S4. PREVENTION OF FACILITY OVERLOADING

a. Design Criteria

The design criteria for the permitted treatment facility are as follows:

Average Design Flow	380 m^3d (100,000 gpd)
Population Equivalent	1,000
BOD Loading	90 kg/d (200 lb/d)
BOD Removal Efficiency	90%

b. Plans for Maintaining Adequate Capacity

When the actual flow or waste load reaches 85 percent of the design capacity as specified in Paragraph a., or when the projected increases would reach design capacity within five years, whichever occurs first, the permittee shall submit to the department on an annual basis, a plan and a schedule for continuing to maintain adequate capacity. This plan shall address any and all of the actions necessary to meet this objective. This may include the following items:

1. Analysis of the present design and/or process modifications that would establish the ability of the existing facility to reliably treat flows and/or waste loads (i.e., achieve the effluent limits and other requirements of this permit), in excess of the existing design criteria.

S4. PREVENTION OF FACILITY OVERLOADING (Continued)

2. Elimination of excessive infiltration and inflow of uncontaminated ground and surface water into the sewer system to reduce extraneous flow.

3. Limitation on future sewer extension or connections or additional flow or waste load.

4. Modification or expansion of facilities necessary to accommodate increased flow or waste load.

5. Any other actions necessary to achieve this objective.

The plan shall specify and contracts, ordinances, methods for financing or other arrangements necessary to achieve this objective.

S5. NOTIFICATION OF SIGNIFICANT NEW OR ALTERED SOURCES

The permittee shall submit written notice to the department whenever any new or altered commercial or industrial source proposes to discharge waste into it's municipal sewer system which may interfere with the operation of the treatment works including interference with the use or disposal of municipal sludge and/or which may pass through the treatment works causing violations of the State Water Quality Standards (Chapter 173-201 Washington Administrative Code). Connection to the sewer system shall not be allowed until the commercial or industrial applicant obtains a State Waste Discharge Permit as provided in the Revised Code of Washington Chapter 90.48.160.

The permittee shall assist the department in monitoring commercial and industrial discharges into the municipal sewer system.

S6. RESIDUAL SOLIDS HANDLING

a. The permittee shall handle, utilize and dispose of all residual solids in such a manner as to prevent its entry into state ground or surface waters.

b. The permittee shall not permit leachate from its residual solids to enter state surface waters without providing all known, available and reasonable methods of treatment, nor permit such leachate to cause any adverse effect on state ground waters. The permittee shall apply for a permit or permit modification as may be required for such discharges.

c. In the event that sludge is wasted from the lagoon, the permittee shall submit a report detailing the sewage treatment plant residual solids utilization and disposal activities. The report shall be submitted to the Department of Ecology within thirty days after the end of the calendar year in which the sludge was wasted.

S6. RESIDUAL SOLIDS HANDLING (Continued)

The report will include the following information:

1. A map showing each sludge utilization and disposal site (a photocopy of a 7½ or 15 minute U.S.G.S. quadrangle map will be acceptable).

2. An approximate summary of quantities of sludge disposed or utilized at each site.

3. A statement, for each site, of the existing land use. If agricultural, please state crop grown or types of animals grazed.

4. A statement indicating whether sludge is made available to the general public.

5. A statement indicating how scum, grit and other residual solids are disposed of, if handled separately from the sludge.

A report form is available from the Washington State Department of Ecology for summarizing the information of 2. through 5., above.

d. The requirements of c. 1. through 5. above will be waived for any sites for which a solid waste disposal site permit is obtained from the jurisdictional health department.

S7. OPERATION AND MAINTENANCE OF FACILITIES

In accordance with the Washington Administrative Code, Chapter 173-230 (Certification of Operators of Wastewater Treatment Plants), the permittee shall provide an adequate operating staff which is qualified to carry out the operation, maintenance and testing activities required to insure compliance with the conditions of this permit. An operator certified for a Class I plant by the State of Washington shall be in responsible charge of the day-to-day operation of the wastewater treatment plant.

S8. CONSTRUCTION OR MAINTENANCE RELATED REDUCTION IN LEVEL OF TREATMENT

If the permittee contemplates a reduction in the required level of treatment that would exceed permit effluent 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. If such a reduction involves a bypass, the requirements of Condition G5. and the "Construction or Maintenance Related Overflow or Bypass" conditions must be met.

S9. CONSTRUCTION OR MAINTENANCE RELATED OVERFLOW OR BYPASS

Bypasses of untreated or partially treated sewage during construction or maintenance shall be avoided if at all feasible.

If a construction or maintenance related overflow or bypass is contemplated, the permittee shall submit to the department not less than 90 days prior to the contemplated overflow or bypass, a report which describes in detail any construction work which will result in the overflow or bypass of wastewater. The report shall contain: (1) an analysis of all known alternatives which would eliminate, reduce, or mitigate the need for bypassing; (2) a cost-effective analysis of alternatives including comparative resource damage assessment; (3) the minimum and maximum duration of bypass under each alternative; (4) a recommendation as to the preferred alternative for conducting the bypass; (5) the projected date of bypass initiation; (6) a statement of compliance with the State Environmental Policy Act; and (7) a request for a water quality modification, as provided for in Chapter 173-201-100(2) of the Washington Administrative Code.

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.

Final authorization to bypass may be granted after review of the above information, in accordance with Condition G5. Authorization to bypass will only be by administrative order.

S10. PROVISION FOR ELECTRIC 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 electric 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.

GENERAL CONDITIONS

G1. All discharges and activities authorized by this permit shall be consistent with the terms and conditions of this permit. The discharge of any pollutant more frequently than or at a level in excess of that authorized by this permit shall constitute a violation of the terms and conditions of this permit.

G2. The permittee shall at all times properly operate and maintain all facilities and systems of collection, treatment and control (and related appurtenances) which are installed or used by the permittee to achieve compliance with conditions of this permit.

G3. The permittee, in order to maintain compliance with its permit, shall control production and/or all discharges upon reduction, loss, failure, or bypass of the treatment facility until the facility is restored or an alternative method of treatment is provided. This requirement applies in the situation where, among other things, the primary source of power of the treatment facility is reduced, lost, or fails.

G4. If, for any reason, the permittee does not comply with or will be unable to comply with any of the discharge limitations or other conditions specified in the permit, the permittee shall, at a minimum, provide the department with the following information:

a. A description of the nature and cause of noncompliance, including the quantity and quality of any unauthorized waste discharges;

b. The period of noncompliance, including exact dates and times and/or the anticipated time when the permittee will return to compliance; and

c. Steps taken or to be taken to reduce, eliminate, and prevent recurrence of the noncompliance.

In addition, the permittee shall take immediate action to stop, contain, and clean up any unauthorized discharges and take all reasonable steps to minimize any adverse impacts to waters of the state and correct the problem. The permittee shall notify the department immediately by telephone so that an investigation can be made to evaluate any resulting impacts and the corrective actions taken to determine if additional action should be taken.

In the case of any discharge subject to any applicable toxic pollutant effluent standard under Section 307 (a) of the Clean Water Act, or which could constitute a threat to human health, welfare, or the environment, 40 CFR Part 122 requires that the information specified in items G4.a., G4.b., and G4.c., above, shall be provided not later than 24 hours from the time the permittee becomes aware of the circumstances. If this information is provided orally, a written submission covering these points shall be provided within five days of the time the permittee becomes aware of the circumstances, unless the department waives or extends this requirement on a case-by-case basis.

Compliance with these requirements does not relieve the permittee from responsibility to maintain continuous compliance with the conditions of this permit or the resulting liability for failure to comply.

G5. The intentional bypass of wastes from all or any portion of a treatment works to the extent that permit effluent limitations cannot be met is prohibited unless the following four conditions are met:

a. Bypass is: (1) unavoidable to prevent loss of life, personal injury, or severe property damage; or (2) necessary to perform construction or maintenance-related activities essential to meet the requirements of the Clean Water Act and authorized by administrative order;

b. There are no 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 temporary reduction or termination of production;

c. The permittee submits notice of an unanticipated bypass to the department in accordance with Condition G4. Where the permittee knows or should have known in advance of the need for a bypass, this prior notification shall be submitted for approval to the department, if possible, at least 30 days before the date of bypass (or longer if specified in the special conditions);

d. The bypass is allowed under conditions determined to be necessary by the department to minimize any adverse effects. The public shall be notified and given an opportunity to comment on bypass incidents of significant duration, to the extent feasible.

"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. Severe property damage does not mean economic loss caused by delays in production.

After consideration of the factors above and the adverse effects of the proposed bypass, the department will approve or deny the request. Approval of a request to bypass will be by administrative order under RCW 90.48.120.

G6. 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 permittee's premises where a discharge source is located or where any records must be kept under the terms and conditions of the permit;

b. To have access to and copy at reasonable times any records that must be kept under the terms and conditions of the permit;

c. To inspect at reasonable times any monitoring equipment or method required in the permit;

d. To inspect at reasonable times any collection, treatment, pollution management, or discharge facilities required under the permit;

e. To sample at reasonable times any discharge of pollutants.

G7. The permittee shall submit a new application or supplement to the previous application where facility expansions, production increases, or process

modifications will (1) result in new or substantially increased discharges of pollutants or a change in the nature of the discharge of pollutants, or (2) violate the terms and conditions of the existing permit.

G8. After notice and opportunity for public hearing, this permit may be modified, terminated, or revoked during its term for cause as follows:

a. Violation of any term or condition of the permit;

b. Failure of the permittee to disclose fully all relevant facts or misrepresentation of any relevant facts by the permittee in the application or during the permit issuance process;

c. A change in any condition that requires either a temporary or a permanent reduction or elimination of any discharge controlled by the permit;

d. Information indicating that the permitted discharge poses a threat to human health or welfare;

e. A change in ownership or control of the source; or

f. Other cause listed in 40 CFR Part 122.15 and 122.16.

Permit modification, revocation and reissuance, or termination may be initiated by the department or requested by any interested person.

G9. A permittee who knows or has reason to believe that any activity has occurred or will occur which would constitute cause for modification or revocation and reissuance under Condition G8. or 40 CFR Part 122.15 must report its plans, or such information, to the department so that a decision can be made on whether action to modify or revoke and reissue a permit will be required. The department may then require submission of a new application. Submission of such application does not relieve the discharger of the duty to comply with the existing permit until it is modified or reissued.

G10. 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 toxic effluent standard or prohibition.

G11. Prior to constructing or modifying any wastewater control facilities, detailed plans shall be submitted to the department for approval in accordance with WAC 173-240. Facilities shall be constructed and operated in accordance with the approved plans.

G12. All other requirements of 40 CFR Part 122.7, 122.60, and 122.61 are incorporated into this permit by reference.

G13. Nothing in this permit shall be construed as excusing the permittee from compliance with any applicable federal, state, or local statutes, ordinances, or regulations.

'12.
MK

1-23 83
(date)

Washington State Department of Ecology
Northwest Regional Office
4350 - 150th Avenue N.E.
Redmond, Washington 98052

Gentlemen:

I certify the public notice application for NPDES permit has been posted PROMINATLY in accordance with the procedures outlined in your letter transmitting the public notice form.

Wayne Hoover
Signature

WAYNE HOOVER
Name Printed

ST. SEWER / WATER SUPT
Title

TOWN OF CONCRETE (WA-002053-1 M)
Company Permit Number

BOX 39 CONCRETE WN 98237 853-8401
Address Telephone

1-23-83
Date

APPENDIX F

Mixing Zone Study

DEPARTMENT OF ECOLOGY
NORTHWEST REGIONAL OFFICE
FACSIMILE COVER SHEET

WASHINGTON STATE DEPARTMENT OF ECOLOGY

GLO 98749
TOWN OF CONCRETE

DATE: April 2, 1999 TIME: 2:25 PM

Number of Pages: 4 (6) including Cover Sheet

TO: Ken Alexander, PE Gray & Osborne, Inc.

FAX # 206-283-3206

FROM: Gerald Shervey, PE – WQ Engineer

PHONE: (425) 649-7215

SECTION: Water Quality

Department of Ecology
Northwest Regional Office
3190 - 160th Avenue S.E.
Bellevue, WA 98008-5452
Phone: (425) 649-7000 Fax: (425) 649-7098

COMMENTS: Here is the dilution analysis for the Concrete WWTP. I will mail a full package sometime next week. Let me know if you think any assumptions need to revised or would like additional modeling scenarios done.

Town of Concrete WWTP
Preliminary Mixing Zone Estimate

Prepared by Gerald Shervey
Washington State Department of Ecology, April, 1999

Summary: The existing outfall for the Town of Concrete WWTP provides inadequate dilution to meet water quality – based permit limits for chlorine and ammonia. Adequate dilution of ammonia in the receiving water is necessary to continue using the aerated lagoon treatment system currently employed by the town for wastewater treatment. Reconfiguring the flow pattern of the Baker River in the area just below the lowest Baker River dam or moving the outfall to the main channel will provide adequate dilution to meet future permit limitations for ammonia. Removing boulders and rocks upstream of the outfall to provide a flow of 26 CFS (one third of the current minimum instream flow requirement of 80 CFS for the Baker River dam) will provide adequate dilution. Constructing a new outfall with a terminus at least 10 feet from the river bank will also provide adequate dilution. The dilution estimates provided here should be refined based on more precise outfall design and some field work (cross sections and velocity measurements) in the Baker River to obtain final mixing estimates.

The amount of mixing provided within the dilution zone was estimated by the Department based on the regulated low flow of 80 CFS in the Baker River and assumed dimensions of the channel. Bob Barnes of Puget Sound Energy estimated the width of channel near the outfall during the low flow episode as 150 feet wide and the velocity at 0.3 fps. The corresponding average depth would be 1.78 feet deep. ($Q=AV$, $80 = 150 \times 1.78 \times 0.3$). Barnes also said that the Skagit River provides a backwater effect up to near the end of the 300 foot mixing zone – that effect drops the velocity to an estimated 0.06 fps. Velocity is assumed at 0.3 fps for the dilution modeling. This mixing zone analysis is approximate due to using these estimated parameters along with the uncertainty involved in predicting dilution for effluent discharges. Field measurement of the variables used for the modeling will allow better prediction of dilution.

Gray and Osborne, Inc. provided pictures of the outfall from October 8, 1998. The existing outfall is equipped with a diffuser composed of 6 ports of 2 inch diameter alternating on each side of the pipe spaced two feet apart. Bob Barnes reported that the flow was 125 CFS on the day the photos were taken. The photos show a outfall diffuser structure exposed on the side of the channel discharging to large isolated pool with the main flow of the Baker River about 50 feet from the outfall. The green coloration of the pool contents provide evidence that the outfall provides no dilution in the acute mixing zone during low flow events. Chronic dilution is provided when the pool contents passively mix with the river at the edge of the natural channel. The passive mixing conditions are difficult to model, but the discharge would be inadequately mixed 300 feet downstream of the outfall due to the lack of discharge momentum and the tendency of the effluent plume to hug the shoreline.

The modeling described here attempts to estimate the mixing provided by altering the river course or moving the outfall.

1. Altering the river course would involve removing a large cobble deposit upstream of the outfall. For modeling, I assume that 33% of the river flow (26 CFS) would pass over the existing outfall in 50 foot wide by 1.8 deep channel at a speed of 0.3 fps. The outfall diffuser would be located nearly on the bank of the channel. This work would require not

only removing boulders and other excavation upstream of the outfall, but also possibly grading work near the fishtrap for the dam to maintain a pool of river water for fish passage.

2. Moving the existing outfall location (and using a similar diffuser) into the active channel with the diffuser section beginning about 10 feet from the shore. The diffuser would be perpendicular to the flow direction.

3. Moving the existing outfall location into the active channel with a four inch nozzle located about 10 feet from the shore. The nozzle would be perpendicular to the flow direction.

The history of effluent flow volume is shown in Figure 1. The dilution factors calculated for the mixing zone and zone of acute criteria exceedance are summarized in Table 1. The mixing zone (area for meeting chronic water standards) is limited to a distance of 300 feet (92 meters) downstream from the outfall. The distance for meeting acute water quality standards (zone of acute criteria exceedance) is limited to 30 feet (9.2 meters) downstream of the outfall. Other ambient values are assumed worst case values for the late summer and early fall based on Ecology ambient monitoring in the Baker River prior to 1992 (summary attached).

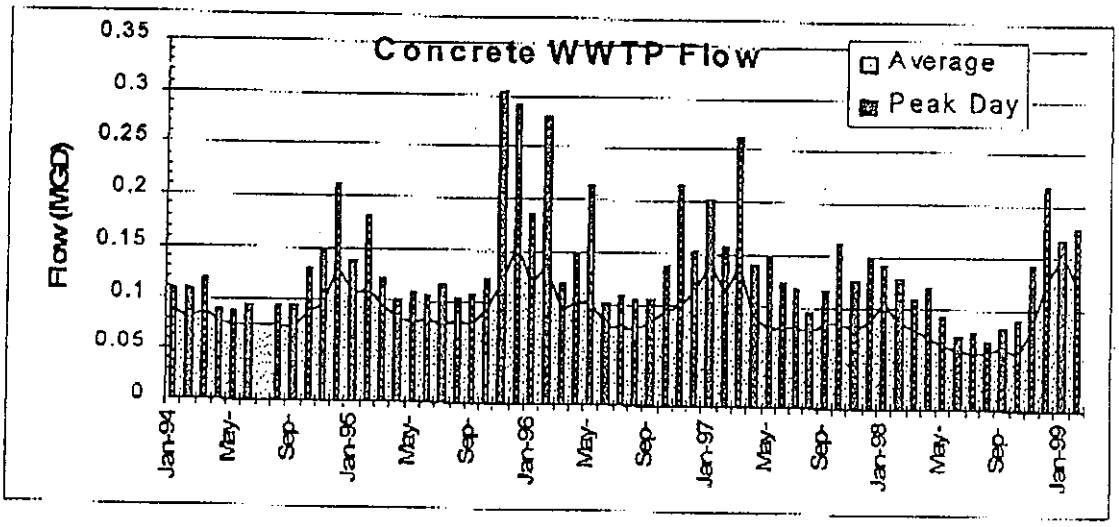


Figure 1: Average monthly and maximum daily Concrete WWTP flows by month.

Table 1: Summary of data, assumptions, Cormix model outputs for dilution zone estimate.

Critical flow = 80CFS=2.26 M^3/sec total in the Baker River.	Effluent temperature range of 4 to 20 degrees C, use 20. River temperature assumed at 12 degrees. (Revise to 14 for final runs)
Acute zone extends 30 feet (9.2 M) from outfall	Channel width = 150' = 45 M
Chronic zone extends 300 feet (92 M) from outfall	Channel depth = 1.78' = 45 M
Discharge depth = 0.4 M (dictated by CORMIX)	Manning's n = 0.03

Concrete WWTP Preliminary Mixing Zone Estimate

Cormix file name	effluent flowrate (MGD)	effluent flowrate (M^3/s)	comments	acute dilution	chronic dilution
Conpcc08	0.08	0.0035	Case 1 Partial channel, existing outfall	36	**38**
Conpcc10	0.10	0.0044	Uses 26 CFS = 0.75 M^3/sec, 50' (15.25 M)	28	30
Conpcc12	0.12	0.0052	channel width, depth of 1.8' (0.54 M)	**24**	25
Conpca15	0.15	0.0066	1st Port located 1 foot from shore.	19	20
Conpca20	0.20	0.0088	Diffuser is 6 alternating 2" ports set horizontally over	14	15
Conpca25	0.25	0.0109	10 feet of the of diffuser	12	12
Confc08	0.08	0.0035	Case 2 Full channel. Install the existing outfall into	**42**	70
Confc10	0.10	0.0044	the main channel about 10 feet from shore.	38	**64**
Confc12	0.12	0.0052	1st Port located 10 foot from shore	31	58
Confc14	0.14	0.0061	Diffuser is 6 alternating 2" ports set horizontally over	26	55
Confc16	0.16	0.0070	10 foot diffuser		
Confcn08	0.08	0.0035	Case 3 Full channel. Install a 4" nozzle to the	22	83
Confcn10	0.10	0.0044	outfall in the main channel about 10 feet from shore.	20	71
Confcn12	0.12	0.0052	1st Port located 10 foot from shore	16	68
Confcn14	0.14	0.0061	Nozzle is oriented perpendicular to current	15	64
Confcn16	0.16	0.0070		13	60

The appropriate dilution factors for the three different cases are marked by double borders in Table 1. These dilution values have been incorporated in the permit limit calculations in Table 2 to provide monthly average and daily maximum permit limitations for the Concrete WWTP. Ammonia criteria calculations are shown in Table 3 and are expressed as mg/L Nitrogen (Total ammonia would be 20% greater). The minimum dilution values necessary to obtain limits of 30 mg/L of ammonia as N are 11:1 for acute and 30:1 chronic. The dilution improves dramatically by placing the outfall in the main channel, not only is the volume of ambient water greater, but the plume does not hug the shoreline because the outfall is located farther from shore.

The Department of Ecology uses either design flows or historical flows for calculating dilution. The intent is to use the worst case expected daily maximum flow for acute dilution and the worst case monthly average dilution during the "critical period." The critical period of rivers in the Skagit basin occur from August through October. This period of the year has low rainfall coupled with minimal glacial/snow pack melt. Eyeballing the flow graph suggests using a value of 0.08 MGD for figuring chronic dilution and 0.12 MGD for acute dilution. Flow values from the Concrete WWTP prior to 1998 may not be useful because flow measuring equipment was found to be inaccurate and I & I have been reduced. Future estimated design flows should be examined should be used for estimating future dilution values.

These calculations are approximate. The dilution values derived will need to be refined as the design of the plant and outfall alternatives are selected. Field work involving cross sections of the river and measure of volume and velocity are the needed. A dye tracer study would be nice, but is not necessary for this small discharge with minimal amount of toxic pollutants.

Concrete WWTP Preliminary Mixing Zone Estimate

Table 2: 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.

PARAMETER	Acute Dil'n Factor	Chronic Dil'n Factor	Ambient Concentration	Water Quality Standard Acute	Water Quality Standard Chronic	Average Monthly Limit (AML)	Maximum Daily Limit (MDL)
Case 1			Acute	ug/L	ug/L	ug/L	ug/L
AMMONIA as N (in mg/L)	24	38	0.06	5.7000	1.2900	38	77
chlorine	24	38		19.00	11.00	174	456
Case 2							
AMMONIA as N (in mg/L)	31	70	0.06	5.7000	1.2900	71	142
chlorine	31	70		19.00	11.00	225	589
Case 3							
AMMONIA as N (in mg/L)	16	83	0.06	5.7000	1.2900	45	90
chlorine	16	83		19.00	11.00	116	304
Required dilution							
AMMONIA as N (in mg/L)	11		0.06	5.7000	1.2900	31	62
AMMONIA as N (in mg/L)		30	0.06	5.7000	1.2900	30	61

Table 3: 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. (will not match WAC 173-201A chronic values).

INPUT	range	
1. Ambient Temperature (deg C; 0<T<30)	1.4 to 15.4	15.0
2. Ambient pH (6.5<pH<9.0)	6.7 to 8.2	8.00
3. Acute TCAP (Salmonids present- 20; absent- 25)		20
4. Chronic TCAP (Salmonids present- 15; absent- 20)		15

2. Un-ionized Ammonia Criteria	
Acute (1-hour) Un-ionized Ammonia Criterion (ug NH3/L)	183.9
Chronic (4-day) Un-ionized Ammonia Criterion (ug NH3/L)	41.9
3. Total Ammonia Criteria:	
Acute Total Ammonia Criterion (mg NH3+ NH4/L)	6.9
Chronic Total Ammonia Criterion (mg NH3+ NH4/L)	1.6
4. Total Ammonia Criteria expressed as Nitrogen:	
Acute Ammonia Criterion as mg N	**5.7**
Chronic Ammonia Criterion as N	**1.29**

[Attach ambient summary for Ecology ambient monitoring station 04B070 Baker River at Concrete (2-25-92).]

QUARTERLY DATA SUMMARY--SIX YEAR AVERAGE

REPORT CREATION DATE: 02/25,

Station Number: 048070 Name: BAKER R @ CONCRETE

Class: AA Elevation: 175 River Mile: 0.60

Location:
LOCATED AT THE BRIDGE ON OLD HIGHWAY 20 ON THE EAST OF CONCRETE .2 MILES ABOVE THE BURLINGTON NORTHERN RR TRESTLE

Water Years Sampled:

5 6	7	8	9
9 0 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0 1 2 3 4			
X X X X		X X X X X X X X X X X X X X X X	

VARIABLE	P-CODE	UNITS	---OCTOBER-DECEMBER---			-----JANUARY-MARCH----			------APRIL-JUNE------			----JULY-SEPTEMBER----			-----SIX YEAR----	
			MEAN	STD. DEV.	N	MEAN	STD. DEV.	N	MEAN	STD. DEV.	N	MEAN	STD. DEV.	N	MAX	MIN
TEMP	P10	C	9.961	3.089	18	4.378	0.805	18	8.000	1.616	18	13.039	1.125	18	15.100	3.00
PRESS	P25	mmHg	759.383	8.701	18	761.856	7.201	18	760.811	5.028	18	759.972	4.170	18	774.000	740.00
OXYGEN	P300	mg/L	11.350	1.173	18	12.528	0.579	18	12.072	0.740	18	10.611	0.478	18	13.900	8.70
PCTSAT	P301	Percent	99.222	6.316	18	96.044	3.277	18	101.371	5.548	17	100.282	3.030	17	115.800	83.80
FC	P31616	#/100ml	3.000	3.361	18	1.444	0.705	18	5.333	16.205	18	1.833	2.256	18	15.000	1.00
PH	P400	units	7.293	0.373	15	7.406	0.313	17	7.263	0.245	16	7.218	0.274	17	8.200	6.70
SUSSOL	P530	mg/L	9.389	10.147	18	8.111	6.936	18	4.500	4.706	18	2.263	2.199	16	62.000	1.00
FLOW	P60	CFS	3728.889	633.003	18	2698.833	1466.755	18	2685.983	1689.280	18	3047.111	1303.278	18	4120.000	35.70
NH3_N	P610	mg/L	0.018	0.013	16	0.017	0.011	17	0.015	0.008	18	0.013	0.004	17	0.060	0.01
NO2_DIS	P613	mg/L	0.009	0.003	9	0.010	0.000	12	0.010	0.000	12	0.009	0.002	11	0.010	0.002
NO2_N	P615	mg/L	0.010	0.000	8	0.010	0.000	5	0.010	0.000	6	0.010	0.000	6	0.010	0.010
NH3_UN	P619	mg/L	0.000	0.000	10	0.000	0.000	11	0.000	0.000	12	0.000	0.000	9	******.***	0.000
NO3_N	P620	mg/L	0.070	0.034	4	0.106	0.009	5	0.077	0.028	6	0.030	0.010	5	0.120	0.020
NO2_NO3	P630	mg/L	0.079	0.038	12	0.120	0.016	12	0.090	0.031	12	0.028	0.017	12	0.140	0.006
TP_P	P665	mg/L	0.030	0.026	16	0.024	0.024	17	0.012	0.005	16	0.010	0.003	17	0.090	0.002
OP_DIS	P671	mg/L	0.012	0.010	16	0.010	0.000	17	0.010	0.000	18	0.010	0.002	18	0.050	0.001
COLOR	P80	Pt-Co	20.250	11.983	4	80.500	112.430	2	35.333	46.307	3	7.333	8.505	3	160.000	1.000
TURB	P82079	NTU	8.156	10.302	16	9.050	9.766	18	4.156	3.496	18	1.671	1.008	17	36.000	0.800
COND	P95	umhos	50.667	4.923	18	55.611	5.054	18	56.111	7.873	18	44.944	9.346	18	74.000	33.000

Summary statistics should be used with caution because variables may not be normally distributed. Values at the detection limit were replace with 1/2 the detection limit.

APPENDIX G

Consent Order

STATE OF WASHINGTON

DEPARTMENT OF ECOLOGY

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

April 3, 1998

CERTIFIED MAIL
Z 224 364 989

The Honorable David Williams
Mayor, Town of Concrete
P.O. Box 39
Concrete, WA 98237

Dear Mayor Williams:

Enclosed is a copy of Consent Order No. DE 98WQ-N103 between the Town of Concrete and the Department of Ecology. We are maintaining the original copy of the order in our files for the public record.

If you have any questions concerning the content of the document, I can be reached at (425) 649-7201 or write, Department of Ecology Northwest Regional Office, c/o Enforcement Coordinator, 3190 - 160th Avenue SE, Bellevue, Washington 98008-5452 .

Sincerely,

Tricia Miller

Tricia Miller
Enforcement Coordinator
Water Quality Section

RSS:TM

cc: Central Programs Enforcement Unit
Ron Langley, Public Information Officer
Ralph Svrjcek, Municipal Enforcement
Central Files; Skagit County, WQ 6.4, WA-002085-1

STATE OF WASHINGTON
DEPARTMENT OF ECOLOGY

THE MATTER OF THE COMPLIANCE BY	)	
THE TOWN OF CONCRETE	)	
with Chapter 90.48 RCW and the Rules and Regulations of the Department of Ecology	)	ORDER ON CONSENT
	)	No. DE 98WQ-N103

I. INTRODUCTION

This order is issued to the Town of Concrete (the Town) by the State of Washington Department of Ecology (the Department), pursuant to Chapter 90.48 of the Revised Code of Washington (RCW), otherwise known as the Water Pollution Control Act. RCW 90.48.260 designates the Department as the state water pollution control agency for all purposes of the Federal Clean Water Act (CWA) and grants complete authority to administer a National Pollutant Discharge Elimination System (NPDES) permit program. The Department is authorized to issue permits that include effluent treatment and limitation requirements, as well as inspection, monitoring, and reporting requirements. The Department may terminate or modify permits and has the authority to bring enforcement actions in order to carry out the provisions of Chapter 90.48 RCW, such as noncompliance with permit conditions. By signing this order, The Town of Concrete consents to the issuance of this order and agrees to abide by its terms.

II. FACTS REGARDING THIS CASE

A. A review of Discharge Monitoring Report (DMR) data for the Town's Sewage Treatment Plant revealed that the facility cannot consistently meet the Biochemical Oxygen Demand (BOD) effluent limitations specified in Special Condition S1. of the Town's NPDES permit No. WA-002085-1.

B. Notice of Violation (NOV) No. DE 96WQ-N251 was issued to the Town on September 14, 1996, concerning the violations noted in subsection A above. In a letter dated October 8, 1996, and in various meetings and telephone conversations with the Department, the Town has responded to the questions contained in the NOV. Since the issuance of the NOV, the Town has made considerable progress in resolving problems

with its water system that had posed a public health threat. The Town has accomplished the following important items related to improving its NPDES permit compliance problems:

- contracted with an engineering consulting firm,
- developed a internal self-help (STEP) program,
- applied for and offered loan money for the development of a Comprehensive Sewer Plan,
- made several minor sewage treatment plant improvements,
- began smoke testing of the collection system,
- attended Ecology sponsored training on developing sewer rates,
- performed a water and sewer Rate Structure Study,
- began the process of characterizing its sludge and identifying application sites,
- worked closely with Northwest Small Cities Services to develop and implement an infrastructure improvement program, and
- drafted its Growth Management Comprehensive Plan, development regulations, and critical areas ordinances, which should be completed by March 1998.

Thus, the Town is now prepared to accelerate its efforts to resolve its NPDES compliance problems.

C. The Town's responses are sufficient to satisfy the Department that it is taking prudent and reasonable efforts to solve its NPDES permit compliance problems since being contacted by the Department in September 1996. The Town of Concrete has acted in good faith in keeping the Department informed concerning the period of noncompliance above and has supplied all information requested by the Department

III. COMPLETION SCHEDULE

A. The Town shall prepare and submit by April 15, 1999, a draft Comprehensive Sewer Plan that addresses the following immediate or potential water quality issues in addition to the basic requirements of Washington Administrative Code (WAC) 173-240:

- extension of the Pump Station 3 influent line to the headworks,
- inflow and infiltration in the collection system,

- improved influent sampling, and
- sludge removal from the existing lagoon.
- wastewater treatment plant improvements to provide reliable treatment of wastewater and compliance with the NPDES permit

B. The Town shall prepare and submit by April 15, 1999, a draft Engineering Report for the upgrade of its existing sewage treatment lagoon.

C. The Town shall complete smoke testing of its collection system by October 31, 1998, and report the results to the Department by December 15, 1998.

D. The Town shall submit no later than April 30, 1998, a Residual Solids Handling Plan for review and approval. The plan shall include the following minimum information:

- A description of the sludge use and disposal procedures at the facility.
- For land application sites, information on the suitability of the site and a description of the site management.
- Sludge monitoring data including chemical analyses parameters related to pathogen transmission. Send those monitoring results in a form tabulated by date and parameter.
- An estimate of the amount of sludge to be disposed of.
- A list of any potential sites under consideration, the preliminary status of their availability, and the timetable for additional investigation on their use on either a short- or long term basis.

E. The Town shall install a baffling curtain in the sewage treatment lagoon to minimize the loss of solids and reduce potential short circuiting. The removal of sludge from the sewage treatment lagoon shall begin no later than September 1, 1998.

F. The Town shall submit quarterly progress reports on its efforts to meet the requirements above and bring the sewage treatment plant into consistent compliance with permit conditions. These reports shall be filed with the March, June, September, and December Discharge Monitoring Reports and shall continue until the sewage treatment plant upgrade is completed.

IV. STIPULATIONS

By the signatures appearing below, the Town of Concrete hereby consents and agrees to :

- The issuance of the Order:
- Perform and comply with the Town's obligations as specified in the Order: and
- Not appeal, contest, or legally challenge the issuance of the Consent Order or the Department's jurisdiction to enforce this Consent Order.

V. EFFECTIVE DATE

This order is effective on MAR 2 6 1998.

David H Williams
Mayor, Town of Concrete

3-16-98
Date

John H John
Supervisor, Water Quality
Northwest Regional Office
Department of Ecology

26 March 98
Date

APPENDIX H

Smoke Testing Information

Town of Concrete
Smoke Testing Event, September 17-19, 1997

New Address	Former Address	Problem Description
Not Reported	431 Main Street	Smoke from Roof Vent
45191 Main Street	429 Main Street	Smoke in yard near front of door
45191 Main Street	503 Main Street	Fish pond hooked up to sewer
45185 Duffy Street	431 Duffy Street	Smoke from vents under house
45199 Duffy Street	427 Duffy Street	Possible broken line or cleanout?
45303 Main Street	405 Main Street	Broken sewer pipe, NE corner by the wall
45309 Main Street	403 Main Street	Need to extend vent pipe up through the roof
45284 Main Street	400 Main Street	Need to extend two vents through roof
7362 N. Superior Avenue	300 N. Superior Avenue	South side by oil tank
7258 B. Street	200 B. Street	Bad venting NE corner under downspout
7263 A Street	203 A Street	Bad venting
7259 B Street	201 B Street	Possible cleanout problem
45659 Limestone	225 Limestone	Uncapped cleanout by tree and fence
Old High School	Old High School	70'x70' roof connected to sewer
Legion	Legion	Poor venting in attic
45670 Short	228 Short	Uncapped Extension

APPENDIX I

Manhole Inspection Logs

PHYSICAL SURVEY RECORD

Time: 10:10 a.m.
Date: 1/26/99

Manhole No. K-1
LINE K-1

City: CONCRETE
G&O Job #: 98749
Crew: MH, JB

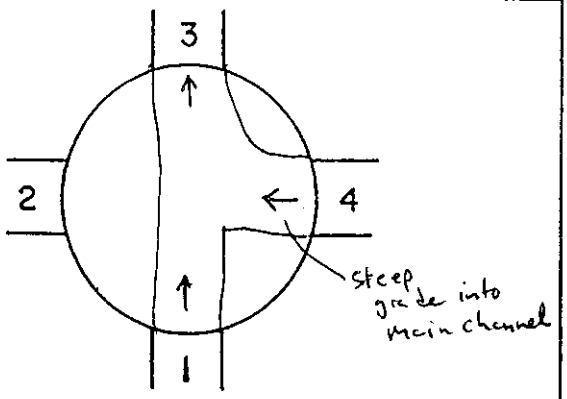
MANHOLE DESCRIPTION

1. Depth	4. Weather Conditions cold, rainy
2. Lid Condition good	5. Water Table Above Channel unknown
A. Diameter 24"	6. Structural Condition good
B. No. of holes 3	A - Base
C. Size of holes 1"	B - Channel
D. Lid seal leaks NO	C - Sections
3. Material	D - Cone
A. Precast Sections good	E - Steps
B. Poured/Precast Base good	F - Neck
C. Brick	G - Casting
D. Other	H - Other

North/South Street:
Mill

East/West Street:
Miller

North



PIPE DESCRIPTION

Pipe Number	1	2	3	4	5	6
A. Pipe Size	8"		8"	8"		
B. Material	CONC.		CONC.	CONC		
C. Hgt. above Chnl.				2.5'		
D. Deposit Depth						
E. Deposit Type						
F. Flow Depth	1.5"		1.5"	0		
G. Flow Velocity	slow		slow			
H. Line						
I. Grade						
J. Joints Offset						
K. Joints Separated						
L. Joints Leak						
M. Root Growth						
N. Temperature						

PHYSICAL SURVEY RECORD

Time: 11:00 a.m.
Date: 1/26/99

Manhole No. A-1

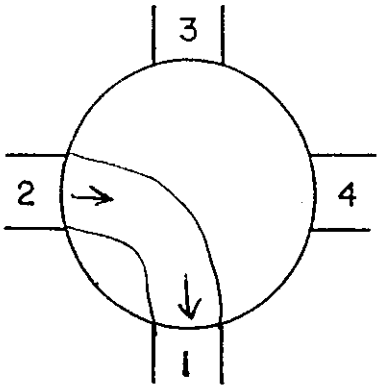
City: CONCRETE
G&O Job #: 99749
Crew: MH, JB

MANHOLE DESCRIPTION	
1. Depth	4. Weather Conditions cold, rainy
2. Lid Condition good	5. Water Table Above Channel unknown
A. Diameter 24"	6. Structural Condition good
B. No. of holes 1	A - Base
C. Size of holes 1"	B - Channel
D. Lid seal leaks	C - Sections
3. Material	D - Cone
A. Precast Sections	E - Steps
B. Poured/Precast Base	F - Neck
C. Brick	G - Casting
D. Other	H - Other

North/South Street:
N/A

East/West Street:
N/A

North



PIPE DESCRIPTION						
Pipe Number	1	2	3	4	5	6
A. Pipe Size	8"	8"				
B. Material	cast iron	cast iron				
C. Hgt. above Chnl.						
D. Deposit Depth	2"	1.5				
E. Deposit Type						
F. Flow Depth						
G. Flow Velocity	fast	fast				
H. Line						
I. Grade						
J. Joints Offset						
K. Joints Separated						
L. Joints Leak						
M. Root Growth						
N. Temperature						

PHYSICAL SURVEY RECORD

Time: 1225 p.m.
Date: 1/26/99

Manhole No. B-3
LINE B-3

City: CONCORD
G&O Job #: 98749
Crew: MH, JB

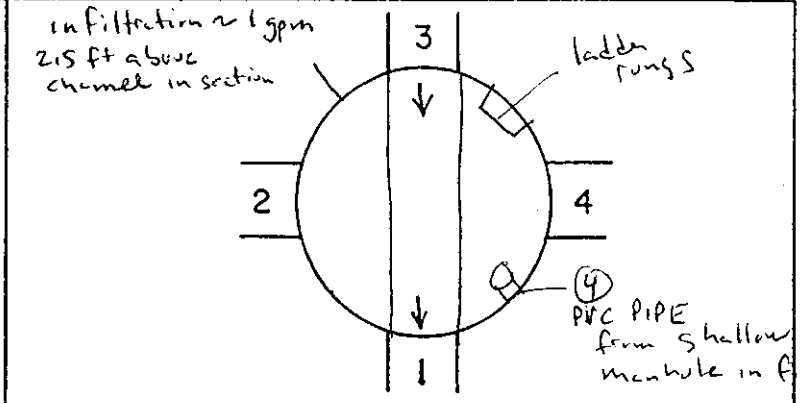
MANHOLE DESCRIPTION

1. Depth 8' 5"	4. Weather Conditions cold, clearing
2. Lid Condition good	5. Water Table Above Channel at least 4'
A. Diameter 24"	6. Structural Condition
B. No. of holes 1	A - Base good
C. Size of holes 1" accesshole	B - Channel good
D. Lid seal leaks no	C - Sections one source of infiltration
3. Material	D - Cone good
A. Precast Sections yes- conc.	E - Steps good
B. Poured/Precast Base	F - Neck OK
C. Brick	G - Casting
D. Other	H - Other

North/South Street:
Gressmere Road
(City boundary)

East/West Street:

North ↑



PIPE DESCRIPTION

Pipe Number	1	2	3	4	5	6
A. Pipe Size	8"		8"	8"		
B. Material	cast iron		CONCRETE	PVC		
C. Hgt. above Chnl.						
D. Deposit Depth						
E. Deposit Type						
F. Flow Depth	1"		1.5"	TRICKLE ONLY		
G. Flow Velocity						
H. Line						
I. Grade						
J. Joints Offset						
K. Joints Separated						
L. Joints Leak						
M. Root Growth						
N. Temperature						

PHYSICAL SURVEY RECORD

Time: 12:50 p.m.
Date: 1/26/99

Manhole No. B-1
LINE B-1

City: CONCRETE
G&O Job #: 98749
Crew: MH, JB

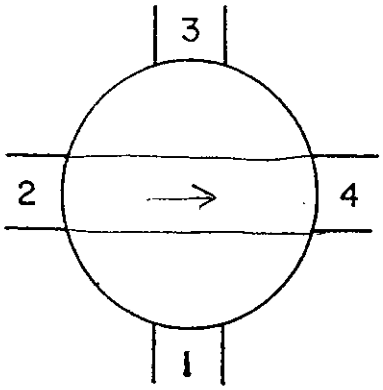
MANHOLE DESCRIPTION

1. Depth 8' 7"	4. Weather Conditions cold, rain stopped
2. Lid Condition good	5. Water Table Above Channel unknown
A. Diameter 24"	6. Structural Condition good
B. No. of holes 3	A - Base
C. Size of holes 1"	B - Channel
D. Lid seal leaks no	C - Sections
3. Material	D - Cone
A. Precast Sections yes - conc.	E - Steps
B. Poured/Precast Base	F - Neck
C. Brick	G - Casting
D. Other	H - Other

North/South Street:

East/West Street:
FIR ST
(Rd just S. of SR 20)

North



PIPE DESCRIPTION

Pipe Number	1	2	3	4	5	6
A. Pipe Size		6"		8"		
B. Material		CONC		CONC		
C. Hgt. above Chnl.						
D. Deposit Depth						
E. Deposit Type						
F. Flow Depth		1"		1"		
G. Flow Velocity						
H. Line						
I. Grade						
J. Joints Offset						
K. Joints Separated						
L. Joints Leak						
M. Root Growth						
N. Temperature						

PHYSICAL SURVEY RECORD

Time: 1:06 p.m.
Date: 4/26/99

Manhole No. R-1

City: CONCRETE
G&O Job #: 99749
Crew: MH, JB

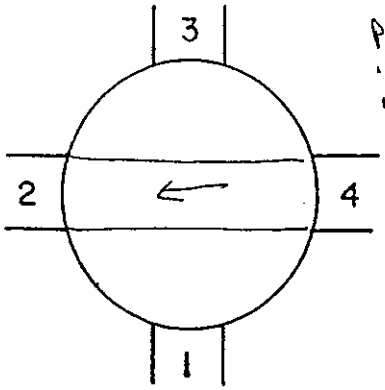
MANHOLE DESCRIPTION

1. Depth 9' 7"	4. Weather Conditions cold, rain stopped
2. Lid Condition ~~24"~~ good	5. Water Table Above Channel
A. Diameter 24"	6. Structural Condition
B. No. of holes 1	A - Base wet
C. Size of holes 1"	B - Channel good
D. Lid seal leaks no	C - Sections 2 holes - 1st ring, 2 holes 2nd ring
3. Material	D - Cone 2 pick holes
A. Precast Sections	E - Steps good
B. Poured/Precast Base	F - Neck rings offset
C. Brick	G - Casting
D. Other	H - Other

North/South Street:

East/West Street: @ edge of cul-de-sac Ridgeway Court

North



PICK HOLES IN SECTIONS ARE NOT GROUTED FROM THE INSIDE, GROUTED ON OUTSIDE NO INFILTRATION

PIPE DESCRIPTION

Pipe Number	1	2	3	4	5	6
A. Pipe Size		8"		8"		
B. Material		PVC		PVC		
C. Hgt. above Chnl.						
D. Deposit Depth						
E. Deposit Type						
F. Flow Depth		Ø		Ø		
G. Flow Velocity		Ø		Ø		
H. Line						
I. Grade						
J. Joints Offset						
K. Joints Separated						
L. Joints Leak						
M. Root Growth						
N. Temperature						

PHYSICAL SURVEY RECORD

Time: 1:15 p.m.
Date: 1/26/99

Manhole No. R-2

City: CONCRETE
G&O Job #: 98749
Crew: MH, JB

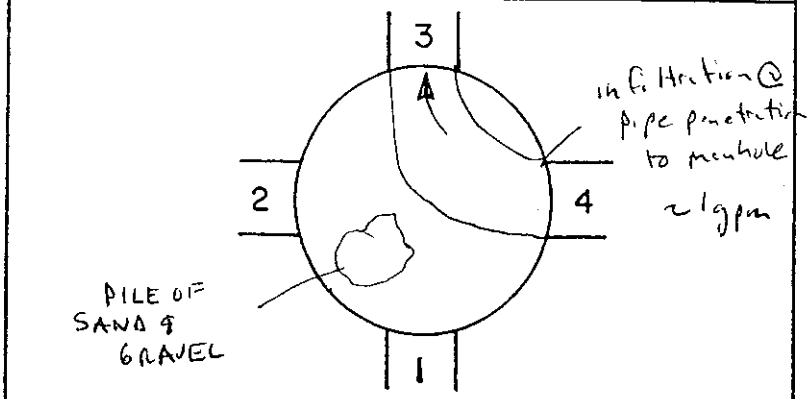
MANHOLE DESCRIPTION

1. Depth 7' 0"	4. Weather Conditions cold, clearing
2. Lid Condition good	5. Water Table Above Channel
A. Diameter 24"	6. Structural Condition
B. No. of holes 1 - access hole	A - Base ok
C. Size of holes 1"	B - Channel ok
D. Lid seal leaks no	C - Sections some infiltration between 1st & 2nd RING
3. Material	D - Cone one hole not grouted, no infilt seen, though
A. Precast Sections	E - Steps good
B. Poured/Precast Base	F - Neck ok
C. Brick	G - Casting
D. Other	H - Other

North/South Street:
N. RIETZE

East/West Street:
DUFFY ST

North



PIPE DESCRIPTION

Pipe Number	1	2	3	4	5	6
A. Pipe Size			8"	8"		
B. Material			PVC	PVC		
C. Hgt. above Chnl.						
D. Deposit Depth						
E. Deposit Type						
F. Flow Depth			1/4"	1/4"		
G. Flow Velocity			~1 ft/sec	~1 ft/sec		
H. Line						
I. Grade						
J. Joints Offset						
K. Joints Separated						
L. Joints Leak						
M. Root Growth						
N. Temperature						

PHYSICAL SURVEY RECORD

Time: 1:26 p.m.
Date: 1/26/99

Manhole No. A-3

City: CONCRETE
G&O Job #: 98745
Crew: MH, JB

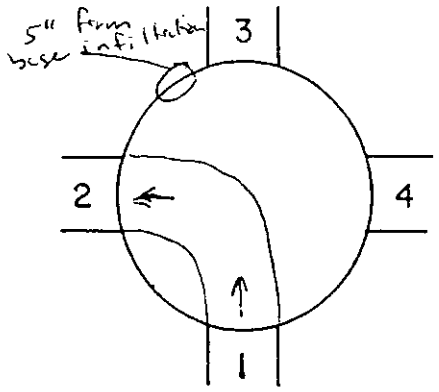
MANHOLE DESCRIPTION

1. Depth 8' 10"	4. Weather Conditions cold
2. Lid Condition good	5. Water Table Above Channel unknown
A. Diameter 24"	6. Structural Condition
B. No. of holes 1 - pick access	A - Base infiltration
C. Size of holes 1"	B - Channel good
D. Lid seal leaks no	C - Sections infiltration - 5" from bottom of base
3. Material	D - Cone OK
A. Precast Sections yes, conc	E - Steps good
B. Poured/Precast Base	F - Neck OK
C. Brick	G - Casting
D. Other	H - Other

North/South Street:
N. RIEZE

East/West Street:
PUFFY ST

North



PIPE DESCRIPTION

Pipe Number	1	2	3	4	5	6
A. Pipe Size	8"	8"				
B. Material	PVC	PVC				
C. Hgt. above Chnl.						
D. Deposit Depth						
E. Deposit Type						
F. Flow Depth	1/2"	1/2"				
G. Flow Velocity						
H. Line						
I. Grade						
J. Joints Offset						
K. Joints Separated						
L. Joints Leak						
M. Root Growth						
N. Temperature						

PHYSICAL SURVEY RECORD

Time: 1:31 p.m.
Date: 4/26/99

Manhole No. E-4
line E-4

City: CONCRETE
G&O Job #: 98749
Crew: MH, JB

MANHOLE DESCRIPTION

1. Depth 8' 9"	4. Weather Conditions cold
2. Lid Condition good	5. Water Table Above Channel
A. Diameter 24"	6. Structural Condition good
B. No. of holes 3 2 holes w/ washers	A - Base
C. Size of holes 1"	B - Channel
D. Lid seal leaks no	C - Sections
3. Material	D - Cone
A. Precast Sections yes, conc	E - Steps
B. Poured/Precast Base conc	F - Neck
C. Brick	G - Casting
D. Other	H - Other

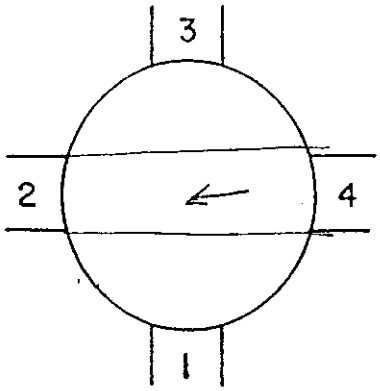
North/South Street:

N. FRIEZE

East/West Street:

DUFFY ST.

North



PIPE DESCRIPTION

Pipe Number	1	2	3	4	5	6
A. Pipe Size		8"		8"		
B. Material		CONC		PVC		
C. Hgt. above Chnl.						
D. Deposit Depth						
E. Deposit Type						
F. Flow Depth		1/2"		1/2"		
G. Flow Velocity						
H. Line						
I. Grade						
J. Joints Offset						
K. Joints Separated						
L. Joints Leak						
M. Root Growth						
N. Temperature						

PHYSICAL SURVEY RECORD

Time: 1:55 | Manhole No. R-A | City: CONCRETE
Date: 4/28/99 | G&O Job #: 98745
Crew: MH, JR

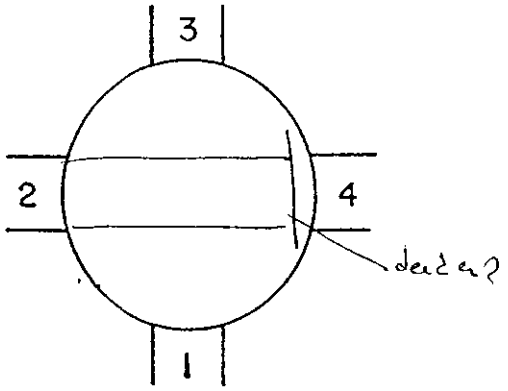
MANHOLE DESCRIPTION

1. Depth 10' 6"	4. Weather Conditions cold
2. Lid Condition good	5. Water Table Above Channel
A. Diameter 24"	6. Structural Condition
B. No. of holes 1	A - Base ok
C. Size of holes 1"	B - Channel ok
D. Lid seal leaks	C - Sections infiltration 3' from base & on 2nd ring very slight
3. Material	D - Cone ok
A. Precast Sections yes, conc.	E - Steps ok
B. Poured/Precast Base	F - Neck
C. Brick	G - Casting
D. Other	H - Other

North/South Street:

East/West Street:
Cul-de-sac

North



PIPE DESCRIPTION

Pipe Number	1	2	3	4	5	6
A. Pipe Size		6"				
B. Material		PVC				
C. Hgt. above Chnl.						
D. Deposit Depth						
E. Deposit Type						
F. Flow Depth		no - ϕ				
G. Flow Velocity						
H. Line						
I. Grade						
J. Joints Offset						
K. Joints Separated						
L. Joints Leak						
M. Root Growth						
N. Temperature						

PHYSICAL SURVEY RECORD

Time: 2:01 p.m.
Date: 1/26/99

Manhole No. A-19
LINE A-19

City: CONCRETE
G&O Job #: 98749
Crew: MH, JB

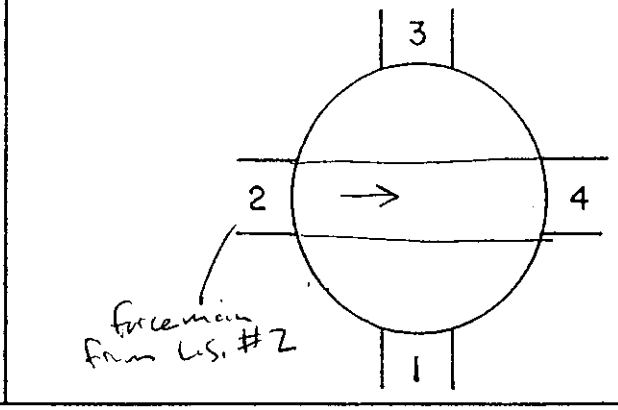
MANHOLE DESCRIPTION

1. Depth 5' 9"	4. Weather Conditions Cold
2. Lid Condition Good	5. Water Table Above Channel
A. Diameter 24"	6. Structural Condition Good
B. No. of holes 1	A - Base
C. Size of holes 1"	B - Channel
D. Lid seal leaks no	C - Sections
3. Material	D - Cone
A. Precast Sections yes, conc	E - Steps
B. Poured/Precast Base	F - Neck
C. Brick	G - Casting
D. Other	H - Other

North/South Street:

East/West Street:
Main St.

North



PIPE DESCRIPTION

Pipe Number	1	2	3	4	5	6
A. Pipe Size		6"		8"		
B. Material		PVC		conc.		
C. Hgt. above Chnl.						
D. Deposit Depth						
E. Deposit Type						
F. Flow Depth		1/2"		1/2"		
G. Flow Velocity		fast		fast		
H. Line						
I. Grade						
J. Joints Offset						
K. Joints Separated						
L. Joints Leak						
M. Root Growth						
N. Temperature						

PHYSICAL SURVEY RECORD

Time: 2:05 p.m.
Date: 1/26/99

Manhole No. B-10
UMC B-10

City: CONCRETE
G&O Job #: 98745
Crew: MH, JB

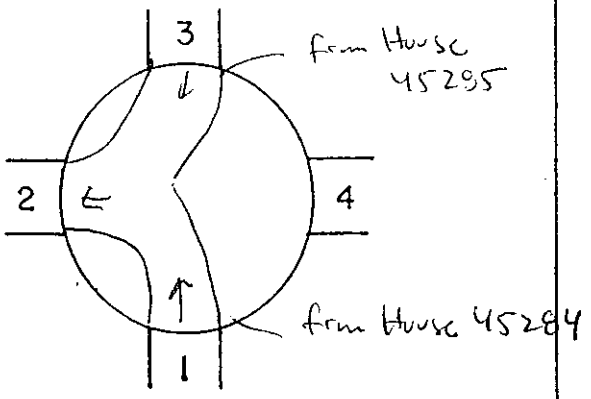
MANHOLE DESCRIPTION

1. Depth 7' 11"	4. Weather Conditions cold
2. Lid Condition good	5. Water Table Above Channel no flow
A. Diameter 24"	6. Structural Condition good
B. No. of holes 3 - 2 plugged w/ washers	A - Base
C. Size of holes 1"	B - Channel
D. Lid seal leaks no	C - Sections
3. Material	D - Cone
A. Precast Sections Yes, conc	E - Steps
B. Poured/Precast Base	F - Neck
C. Brick	G - Casting
D. Other	H - Other

North/South Street:

East/West Street:
Main St

North ↑



PIPE DESCRIPTION

Pipe Number	1	2	3	4	5	6
A. Pipe Size	6"	8"	6"			
B. Material	CONC	CONC	CONC			
C. Hgt. above Chnl.						
D. Deposit Depth						
E. Deposit Type						
F. Flow Depth	Ø	Ø	Ø			
G. Flow Velocity						
H. Line						
I. Grade						
J. Joints Offset						
K. Joints Separated						
L. Joints Leak						
M. Root Growth						
N. Temperature						

APPENDIX J

WWTP Historical Flows and Loadings

WPLCS DMR Data Analysis Report - Data Values

FACILITY NAME: **CONCRETE STP**

COVERS: **January 1994 Through September 1998** **A shaded cell denotes a violation**

DATE	INFLUENT								EFFLUENT						
	BOD, 5-DAY (20 DEG. C), MG/L		BOD, 5-DAY (20 DEG. C), LBS/DAY		SOLIDS, TOTAL SUSPENDED, MG/L		SOLIDS, TOTAL SUSPENDED, LBS/DAY		FLOW, IN CONDUIT OR THRU TREAT, GPD		BOD, 5-DAY (20 DEG. C), MG/L	BOD, 5-DAY (20 DEG. C), MG/L	BOD, 5-DAY PERCENT REMOVAL	BOD, 5-DAY (20 DEG. C), LBS/DAY	BOD, 5-DAY (20 DEG. C), LBS/DAY
	AVERAGE	MAXIMUM	AVERAGE	MAXIMUM	AVERAGE	MAXIMUM	AVERAGE	MAXIMUM	AVERAGE	MAXIMUM	AVERAGE	WEEKLY AVERAGE	AVERAGE	AVERAGE	WEEKLY AVERAGE
Jan-94	210	249	156		137	162	102		0.089	**0.108**	21	23	89.5	11.5	12
Feb-94	169	201	113		132	134	88		0.080	**0.109**	28.5	40	80.5	19.5	28
Mar-94	151	180	110		138	141	100		0.087	**0.118**	24.5	37	84	15.5	21
Apr-94	151.5	152	97		130	136	83		0.077	0.090	18.5	19	87.5	9.5	10
May-94	205	226	125		126	130	77		0.073	0.087	46.5	68	78	20.56	29
Jun-94	195	206	119		120	124	73		0.073	0.093	34	48	82.6	19.3	28
Jul-94	127.5	202	78		103	124	62		0.073		27.5	34	84.2	13	16
Aug-94	182.5	265	113		199	244	123		0.074	0.093	41	48	77	26	31
Sep-94	263.5	403	158		203	300	122		0.072	0.093	29	42	89	14.5	20
Oct-94	219	224	117.5	134	230	270	120.5	122	0.087	**0.131**	9.5	12	96	4.5	5
Nov-94	254	358	**217**	**264**	192	268	165	198	0.096	**0.149**	25.6	44	90	26	55
Dec-94	146.5	181	112	125	98	126	73.5	78	**0.133**	**0.211**	16.5	17	89	14	19
Jan-95	254.5	265	194	200	256	260	195	196	**0.106**	**0.139**	19	20	97	14.5	15
Feb-95	326.5	283	**268**	**274**	328	396	267	293	**0.110**	**0.181**	23	29	93	20	27
Mar-95	152.5	166	107.5	136	105	116	75	95	0.095	**0.122**	17.5	18	88	12.5	15
Apr-95	181	193	102	103	157	182	66.5	79	0.082	**0.101**	27.7	51	84.6	18	27
May-95	187	232	129	165	190	200	130	142	0.080	**0.108**	30.5	35	84	21	23
Jun-95	229	253	117	123	160	172	81.5	83	0.081	**0.105**	21	25	90	10.5	12
Jul-95	238	256	161	187	169	196	116	143	0.078	**0.116**	22.5	23	90.5	15	16
Aug-95	439	675	**256**	**380**	362	512	214	288	0.079	**0.103**	28	29	93	16.5	17
Sep-95	264	337	143	189	293	338	157	189	0.077	**0.107**	29	38	89	15	19
Oct-95	320.5	406	**255.5**	**312**	326	432	259	332	0.091	**0.122**	40.5	47	87	33	36
Nov-95	162	169	114	139	150	152	107	137	**0.122**	**0.303**	19	23	88	14.5	21
Dec-95	143.5	157	106.5	111	119	136	87.5	88	**0.155**	**0.292**	13.5	15	90	10	10
Jan-96	451	701	**321**	**514**	432	875	317	640	**0.119**	**0.185**	29	37	88	22	27
Feb-96	583	1058	**421.5**	**732**	114	547	331	547	**0.137**	**0.279**	28	32	95	21	23
Mar-96	200.5	217	147.5	171	154	174	113.5	137	**0.093**	**0.119**	23	26	88	17	20
Apr-96	227.5	268	188	**202**	162	184	135.5	151	**0.101**	**0.147**	37.5	50	83	30	33
May-96	200.5	223	166.5	178	158	170	132	148	**0.102**	**0.215**	36.5	37	82	30.5	32

Note: Bolded numbers denote excess of design flow equal 0.1 MGD or design BOD_5 loadings equal 200 LBS/DAY.

WPLCS DMR Data Analysis Report - Data Values

FACILITY NAME: CONCRETE STP

COVERS: January 1994 Through September 1998 **A shaded cell denotes a violation**

DATE	INFLUENT								EFFLUENT						
	BOD, 5-DAY (20 DEG. C), MG/L	BOD, 5-DAY (20 DEG. C), MG/L	BOD, 5-DAY (20 DEG. C), LBS/DAY	BOD, 5-DAY (20 DEG. C), LBS/DAY	SOLIDS, TOTAL SUSPENDED, MG/L	SOLIDS, TOTAL SUSPENDED, MG/L	SOLIDS, TOTAL SUSPENDED, LBS/DAY	SOLIDS, TOTAL SUSPENDED, LBS/DAY	FLOW, IN CONDUIT OR THRU TREAT, GPD	FLOW, IN CONDUIT OR THRU TREAT, GPD	BOD, 5-DAY (20 DEG. C), MG/L	BOD, 5-DAY (20 DEG. C), MG/L	BOD, 5-DAY PERCENT REMOVAL	BOD, 5-DAY (20 DEG. C), LBS/DAY	BOD, 5-DAY (20 DEG. C), LBS/DAY
	AVERAGE	MAXIMUM	AVERAGE	MAXIMUM	AVERAGE	MAXIMUM	AVERAGE	MAXIMUM	AVERAGE	MAXIMUM	AVERAGE	WEEKLY AVERAGE	AVERAGE	AVERAGE	WEEKLY AVERAGE
Jun-96	182.5	184	112	113	175	176	107.5	108	0.078	0.100	42.5	44	76	26	27
Jul-96	204	259	114	137	161	174	91	113	0.078	0.109	38	57	**81**	22	38
Aug-96	286	310	168.5	**212**	237	238	137.5	161	0.076	0.106	40	45	86	22.5	31
Sep-96	286	361	139.5	173	313	484	152	232	0.082	0.105	31	33	89	15.5	17
Oct-96	202	211	122.5	124	155	180	93.5	103	0.093	0.139	28	30	86	17	19
Nov-96	169	199	158	166	139	172	129	143			31	38	84	30	41
Dec-96	152.5	157	132.5	141	106	108	92	97	**0.113**	**0.151**	23.5	29	85	20.5	26
Jan-97	129	132	116	121	84	102	74.5	86	**0.141**	**0.202**	21	27	83	12.5	13
Feb-97	164	181	118	130	150	172	108	124	**0.111**	**0.158**	24.5	33	85	29	32
Mar-97	603.5	810	**514**	**702**	720	880	612	763	**0.139**	**0.262**	17.5	18	97	15	16
Apr-97	264	330	173	**201**	132	156	87	95	0.089	**0.140**	25.5	26	90	17	19
May-97	263	277	145	148	231	268	129	159	0.078	**0.147**	15	20	94	8	12
Jun-97	394	612	**282**	**382**	380	494	269	363	0.080	**0.122**	22.5	28	93.5	15	18
Jul-97	216	277	115	155	169	236	92	112	0.080	**0.117**	36	46	83	20	30
Aug-97	214	265	165	**240**	184	192	100	120	0.075	0.095	38	56	82	19.5	26
Sep-97	207	211	121	133	219	228	127	137	0.083	**0.117**	27	32	87	16	21
Oct-97	313	325	168	184	253	278	137	158	0.085	**0.162**	30.5	35	90	16.5	18
Nov-97	310	314	173	**207**	238	246	132	155	0.079	**0.126**	39	52	87	23	35
Dec-97	267	391	192	**249**	176	214	131	178	0.085	**0.148**	28	34	89	20	25
Jan-98	160	212	117.5	157	196	240	144	178	0.108	**0.142**	37	42.9	76	27	31.8
Feb-98	261	252	136	143	235	256	139	145	0.085	**0.129**	30.8	31.3	86.6	18.4	21.1
Mar-98	274	397	**219**	**318**	252	336	201	269	0.080	**0.108**	28	28	90	22	22.4
Apr-98	157	170	106.5	119	168	180	113.5	126	0.073	**0.121**	25.5	27	83.7	16.5	17.6
May-98	298.5	387	190	219	179	252	161.5	179	0.065	0.092	43.8	59	85	30.7	**45.3**
Jun-98	214	232	101.5	110	186	188	88.5	89	0.058	0.073	58.5	63	72	27.8	29.9
Jul-98	591	900	**270**	**443**	522	800	238	394	0.056	0.077	61	78	89	24	27
Aug-98	287	423	119	187	398	636	168	281	0.056	0.069	37	38.3	87	14	15.7
Sep-98	219	295	123	153	256	284	147.5	148	0.063	0.082	51	57.5	76	30	37.4
Oct-98	250	250	186	186	324	324	240	240	0.055	0.089	35	35	86	26	26
Nov-98	264	264	304	304	198	316	201	364	0.081	0.014	32	32	88	37	37
Dec-98	117	137	113	165	178	227	177.5	279	0.123	**0.218**	24.5	26	78	22.1	27.6

Note: Bolded numbers denote excess of design flow equal 0.1 MGD or design BOD_5 loadings equal 200 LBS/DAY.

WPLCS DMR Data Analysis Report - Data Values

FACILITY NAME: **CONCRETE STP**

COVERS: **January 1994 Through September 1998** **A shaded cell denotes a violation**

DATE	EFFLUENT									
	SOLIDS, TOTAL SUSPENDED, MG/L	SOLIDS, TOTAL SUSPENDED, MG/L	SOLIDS, TOTAL SUSPENDED, LBS/DAY	SOLIDS, TOTAL SUSPENDED, LBS/DAY	PH	PH	COLIFORM, FECAL, #/100 ML	COLIFORM, FECAL, #/100 ML	CHLORINE, TOTAL RESIDUAL, MG/L	CHLORINE, TOTAL RESIDUAL, MG/L
	AVERAGE	MAXIMUM	AVERAGE	MAXIMUM	MINIMUM	MAXIMUM	GEOMETRIC MEAN	7 DAY GEOM. MEAN	AVERAGE	MAXIMUM
Jan-94	36.5	39	19.5	20	7.5	7.8	3.0	11.0		
Feb-94	35.5	40	24.5	28	7.6	7.9	1.0	1.0		
Mar-94	26	28	15.5	19	7.6	7.9	3.0	8.0		
Apr-94	32	36	17	19	7.6	8.1	52.0	107.0	0.2	0.2
May-94	61.5	62	28	30	7.7	7.8	1000.0	9999.0	0.2	0.2
Jun-94	41	49	23	28	6.9	7.6				
Jul-94	43	52	22	26	6.8	7.3	114.0		0.18	0.3
Aug-94	50	58	31.5	36	6.7	7.5	162.0		0.2	0.2
Sep-94	60	66	30.5	36	6.8	7	1.3	19.0	0.2	0.2
Oct-94	63	64	34	40	6.8	7			0.3	0.4
Nov-94	56	66	47.6	57	7	8.5	2.0	110.0	0.4	0.4
Dec-94	49	50	41	56	7.9	8.5			0.3	0.4
Jan-95	42	48	32	37	7.3	8.4	4.5	29.0	0.3	0.3
Feb-95	36.5	41	30	30	7.8	8.4	44.5	69.0	0.3	0.3
Mar-95	37	40	24.5	30	7.9	8	31.0	123.0	0.3	0.4
Apr-95	34.5	48	19.5	26	7.8	8.1	10.3	41.0	3.5	4
May-95	72.5	90	49	59	6.8	8.1	4.7	59.0	0.3	0.4
Jun-95	54	72	27.5	35	7	7.8	6.9	164.0	0.3	0.3
Jul-95	68	90	47	66	6.9	7.4	4.0	10.2	0.2	0.2
Aug-95	42	47	25	26	7	7.7	1.6	50.0	0.2	0.2
Sep-95	49	60	27	34	6.8	7.2	1.8	60.0	0.2	0.2
Oct-95	80	86	65	73	7.4	8	2.0	112.0	0.2	0.2
Nov-95	61.5	72	46	65	7.6	7.9	0.2	0.2	0.2	0.2
Dec-95	40	58	31.5	49	7.5	8	0.3	0.3	0.2	0.3
Jan-96	49	60	38	44	7.7	8.1	3.0	22.0	0.2	0.3
Feb-96	41	42	31	32	7.7	8.5	0.0	0.1	0.2	0.3
Mar-96	40	43	29.5	34	7.5	8	0.2	0.7	0.3	0.3
Apr-96	42	44	36	43	7.5	8.5	0.2	1.7	0.2	0.3
May-96	49	50	37	40	7	8	1.0	10.4	0.2	0.2

WPLCS DMR Data Analysis Report - Data Values

FACILITY NAME: CONCRETE STP

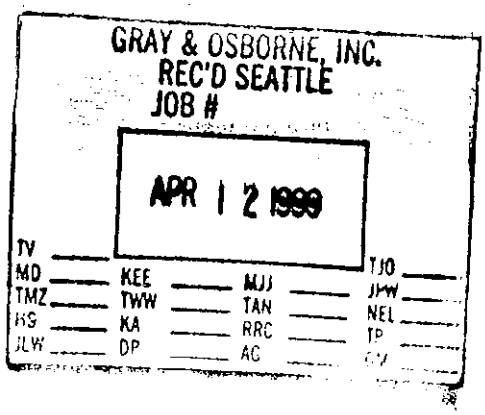
COVERS: January 1994 Through September 1998 **A shaded cell denotes a violation**

DATE	EFFLUENT									
	SOLIDS, TOTAL SUSPENDED, MG/L	SOLIDS, TOTAL SUSPENDED, MG/L	SOLIDS, TOTAL SUSPENDED, LBS/DAY	SOLIDS, TOTAL SUSPENDED, LBS/DAY	PH	PH	COLIFORM, FECAL, #/100 ML	COLIFORM, FECAL, #/100 ML	CHLORINE, TOTAL RESIDUAL, MG/L	CHLORINE, TOTAL RESIDUAL, MG/L
	AVERAGE	MAXIMUM	AVERAGE	MAXIMUM	MINIMUM	MAXIMUM	GEOMETRIC MEAN	7 DAY GEOM. MEAN	AVERAGE	MAXIMUM
Jun-96	87	92	53	56	6.6	7.2	5.5	47.0	0.2	0.2
Jul-96	66	74	37	50	7.2	7.2	6.1	35.0	0.2	0.3
Aug-96	107	108	62.5	74	7	7.1	3.9	1.5	0.2	0.2
Sep-96	89	98	43.5	47	7	7.6	0.2	0.3	0.2	0.3
Oct-96	42	48	25.5	28	7	7.8	0.8	6.9	0.2	0.2
Nov-96	48	52	46	56	6.8	7	8.9	87.0	0.2	0.2
Dec-96	28	44	39	54	7.4	7.8	1.0	1.0	0.2	0.2
Jan-97	31	38	28.5	37	7.7	8.1	0.5	3.7	7.7	8.1
Feb-97	29	32	21	23	7.7	8.1	5.0	3.0	0.2	0.4
Mar-97	28.5	36	24	30	7.8	8	1.0	10.5	0.2	0.3
Apr-97	49	56	57	73	7.7	8	0.8	7.0	0.2	0.2
May-97	30	38	16	20	7.5	7.8	1.0	10.5	0.2	0.4
Jun-97	34.5	44	23.5	29	7.1	7.9	0.8	5.8	0.1	0.3
Jul-97	43	60	26	40	7.1	7.5	25.0		0.2	0.3
Aug-97	71	96	36.5	44	6.9	7.2	1.6	47.0	0.2	0.2
Sep-97	44	48	26	31	6.7	7.4	17.0	89.0	0.2	0.3
Oct-97	46	48	24.5	25	6.3	7.6	0.7	4.8	0.1	0.2
Nov-97	60.5	64	33.5	39	6.8	7.8			0.5	0.2
Dec-97	53	58	39	55	7.2	8.1	0.5	2.9	1	2.01
Jan-98	51	57.5	37	42.7	7.4	8.5	1.3	21.0	0.84	1.42
Feb-98	42.5	47.5	25.4	30.4	7.1	8	0.4	2.3	0.84	1.58
Mar-98	27	33	19	26.4	7.5	8	0.8	6.7	1.2	1.4
Apr-98	21.5	23	14.5	16.1	7.4	8	0.5	3.0	1.15	1.76
May-98	28.7	37.5	20	28.8	7.6	7.9	0.7	4.7	0.45	1.97
Jun-98	104	105	49	49.9	7	8.5	2.0	1220.0	2	2.4
Jul-98	72	96	28	33	6.8	7.6	1.5	31.6	1	3
Aug-98	35	46	13	15.7	7.4	7.5	1.2	14.0	1	2
Sep-98	22	22	12.8	14.3	7.1	7.5	0.8	6.3	1.5	2.5
Oct-98	62.5	62.5	46	46	7.1	7.5	2.8	118.0	2.22	3.65
Nov-98	51.5	55	40.6	55	7.3	8	2.0	4.0	1.52	3.5
Dec-98	24	30	20.3	21.6	7.1	7.9	16.3	72.0	3.65	3

APPENDIX K

Letter from Town Planner Concerning Future Growth

TOWN OF CONCRETE
BUILDING / PLANNING DEPARTMENT
228 D Street & Main Street / P.O. Box 39
Concrete, WA 98237
Ph: (360) 853-8401 / Fax: (360)853-8002



April 8, 1999

Mark Henley
Gray & Osborne
701 Dexter Avenue N., Ste 200
Seattle, WA 98109

Re: Town of Concrete - Projected Growth

Dear Sir;

As the Town of Concrete Planner and a long-time developer, I offer the following opinions for your consideration:

- Residential - Over the past two years there have been an average of three new residential permits issued each year. Within the Town limits there are numerous developed building lots, and several residential zoned sites that will adequately accommodate the next ten years of projected growth. I expect the residential growth to be centered around the Silo Park area of town. There are a number of developed lots available for new single family residences and as the park is developed more families will be attracted to the amenities the park affords.

- Retail / Commercial - the downtown core of Concrete is actually in decline with a number of vacant buildings. There is little to attract off-highway traffic and increase business opportunities. Skagit County is proposing to build a multi-purpose administrative building on Main Street in the area of the Seniors Center which, when finished, will generate service related traffic. This will have a moderate impact on the downtown core.

- Retail / Commercial growth can be reasonably expected in those areas along State Route 20, both within the Town limits, and extending to Albert's Red Apple Grocery store in Grassmere. Again, with the completion of Silo Park, the commercially zoned land between the park and the downtown core, that has exposure and access from Highway 20, will become much more attractive.

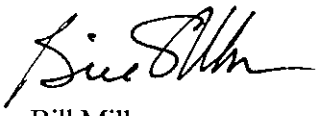
- While it is reasonable to expect some growth & development along Hwy 20 between Town limits and Grassmere, it is encumbent upon Town Council to encourage the development of commercial property between Silo Park and the downtown core to ensure the survival of businesses in the downtown core.

- Industrial - the Town has little industrial zoned property within town limits. Industrial growth, if any, will be centered in the Grassmere area which is contained in the Town's Urban Growth boundary. At this point in time, there is little or nothing being done to encourage industry to locate in the area. Industrial growth is expected to be very minimal for the forseeable future.

- The incorporation of the Grassmere area into the Town's Urban Growth Boundary accommodates the provision of existing services by the Town to the residents and businesses in Grassmere. It may be some time before the Town actually extends town limits and incorporates Grassmere. Growth projections for the Grassmere area are very low and will have minimal impact on the town.

I hope the above adequately responds to your questions. If I can be of any further assistance, please contact me at your convenience.

Sincerely,



Bill Miller
Building / Planning Official

APPENDIX L

Cost Estimates for Sewer System Improvements

Estimated Costs
Long-Term Improvement #1 - Electrical Modifications to Existing Lift Stations
Town of Concrete

Item	Quantity	Unit of Meas.	Unit Price	Amount
		($)	($)	($)
Electrical Panel	1	EA.	$3,500	$3,500
PLC w/ Autodialer	1	EA.	$8,000	$8,000
Ultrasonic Level Sensor	1	EA.	$3,500	$3,500
Manual transfer - Non-Auto	1	EA.	$1,500	$1,500
Emergency generator receptacle	1	EA.	$500	$500
Misc. Wiring	1	L.S.	$300	$300
Starters (Soft Starters)	2	EA.	$2,200	$4,400
Trenching	1	L.S.	$2,000	$2,000
Seal-Offs	1	L.S.	$1,500	$1,500
Demolition	1	L.S.	$2,000	$2,000
Subtotal				$27,200
Contingency (20%)				$5,440
Sales Tax (7.8%)				$2,546
Estimated Construction Cost				$35,186
22% Legal, Admin, & Eng				$7,741
Total Capital Cost				$42,927
		Say $ 45,000 per lift station		

Note: A 100kW trailer mounted generator will cost approximately $20,000.

Estimated Costs
Long-Term Improvement #2 - Additional Sewer Line Alternative
Town of Concrete

Item	Quantity	Unit of Meas. ($)	Unit Price ($)	Amount ($)
Mobilization/Demobilzation	1	L.S.	$15,000	$15,000
Excavation Safety System	1	L.S.	$5,000	$5,000
Ground Water Control	1	L.S.	$5,000	$5,000
Locate Existing Utilities	1	L.S.	$5,000	$5,000
Temp. Sewage Pumping	1	L.S.	$2,500	$2,500
Remove & Wastehaul Exist. Structures	1	L.S.	$1,000	$1,000
Special Excavation	200	C.Y.	$40	$8,000
8" PVC Gravity Sewer (Incl. Bedding)	900	L.F.	$55	$49,500
48" ID Manhole, Basic to 8 feet	4	EA.	$3,000	$12,000
Connect to Existing Sanitary Facilities	2	EA.	$2,000	$4,000
Foundation Material	200	C.Y.	$30	$6,000
Gravel Base	1,270	C.Y.	$15	$19,050
CSTC	70	TN	$15	$1,050
CSBC	42	TN	$15	$630
Restoration	1	L.S.	$3,000	$3,000
Cold Mix AC	18	TN	$100	$1,800
AC Pavement Repair	167	SY.	$20	$3,340
Concrete Sidewalk Repair	5	SY.	$35	$175
Sawcutting	300	L.F.	$40	$12,000
Subtotal				$154,045
Contingency (20%)				$30,809
Tax (7.8%)				$14,419
Estimated Construction Cost				$199,273
22% Legal, Admin., Eng.				$43,840
Total Capital Cost				**$243,113**
				Say $243,000

Estimated Costs
Sewer Service to Grassmere Area (IUGA) - Sewer Lines & Forcemains
Town of Concrete

Item	Quantity	Unit of Meas. ($)	Unit Price ($)	Amount ($)
Mobilization/Demobilzation	1	L.S.	$160,000	$160,000
Excavation Safety System	1	L.S.	$5,000	$5,000
Ground Water Control	1	L.S.	$10,000	$10,000
Locate Existing Utilities	1	L.S.	$10,000	$10,000
Temp. Sewage Pumping	1	L.S.	$10,000	$10,000
Remove & Wastehaul Exist. Structures	1	L.S.	$2,500	$2,500
Abandon Existing Manhole	1	EA.	$800	$800
Special Excavation	500	C.Y.	$40	$20,000
8" PVC Gravity Sewer (Incl. Bedding)	13,850	L.F.	$55	$761,750
6" Gravity Side Sewer	1,000	L.F.	$60	$60,000
8" x 6" Tee (Sewer)	50	EA.	$50	$2,500
48" ID Manhole, Basic to 8 feet	57	EA.	$3,000	$171,000
Connect to Existing Sanitary Facilities	2	EA.	$2,000	$4,000
Foundation Material	500	C.Y.	$20	$10,000
Gravel Base	4,800	C.Y.	$15	$72,000
CSTC	300	TN	$15	$4,500
CSBC	1,900	TN	$15	$28,500
Restoration	1	L.S.	$2,000	$2,000
CDF Encasement	100	C.Y.	$90	$9,000
Cold Mix AC	85	TN	$100	$8,500
AC Pavement Repair	7,600	SY.	$20	$152,000
Concrete Sidewalk Repair	100	SY.	$50	$5,000
Concrete Driveway Repair	100	SY.	$50	$5,000
Sawcutting	13,700	L.F.	$2	$27,400
6" D.I. Forcemain	3,400	L.F.	$50	$170,000
Tunnelling	100	L.F.	$300	$30,000
Subtotal				$1,741,450
Contingency (20%)				$348,290
Tax (7.8%)				$163,000
Estimated Construction Cost				$2,252,740
22% Legal, Admin., Eng.				$495,603
Total Capital Cost				**$2,748,342**
				Say $2,750,000

Note: Cost of New Lift Station No. 4 is estimated to be $140,000.
Cost of providing and installing new pumps to increase capacity of Lift Station No. 2 is $30,000.
The above cost estimate does not include any costs associated with temporary construction and permanent easements.

APPENDIX M

SEPA Checklist

SEPA CHECKLIST
ENVIRONMENTAL CHECKLIST

A. BACKGROUND

1. Name of proposed project, if applicable:

Town of Concrete Comprehensive Sewer and Wastewater Facility Plan

2. Name of applicant:

Town of Concrete, Washington

3. Address and phone number of applicant and contact person:

Applicant
Town of Concrete
228 D Street & Main Street
P.O. Box 39
Concrete, WA 98237

Contact Person
Mr. David Williams
Mayor, Town of Concrete

4. Date checklist prepared:

July 26, 1999

5. Agency requesting checklist:

Town of Concrete, Washington

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

The construction of wastewater treatment plant (WWTP) improvements will be completed by the year 2005 to serve projected flows through the year 2020. Construction of sewer system expansion projects to serve the UGA will be constructed in conjunction with growth.

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

No, there are no plans for future activity related to or connected with the proposal.

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

The Facility Plan includes analysis of a number of environmental issues including odor and water quality. This checklist includes the analysis from those studies.

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

There are no other pending applications.

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

The project is required to meet the effluent standards of the current and future NPDES permits for the plant.

WWTP Improvements Construction
Building Permit (Town of Concrete)
Conditional Use Permit (Town of Concrete)
Design Document Review (Washington State Department of Ecology)
National Pollutant Discharge Elimination System (NPDES) Permit (Washington State Department of Ecology)
Coverage under Washington State General Permit For Final Use or Disposal of Biosolids (Washington State Department of Ecology)

Sewer System Expansion Projects
Building Permit (Town of Concrete)
Conditional Use Permit (Town of Concrete)
Design Document Review (Washington State Department of Ecology)
State Highway Crossing Permit (Dept. of Transportation)

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

The existing treatment facility is unable to meet effluent limits in its current NPDES permit.

The proposed plan is for the expansion of the Town of Concrete's wastewater treatment plant to meet the projected future plant loadings and effluent limits to be imposed by NPDES permits within the 20-year planning period.

The proposed process scheme for the Wastewater Treatment Plant is that of a sequencing batch reactor with ultraviolet (UV) light disinfection, designed to achieve an effluent quality that will meet or exceed the discharge limitations set forth by the Washington State Department of Ecology (Ecology). An aerated sludge pond and mechanical dewatering press will be used to treat and dewater residual solids from the wastewater treatment process.

A site plan for the proposed treatment plant improvements is shown in Figure 1.

Wastewater Treatment System

Raw wastewater from the Town of Concrete will continue to be conveyed to the existing treatment plant site via the existing influent pipelines. The existing influent line from lift station No. 3 will be re-routed and combine with the influent gravity line from the north and jointly discharge to the new headworks structure. The new headworks structure will consist of a new self-cleaning screen, gravity grit removal channels, new influent flow meter, and a flow-paced sampling system. The headworks will be constructed to handle the 2020 year peak hour flow of 904,000 gpd.

Effluent from the new headworks will flow by gravity to the sequencing batch reactor. The biological removal of organic material will be performed in the new sequencing batch reactor process. Suspended microbial growth in the basins will remove organic pollutants from the wastewater. Aeration and mixing of the mixed liquor will be accomplished using an air distribution system consisting of fine bubble membrane diffuser disks. Air will be supplied to the diffusers by multi-stage, low-noise, centrifugal blowers located in a new operations building south of the SBR tanks. The blowers will be located inside a new building and shall be equipped with inlet and discharge silencers to reduce noise.

After the SBR cycle (fill-react-settle-draw-idle) is completed, the effluent from the SBR basins will be pumped to the UV disinfection system. The disinfected secondary effluent will then pass over the effluent weir and enter the outfall pipe line. Effluent flow will be measured using a new effluent flow meter installed just downstream of the UV disinfection system. The treated effluent will flow by gravity to the existing outfall in the Baker river.

During power outages the power requirements of the key process components will be met by the output of a new generator located next to the new blower building. The generator will be used to run the headworks, aeration and disinfection equipment during power outages.

Sludge Treatment System

Waste sludge from the sequencing batch reactor will be pumped to the sludge holding pond for further digestion. Sludge digestion will be achieved aerobically using the existing lagoon aerators. Digested sludge will be pumped back to the sludge dewatering facility and dewatered using a new dewatering screw press. Polymer will be added to the dewatering screw press as a flocculant to enhance solids capture and improve dewatering. Centrate from the dewatering screw press will then be conveyed back to the sludge holding pond. The dewatered sludge cake (biosolids) will be then be transported by haul trucks to a permitted beneficial use facility.

The recommended schedule for collection system improvements within the IUGA and Town limits are listed in Table 1 below. The construction of the improvements to the IUGA will be

based on the ability to finance those improvements.

TABLE 1
RECOMMENDED COLLECTION SYSTEM IMPROVEMENTS
SERVICE AREA AND URBAN GROWTH AREA
TOWN OF CONCRETE

Project	Project Date
Short-Term Improvements:	
1) Smoke Testing	1999
2) Grout MH R-2 and R-3	2000
3) Investigate 427 Duffy St.	2000
4) Disconnect By-Pass Line to Little Baker Creek	1999
Long-Term Improvements:	
1) Provide Electrical Modifications to Existing Lift Stations	Before 2005*
2) Provide an additional Sewer Line from MH A-4 to MH A-1	Before 2005*
Service to Grassmere Area (IUGA):	
1) Install Lift Station No. 4	**
2) Provide New Forcemain and Gravity Lines for UGA	**
3) Install larger Pumps at Lift Station No. 2	**

* - Based on obtaining financing and scheduling improvements concurrent with wastewater treatment plant upgrades which will need to be completed by the end of the next permit cycle. (assumed January 2000 - January 2005).
** - These improvements will be dependent upon requirements for further development of this area.

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

The WWTP is located near the intersection of Highway 20 and the Baker River, within the Town limits of Concrete, Washington. It is located in the Section 11, Township 35 N, Range 8E, Willamette Meridian. See Figure 2.

Sewer system improvement and expansion projects are located within the Town limits of Concrete and in Skagit County within the western sewer service area of the IUGA.
Figure 2.

TO BE COMPLETED BY APPLICANT

B. ENVIRONMENTAL ELEMENTS

1. Earth

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

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

The WWTP site is relatively flat with a slope of less than 2 percent. The sewer service area varies in slope from flat to greater than 10 percent.

c. What general types of soils are found on the site (for example, clay, sand, gravel, peat, muck)? If you know the classification of agricultural soils, specify them and note any prime farmland.

According to the *Soil Survey of Skagit County Area, Washington* (National Resource Conservation Service, formerly the Soil Conservation Service, September 1989), soils in Concrete can be generally classified as either 1) soils on flood plains, low terraces, and deltas or 2) soils on uplands and mountains. For the first category, the soils in the vicinity of Concrete can be described as the Larush-Pilchuck type (very deep, well drained and excessively drained, level to gently sloping soils; on flood plains and low terraces). For the second category, the soils in the vicinity of Concrete can be described as the Barneston-Dystric Xerorthents-Indianola type (very deep, somewhat excessively drained and excessively drained, level to very steep slopes; on terraces and terrace escarpments).

A review of the detailed soil map from the *Soil Survey of Skagit County Area, Washington* indicates that the main specific soil type in the vicinity of Concrete's wastewater treatment plant is the Pilchuck loamy sand. This soil classification is described as very deep, excessively drained soil on floodplains. The permeabilities of the Pilchuck loamy sand at depths of 0-43 inches and 43-60 inches are rapid at 6.0-20.0 inches/hour and greater than 20.0 inches/hour, respectively.

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

According to Town staff, slope failures have occurred north of the sewer service area boundary due to steep slopes.

e. Describe the purpose, type, and approximate quantities of any filling or grading proposed. Indicate source of fill.

Modifications of the WWTP will require approximately 0 yds^3 of fill and 300 yds^3 of cut. The primary need for the earthwork is to prepare the site for construction of the sequencing batch reactor tanks, the operations building and the ultraviolet light disinfection system.

Sewer system expansion projects will require minor amounts of fill and cut.

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

At the WWTP site and sewer system project sites, soils would be exposed during grading and construction, and erosion could occur during rainfall. However, erosion will be minimal due to the relative flatness of the sites and the use of erosion control measures during construction.

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

Assuming the open surface of the existing lagoon is not considered an impervious surface, approximately 10 percent of the WWTP site is currently covered with impervious surface. After construction about 25 percent will be covered.

Minor amounts of new impervious area will be produced by sewer system expansion projects.

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

Measures to mitigate short-term erosion for this project could include covering stockpiles of excavated soil and erecting silt fences, as necessary.

2. Air

a. What types of emissions to the air would result from the proposal (i.e., dust, automobile, odors, industrial wood smoke) during construction and when the project is completed? If any, generally describe and give approximate quantities if known.

There would be short-term air quality effects such as minor dust, particulates, and hydrocarbons from equipment emission during construction.

The existing WWTP has had some odor complaints from residents. The odor problems have been attributed to times when the aerators for the existing lagoon were taken off-line.

The upgraded WWTP will operate aerobic treatment processes for both liquid and solid wastes, therefore, odors generated by the new treatment processes are expected to be minimal.

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

No, there are no off-site sources of emissions or odor that would affect the project.

c. Proposed measures to reduce or control emissions or other impacts to air, if any: During construction, standard methods will be used to control dust including spraying exposed soils with water or other dust suppressants.

The primary on-site odor source currently at the plant is the lagoon. The lagoon will be converted during the upgrade to an aerated sludge holding pond. The aerators will help reduce odors by keeping the sludge from going anaerobic.

3. Water

a. Surface

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

The outfall of the WWTP is located in the Baker River. This river flows into the Skagit River which eventually flows into the Puget Sound. The WWTP site is bordered to the east by the Baker River.

The water of the Skagit River and its tributaries, including the Baker River, is considered Class AA (extraordinary). Characteristic uses of Class AA waters include, but are not limited to: water supply (domestic, industrial, agricultural); stock watering; fish and shellfish; wildlife habitat; recreation; commerce and navigation.

It is not anticipated that sewer line projects will impact surface water bodies.

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

No. The wastewater treatment plant upgrade project will not involve any work on the existing outfall.

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

Does not apply.

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

No, the project will not require any surface water withdrawals or diversions.

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

No. The improvements to the treatment plant will be constructed outside of the 100-year floodplain.

The sewer system improvements will be located outside of the 100-year flood plain.

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

The WWTP would continue to discharge treated wastewater effluent that meets the NPDES permit.

The projected average annual flow for the year 2020 is 226,000 gpd. The year 2020 is the 20-year planning horizon for the Facilities Plan.

Estimates of current and future discharges to the Baker River are provided below:

Year	AAF (gal/day)	BOD_5 (lb/year)	TSS (lb/year)	Ammonia (lb/year)	Chlorine (lb/year)
1999	90,000	8,220	20,500	6,850	275
2020	226,000	10,320	10,320	345	0

Flows will increase due to growth within the Town's sewer service area. BOD_5 loadings to the river will increase slightly due to the higher flows, however, effluent BOD_5 levels will be reduced by 2/3 from 30 mg/L to approximately 10 mg/L. TSS loadings to the river will be reduced by approximately half. A nearly 20-fold decrease in ammonia loadings is expected and chlorine discharges will be eliminated entirely.

AAF = Average Annual Flow
BOD_5 = Five-Day Biochemical Oxygen Demand
TSS = Total Suspended Solids

b. Ground:

1) **Will ground water be withdrawn, or will water be discharged to ground water? Give general description, purpose, and approximate quantities if known.**

A limited amount of ground water will be withdrawn during about a 2-month period for construction. The dewatering of excavated areas will be necessary during construction. There will be no ground water withdrawal during operation of the facility.

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

No waste materials will be discharged into the ground.

c. Water Runoff (including storm water):

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

The current and future source of runoff at the site is, and will continue to be, storm water.

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

No waste materials could enter ground or surface waters.

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

Does not apply.

4. Plants

a. Check or circle types of vegetation found on the site:

X **deciduous tree: alder, maple, aspen, other**
X **evergreen tree: fir, cedar, pine, other**
X **shrubs**
X **grass**
X **pasture**
___ **crop or grain**
___ **wet soil plants: cattail, buttercup, bullrush, skunk cabbage, other**
___ **water plants: water lily, eelgrass, milfoil, other**
X **other types of vegetation** (landscaping: lawn, rhododendrons, evergreen shrubs)

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

Minor amounts of landscaping may be removed at the WWTP site. Some vegetation may be removed for the construction of sewer system facilities.

c. List threatened or endangered species known to be on or near the site.

At this time, it is believed that no rare plants, high-quality native wetlands, and high-quality native plant communities on or near the project sites.

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

When construction is complete, the WWTP site will be landscaped, most likely using lawn, evergreen shrubs, and rhododendrons.

Landscaping, as necessary, will be performed to enhance vegetation at sewer system projects.

5. Animals

a. **Circle any birds and animals which have been observed on or near the site or are known to be on or near the site:**

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

b. **List any threatened or endangered species known to be on or near the site.**

The Washington State Department of Fish and Wildlife has classified the Chinook Salmon as a state candidate species for listing. The Chinook Salmon already holds a federal designation of Threatened for the Puget Sound.

c. **Is the site part of a migration route? If so, explain.**

The Skagit River includes anadromous fish runs of chinook, sockeye, chum, and coho salmon. Rainbow Trout/Steelhead also use the river as a migration route.

d. **Proposed measures to preserve or enhance wildlife, if any:**

There will be no work on the outfall and therefore, impacts to the Baker and Skagit River are not anticipated. It is not anticipated that any construction at the treatment plant site or in the collection system will have any adverse effect on wildlife.

6. Energy and Natural Resources

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

Electricity would be the primary source of energy used to meet the upgraded WWTP's needs. The energy would power the equipment for the plant and heat the administration building.

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

No, the project would not affect the potential use of solar energy by adjacent properties.

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

The WWTP will be designed to minimize energy requirements. A more efficient aerator system will be used to treat the wastewater, reducing energy consumption by half of the current levels.

7. Environmental Health

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

A small amount of liquid sodium hypochlorite will be stored at the plant and used to disinfect effluent that will be used as non-potable water at the upgraded treatment plant.

1) Describe special emergency services that might be required.

None required.

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

The chlorine gas disinfection system will be removed and replaced with an ultraviolet light disinfection system that eliminates chlorine in the effluent discharged to the Baker River and greatly reduces risk of exposure to harmful levels of chlorine gas at the WWTP.

b. Noise

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

There are no noise sources in the area that affect the operation of the WWTP.

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

Temporary construction noise during daylight hours could be caused by heavy equipment and demolition of existing structures.

The main noise sources at the expanded WWTP will be (1) the aeration basin blowers in the blower building, and (2) the generator. All of these noise sources could operate at any time of the day. The generator is for emergencies only.

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

Temporary noise from construction could be mitigated by one or more of the following measures:

- Limiting construction to normal working hours on weekdays;
- When possible, placing small, portable acoustical screens around particularly noise equipment;
- Using mufflers on all internal combustion engine-driven equipment;
- If pneumatic tools are used, using those fitted by the manufacturers with mufflers, or adding mufflers, and;
- Turning off all idling equipment.

The design of the facility will include features to mitigate potential noise impacts. These measures include:

- Enclosing the SBR blowers in a building. Utilizing silencers on the blower inlet and discharge.
- Selecting equipment with low noise levels and noise-mitigating features such as vibration isolators.

8. Land and Shoreline Use

a. What is the current use of the site and adjacent properties?

The WWTP site is currently used for the Concrete Wastewater Treatment Plant. The adjacent properties are undeveloped Town property on the north and south, the Baker River to the east, and North Dillard Avenue to the West.

Sewer system project sites are typically used for utility services and existing sewer system facilities.

b. Has the site been used for agriculture? If so, describe.

The Skagit River valley, with its fertile, sandy loam soil, is known for agriculture. The WWTP has been on the site since the 1970s, but it is possible that some form of agriculture was there prior to construction of the WWTP.

c. Describe any structures on the site.

The following future structures will be on the site:

Headworks
Sequencing Batch Reactors
UV Disinfection Channel
Operations Building
Laboratory Building (Modify Existing)
Aerated Sludge Holding Lagoon
Sludge Dewatering Facility

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

The chlorine contact tank and existing headworks structures will be demolished.

e. What is the current zoning classification of the site?

The WWTP site is zoned Public Use.

Sewer system projects may have other zoning classifications, depending on project location.

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

The 1998 Concrete Comprehensive Plan designates the WWTP site as Public Use.

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

This section of the shoreline of the Baker River near the WWTP is designated as Open Space.

h. Has any part of the site been classified as an "environmentally sensitive" area? If so, specify.

No part of the project sites have been classified as environmentally sensitive.

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

There would be 2 employees at the upgraded WWTP.

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

No one would be displaced by the completed projects.

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

There is no mitigation required.

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

One of the purposes of the Facilities Plan is to increase the capacity of the WWTP and sewer system to meet the service area needs for the urban growth boundary identified in the adopted 1998 Comprehensive Plan. The project is necessary so that the land use plans that have been adopted can be implemented.

9. Housing

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

Not applicable.

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

No housing units would be eliminated.

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

None necessary.

10. Aesthetics

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

The tallest structure will most likely be the new blower building which will be approximately 16 ft high with a peaked roof. This is only a few feet higher than the existing laboratory structure that is the existing tallest structure. The principal exterior building material will be masonry block and concrete.

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

Most of the proposed structures will be screened from view by the existing hill slope to the north and west and the trees to the south that surrounds the facility.

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

No measures are proposed.

11. Light and Glare

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

Area lighting will be provided at the upgraded treatment facility. Photocells will operate the lights to provide minimum required lighting in the event of emergency after hours visits by plant staff.

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

No, light or glare should not be a safety hazard or interfere with views.

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

No existing off-site sources will affect the proposal.

d. Proposed measures to reduce or control light and glare impacts, if any.

Photocells will be used on all area lights to turn lights off during daylight. Lights will be directed to avoid light and glare impacts outside the WWTF boundary.

12. Recreation

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

The Skagit River is used for fishing and rafting.

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

No, the project will not displace any existing recreational uses.

c. Proposed measures to reduce or control impacts, if any:

No measures are proposed.

13. Historic and Cultural Preservation

a. Are there any places or objects listed on, or proposed for, national, state, or local preservation registers known to be on or next to the site? If so, generally describe.

No, there are no places or objects on historic preservation registers known on or next to the sites.

b. Generally describe any landmarks or evidence of historic, archaeological, scientific, or cultural importance known to be on or next to the site.

There are no features of this type known on or near the sites.

c. Proposed measures to reduce or control impacts, if any:

No measures are proposed.

14. Transportation

a. Identify public streets and highways serving the site, and describe proposed access to the existing street system. Show on site plans, if any.

Access to the WWTP site is from Lagoon Avenue off Highway 20.

Sewer system projects will be located in service areas served by Highway 20 and Aldridge Place. Lift Station improvements are located at Albert Street and Dillard Avenue (No. 1), on Fir Street, just South of Highway 20 (No. 2), and in the eastern portion of the Town at North Everett Avenue (No. 3). Sewer service for the UGA would include the following existing roadways: Pearl Street, Pine Street, Dalles Road, Spruce Street, Carlson Road, First Street, Second Street, and Grassmere Road.

b. Is site currently served by public transit? If not, what is the approximate distance to the nearest transit stop?

The nearest transit stop to the WWTP is one block to the south at the intersection of North Dillard Avenue and Highway 20.

c. How many parking spaces would the completed project have? How many would the project eliminate?

No parking spaces at the WWTP will be eliminated. It is possible that up to 2 additional spaces will be created.

d. Will the proposal require any new roads or streets, or improvements to existing roads or streets, not including driveways? If so, generally describe (indicate whether public or private).

No new roads or road improvements will be required.

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

No, the project will not use or occur in the immediate vicinity of water, rail, or air transportation.

f. How many vehicular trips per day would be generated by the completed project? If known, indicate when peak volumes would occur.

There will be one employee shift at the WWTP. The shift will begin at 6:30 am and end at 3:30 pm and will involve up to 2 people.

After the project is operational, there will be between 21 and 35 truck trips per week generated by the site.

g. Proposed measures to reduce or control transportation impacts, if any:

The existing transportation system has the additional capacity to accommodate the traffic generated from the upgraded WWTP. No additional measures are necessary.

15. Public Services

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

The project itself is a result of an increased need for public services.

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

No measures are proposed.

16. Utilities

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

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

No new utilities will be required.

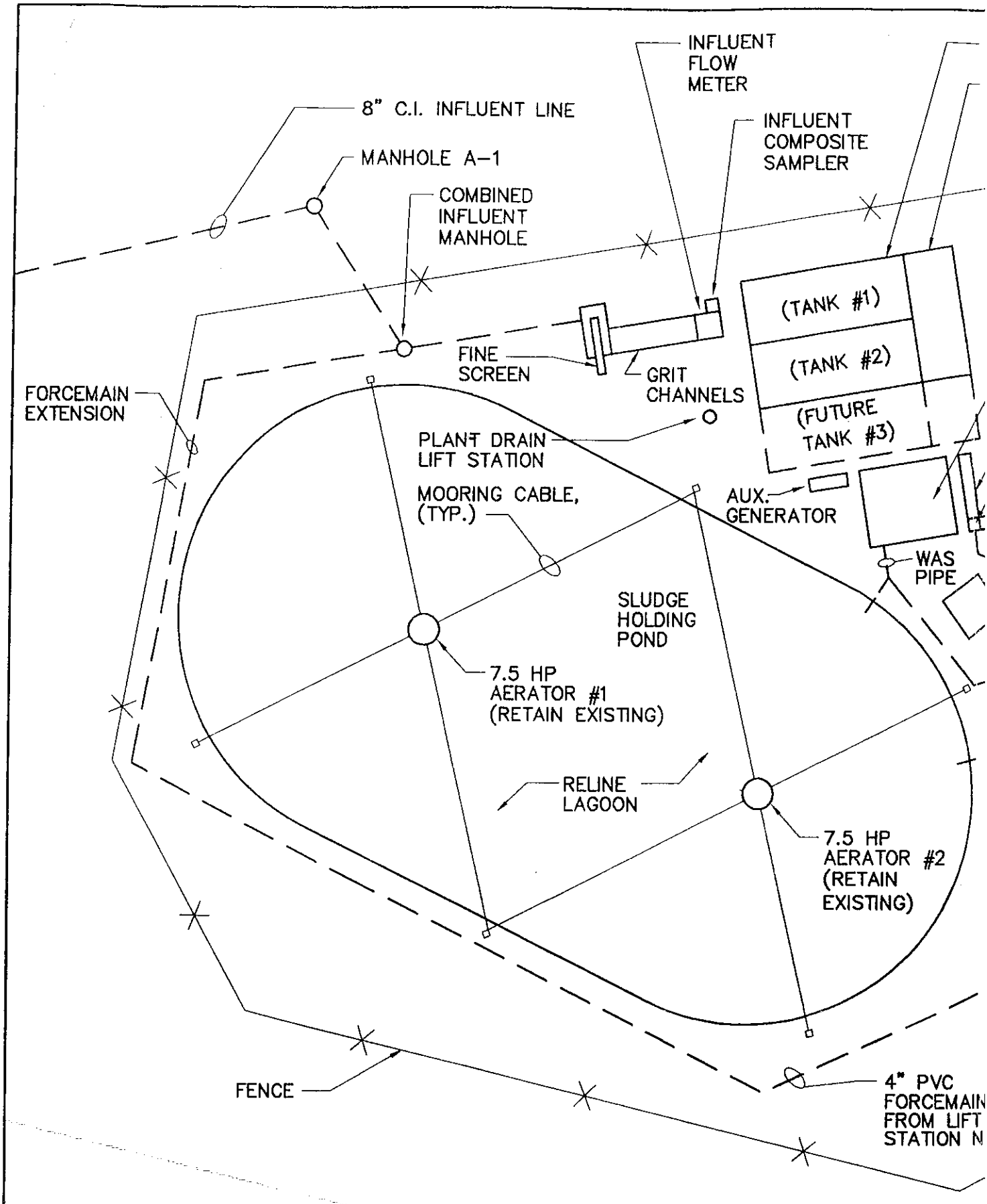
C. SIGNATURE

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

Signature: Kenneth Alexander

Kenneth Alexander, P.E., Gray & Osborne, Inc.

Date Submitted: 26 July 1999



BY: RDNM CREATED: JUN 18 1999 12:15:14 UPDATED: JUL 08 1999 17:16:36 PLOTTED: JUL 12 1999 15:30:06 FILE: L:\CONCRETE\98749\FIG6-2.DWG

BY: BW CREATED: MAR 27 1997 10:31:57 UPDATED: JUL 22 1999 10:36:05 PLOTTED: JUL 22 1999 10:50:50 FILE: L:\CONCRETE\98749\FIG7-1.DWG

APPENDIX N

SERP Document

WASHINGTON STATE WATER POLLUTION CONTROL REVOLVING FUND (SRF) ENVIRONMENTAL CHECKLIST

I. INTRODUCTION AND INSTRUCTIONS (PLEASE READ CAREFULLY)

All projects which receive financial assistance from the State Water Pollution Control Revolving Loan Fund (SRF) program must meet the provisions of the State Environmental Policy Act (SEPA) rules (Chapter 197-11 WAC) and the SRF State Environmental Review Process (WAC 173-98-100). The State Environmental Review Process (SERP) is established to ensure that environmentally sound alternatives are selected and to satisfy the state's responsibility to help ensure that recipients comply with the National Environmental Policy Act and other applicable environmental laws, regulations, and executive orders.

If no environmental documentation has been prepared for your proposal:

1. Complete this checklist;

2. Complete the accompanying SEPA checklist; and

3. Submit them with your application.

The staff of the Department of Ecology will use the checklists and detailed information contained in the facilities plan to help you determine the environmental impacts of your proposal and the appropriate threshold determination.

If you have completed the SEPA process:

1. Complete this checklist;

2. Attach it to your SEPA documentation; and

3. Submit it with your application.

The staff of the Department of Ecology will use the checklists and detailed information contained in the facilities plan to determine if your proposal is in compliance with the SERP process.

Additional information concerning the entire SERP process is contained in SRF program regulations (Chapter 173-98 WAC), the SRF program guidelines, and Appendix I of the SRF program guidelines.

This environmental checklist asks you to provide specific information about your proposal. Answer the questions accurately and carefully with the most precise information known, or give the best description you can. Environmental issues must be resolved before the facilities plan can be approved. If a question does not apply to your proposal, write "does not apply". Complete answers to the questions now may avoid unnecessary delays later.

The checklist questions apply to all parts of your proposal, even if you plan to do them over a period of time or on different parcels of land. Attach any additional information that will help describe your proposal or its environmental effects.

If you have problems completing this checklist, staff from the Water Quality Financial Assistance Program can assist you.

II. BACKGROUND

A. Name of proposed project:

Town of Concrete Comprehensive Sewer and Wastewater Facility Plan

B. Name of applicant: Town of Concrete, Washington

C. Contact Person: Mr. David Williams

Affiliation: Mayor

Address: Town of Concrete
228 D. Street & Main Street
P.O. Box 39
Concrete, WA 98237

Phone Number: (360) 853-8401

D. Name of person completing checklist: Ken Alexander, P.E.

Affiliation: Gray & Osborne, Inc.

Address: 701 Dexter Avenue N., Suite 200
Seattle, WA 98109

Phone Number: (206) 284-0860

E. Date checklist prepared: July 28, 1999

F. Describe the purpose and need for the proposal.

The project will increase the capacity of the existing Town of Concrete wastewater treatment plant (WWTP) and collection system to provide sewer service to projected population and commercial/industrial growth in the Town's sewer service area. The WWTP improvements will provide a level of treatment that meets expected future waste discharge permit requirements and complies with water quality standards for the Baker River, where treated effluent will be discharged.

G. Give a complete description of your proposal, including the proposed uses and the size of the project and site. There are several questions later in this checklist that ask you to describe certain aspects of your proposal. You do not need to repeat those answers on this page.

See Attachment A.

H. Describe the future environment without the proposal.

The Town of Concrete would have inadequate wastewater treatment capacity to serve the existing population. Violations of the Town's NPDES permit would continue to occur. Without this project, current deficiencies in the collection system (i.e. no auxiliary power and alarm annunciation) would not be rectified and capacity to serve new population and development in its service area would be inadequate. Development would be curtailed and no increase in population for the surrounding area would be permitted. An increase in septic systems within the UGA could possibly occur, with resultant potential hazard to local ground and surface waters.

I. Public Involvement.

Please indicate the extent of public involvement or awareness of the planning process:

		Dates
a.	Public Meeting(s)	8/23/99
b.	Public Hearing(s)	8/23/99
c.	Committee Meeting(s)	5/17/99, 7/13/99
d.	Media Coverage	Public meetings have been posted in local newspaper.
e.	No Public Involvement	
f.	Other (please specify)	

J. Is there significant controversy about the proposed project? If yes, explain.

None known.

K. List alternatives to the proposed project which were considered:

1. Continued Lagoon Treatment and Disposal to Baker River
2. Continued Lagoon Treatment and Disposal to Skagit River
3. Land Treatment System
4. Water Reuse - Ground Water Recharge

Briefly outline why alternatives were rejected (e.g., cost, environmental impacts, etc.)

1. Continued Lagoon Treatment and Disposal to Baker River - Cost, excessive area requirements
2. Continued Lagoon Treatment and Disposal to Skagit River - Permitting, New Outfall in Class AA River
3. Land Treatment System - High capital cost, Large land tract unavailable
4. Water Reuse - Ground Water Recharge - Large land tract unavailable

L. How were the following measures considered to be included in the proposed alternative, and if not, why were they not considered:

1. Flow and waste reduction measures, including infiltration/inflow reduction and pretreatment requirements?

   Yes X, How:

   The Town's STEP program will conduct smoke testing of the collection system to identify and eliminate I/I sources. In addition, two manholes with points of infiltration will be grouted.

   No ____, Why Not:

2. Appropriate water conservation measures;

   Yes ____, How:

   WWTP effluent will be recycled for use as irrigation water and to supply yard hydrants at the treatment plant.

   No ____ ,Why Not:

3. Alternative locations, capacities, and construction phasing of facilities;

Yes X, How:

Alternative WWTP site locations were not investigated since the existing treatment plant has adequate area for expansion and is adjacent to the Baker River, the outfall receiving water. Construction of a new WWTP at a different site would not be economical and would most likely reside within the 100-year floodplain. In order to achieve environmental compliance as soon as possible, WWTP project phasing is not recommended. However, sewer system projects will have construction phasing to reduce financial impact and to build additional capacity as population growth occurs.

No ____, Why Not:

4. Alternative waste management techniques, including pretreatment, treatment and discharge, wastewater reuse, land application, and individual systems;

Yes X, How:

WWTP effluent will be reused on site for irrigation and washdown water. Land application of effluent is not feasible due to lack of suitable land, and the existing receiving water (Baker River) has adequate capacity to dispose of effluent without violating water quality standards. Individual sewage systems are not suitable for the Skagit Valley.

No ____, Why Not:

5. Alternative methods for management of sludge;

Yes X, How:

The Town has taken an innovative approach to biosolids management and currently is removing biosolids from the aerated lagoon and using geotubes to collect the biosolids. In the future, solids will be stored in the re-lined lagoon and dewatered using a small screw press. The lagoon will provide sufficient holding time to stabilize the solids to Class B pathogen reduction requirements and could be land applied as a fertilizer and soil conditioner.

No ____, Why Not:

6. Improving effluent quality through more efficient operation and maintenance;

Yes X, How:

The recommended treatment option, sequencing batch reactor followed by UV disinfection, provides a high quality effluent meeting 30/30 mg/L BOD/TSS (average monthly) and 200/100 mL fecal coliform limits (average monthly).

This process is an efficient method of treating wastewater while remaining within the existing footprint of the treatment facility.

No ____, Why Not:

7. Appropriate energy reduction measures; and

Yes X, How:

The WWTP will be designed to minimize energy requirements. A more efficient aerator system will be used to treat the wastewater, reducing energy consumption by half of current levels. The recommended collection system to serve the UGA is primarily a gravity system, which will minimize energy requirements.

No ____, Why Not:

8. Multiple use including recreation, other open space, and environmental education.

Yes X, How:

The WWTP project site does not offer recreation opportunities but can be used to educate the public, including schools, about wastewater treatment and disposal.

No ____, Why Not:

III. ENVIRONMENTAL ELEMENTS

A. AIR

1. Is the project located in an attainment area?

   No.

2. Will the ambient air quality remain within standards if the project is constructed?

   Yes.

3. Discuss mitigation measures to reduce or control emissions or other impacts to air quality, including during construction:

   The upgraded WWTP will operate aerobic treatment processes for both liquid and solid wastes; therefore, odors generated by the new treatment processes are expected to be minimal. The sludge holding pond will have surface aerators for odor control.

B. WATER

1. Surface Water:

   a. What body(s) of water will water pollution control project protect?

   Baker River
   Skagit River
   Local ground waters
   Local surface waters

   b. What body of water will water pollution control facility discharge to?

   Baker River

   c. Does the proposed project lie within a 100-year floodplain? If so, note location of the floodplain and the project on the site plan and provide a discussion of why there is no feasible or prudent alternative for locating the project in the floodplain.

      No. The WWTP site lies outside of the 100-year floodplain.

d. Does the proposed project lie within or will it adversely affect wetlands? If so, note location of wetlands on the site plan, note the area of wetlands to be adversely affected, and provide a discussion of why there is no feasible or prudent alternative for locating the project in the wetlands.

No.

e. Are there any designated or officially recognized wild, scenic or recreational rivers in the planning area or any under study for inclusion in the system?

According to a USGS map, the Skagit River in the vicinity of Concrete is labeled a "Wild and Scenic River".

2. Mitigation Measures:

Discuss mitigation measures to reduce or control water impacts.

The recommended treatment alternative will provide a high effluent quality of less than 30 mg/L BOD_5 and TSS. UV disinfection is recommended, and will eliminate chlorine residual in the effluent. All water quality standards in the Baker River will be met.

C. LAND AND SHORELINE USE

1. Will the project affect any prime or unique farmland? If so describe the amount taken out of production and alternatives considered to minimize this loss.

No.

2. If applicable, what is the current shoreline master program designation of the site, and is the proposal consistent with the shoreline master program?

The WWTP site use is consistent with the Shoreline Master Program designation of Open Space.

The above answers are true and complete to the best of my knowledge.

Signature: Kenneth Alvarez

Date: 26 July 1999

ATTACHMENT A

The proposed plan is for the expansion of the Town of Concrete's wastewater treatment plant to meet the projected future plant loadings and more stringent effluent limits to be imposed by the next NPDES permit.

The proposed process scheme for the Wastewater Treatment Plant is that of a sequencing batch reactor with ultraviolet (UV) light disinfection, designed to achieve an effluent quality that will meet or exceed the discharge limitations set forth by the Washington State Department of Ecology (Ecology). An aerated sludge pond and mechanical dewatering press will be used to treat and dewater residual solids from the wastewater treatment process.

A site plan for the proposed treatment plant improvements is shown in Figure 1.

Wastewater Treatment System

Raw wastewater from the Town of Concrete will continue to be conveyed to the existing treatment plant site via the existing influent pipelines. The existing influent line from lift station No. 3 will be re-routed and combine with the influent gravity line from the north and jointly discharge to the new headworks structure. The new headworks structure will consist of a new self-cleaning screen, gravity grit removal channels, new influent flow meter, and a flow-paced sampling system. The headworks will be constructed to handle the 2020 year peak hour flow of 904,000 gpd.

Effluent from the new headworks will flow by gravity to the sequencing batch reactor. The biological removal of organic material will be performed in the new sequencing batch reactor process. Suspended microbial growth in the basins will remove organic pollutants from the wastewater. Aeration and mixing of the mixed liquor will be accomplished using an air distribution system consisting of fine bubble membrane diffuser disks. Air will be supplied to the diffusers by multi-stage, low-noise, centrifugal blowers located in a new operations building south of the SBR tanks. The blowers will be located inside a new building and shall be equipped with inlet and discharge silencers to reduce noise.

After the SBR cycle (fill-react-settle-draw-idle) is completed, the effluent from the SBR basins will be pumped to the UV disinfection system. The disinfected secondary effluent will then pass over the effluent weir and enter the outfall pipe line. Effluent flow will be measured using a new effluent flow meter installed just downstream of the UV

disinfection system. The treated effluent will flow by gravity to the existing outfall in the Baker river.

During power outages the power requirements of the key process components will be met by the output of a new generator located next to the new blower building. The generator will be used to run the headworks, aeration and disinfection equipment during power outages.

Sludge Treatment System

Waste sludge from the sequencing batch reactor will be pumped to the sludge holding pond for further digestion. Sludge digestion will be achieved aerobically using the existing lagoon aerators. Digested sludge will be pumped back to the sludge dewatering facility and dewatered using a new dewatering screw press. Polymer will be added to the dewatering screw press as a flocculant to enhance solids capture and improve dewatering. Centrate from the dewatering screw press will then be conveyed back to the sludge holding pond. The dewatered sludge cake (biosolids) will then be transported by haul trucks to a permitted beneficial use facility.

The recommended schedule for collection system improvements within the IUGA and Town limits are listed in Table 1 below. The construction of the improvements to the IUGA will be based on the ability to finance those improvements.

TABLE 1
RECOMMENDED COLLECTION SYSTEM IMPROVEMENTS
SERVICE AREA AND URBAN GROWTH AREA
TOWN OF CONCRETE

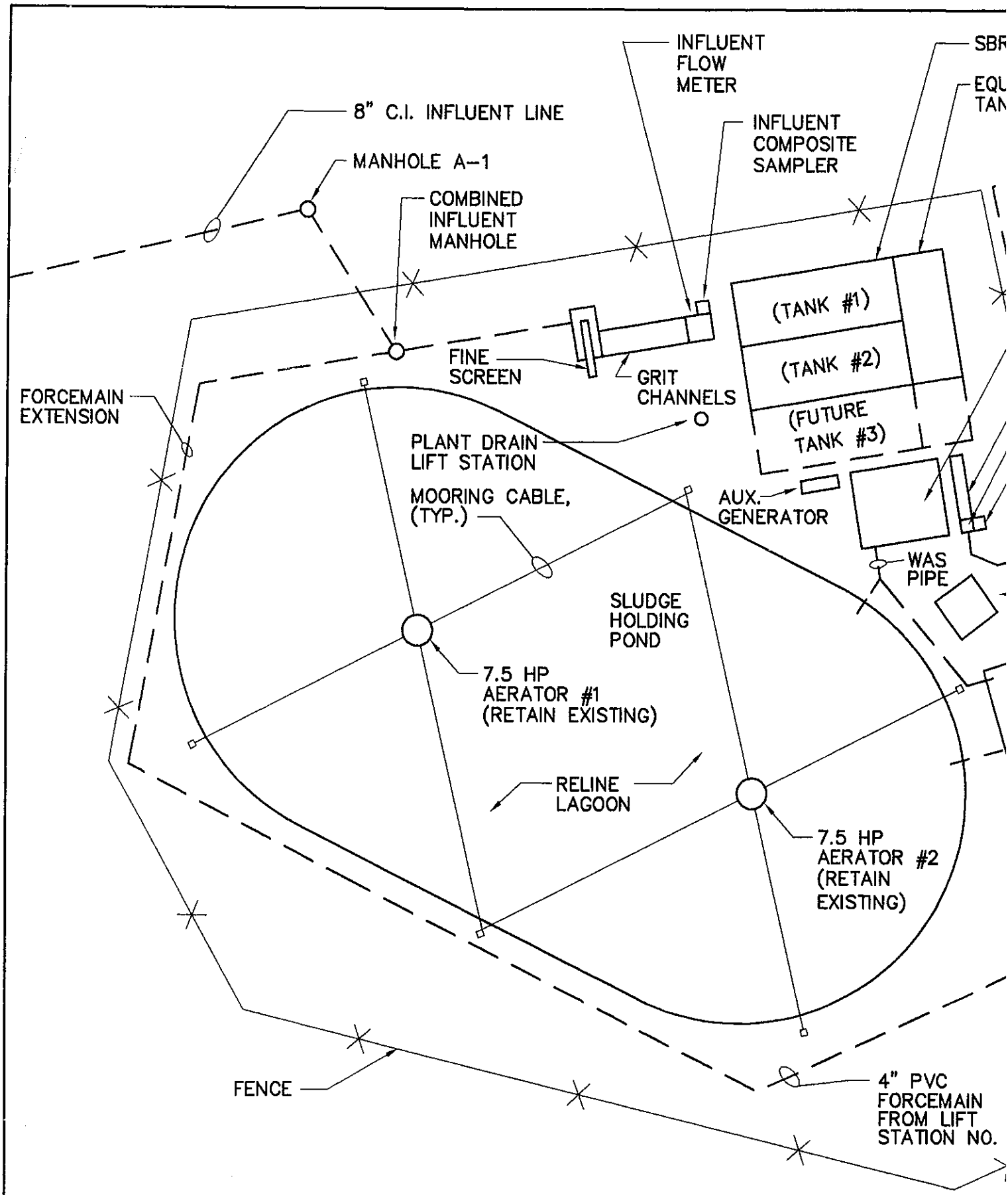
Project	**Project Date**
Short-Term Improvements:	
1) Smoke Testing	1999
2) Grout MH R-2 and R-3	2000
3) Investigate 427 Duffy St.	2000
4) Disconnect By-Pass Line to Little Baker Creek	1999
Long-Term Improvements:	
1) Provide Electrical Modifications to Existing Lift Stations	Before 2005*

2) Provide an additional Sewer Line from MH A-4 to MH A-1	Before 2005*

Service to Grassmere Area (IUGA):

1) Install Lift Station No. 4	**
2) Provide New Forcemain and Gravity Lines for UGA	**
3) Install larger Pumps at Lift Station No. 2	**

* - Based on obtaining financing and scheduling improvements concurrent with wastewater treatment plant upgrades which will need to be completed by the end of the next permit cycle. (assumed January 2000 - January 2005).
** - These improvements will be dependent upon requirements for further development of this area.



APPENDIX O

Capital Project Funding Sources

AVAILABLE CAPITAL PROJECT FUNDING SOURCES

This section describes several funding sources available to the Town without reference to any specific project, including information on the following:

Grants: Community Development Block Grant (CDBG)
USDA Rural Development (RD)
USDA Forest Service Rural Community Assistance
Centennial Clean Water Fund (DOE)

Loans: Centennial Clean Water Fund/State Revolving Fund (CCWF/SRF)
Public Works Trust Fund (PWTF)
USDA Rural Development (RD)
Community Economic Revitalization Board (CERB)

Bonds: Revenue Bonds
General Obligation Bonds

Other: Local Improvement Districts
Developer Financing
System Development Charges

COMMUNITY DEVELOPMENT BLOCK GRANT

Community Development Block Grant (CDBG) financing is available to non-entitlement cities and counties for projects primarily benefiting low to moderate income person. The maximum grant funding available is $750,000. To be eligible for CDBG grants, cities must be included on the list of eligible jurisdictions and must be a jurisdiction with at least 51% low/moderate incomes.

USDA RURAL DEVELOPMENT

USDA Rural Development (RD) has a loan program which, under certain conditions, includes a limited grant program. Grants determination is based on a formula which incorporates existing utility debt service and existing sewer service rates.

In addition, RD has a loan program for needy communities that cannot obtain funding by commercial means through the sale of revenue bonds. The loan program provides long-term 30- to 40-year loans at an interest rate that is based on federal rates and varies with the commercial market.

USDA FOREST SERVICE RURAL COMMUNITY ASSISTANCE

As part of the Northwest Economic Adjustment Initiative contained in the President's Forest Plan, the USDA Forest Service administers a grant program designed to stimulate economic diversification in timber-dependent communities. Grants are available for projects implementing recommendations from a Community Action Plan developed according to Forest Service guidelines.

The program does not normally fund land acquisition or operations and maintenance costs, but will fund infrastructure improvements or technical assistance related to economic development. Design funding is preferred over construction funding. The federal contribution is generally limited to 80% of project costs, and the Forest Service expects a maximum funding of $50,000 per project.

CENTENNIAL CLEAN WATER FUND GRANT

In 1986 the Washington State Legislature established the Water Quality Account, which funds a variety of programs related to water quality. This account is financed primarily from tobacco tax revenues ad may also be supplemented from the State General Fund, subject to legislative appropriation. The Centennial Clean Water fund (Centennial) is one of the programs funded by the account, and is authorized by Chapter 70.146 of the Revised Code of Washington. The Centennial fund provides grants and low-interest loans to local governments for water pollution control facilities and water pollution control activities designed to prevent and control water pollution to state surface and ground water. The Water Quality Program of the Department of Ecology has administered the centennial fund since its inception. In recent years the amount of grant funds available through the project has diminished. The competition for grant funds is very intense.

Grant funds are available for the construction of wastewater treatment facilities. Grant participation under Centennial is generally limited to 50% of eligible project costs. Eligible project costs are defined by 100% of the capacity generated by exiting residential flows. Costs associated with capacity greater than the 100% guideline are generally not considered eligible for DOE grant participation. In addition, Centennial does not necessarily fund all elements of a project. Portions of the project that might be grant eligible include improvements required to bring the facilities up to standards of the "Criteria for Sewage Works Design", facility redundancy requirements, secondary power supplies, and items required by an Ecology permit or order.

The amount of grant funding available through the Centennial program has decreased in recent years. Grant funds from Centennial are allocated on a competitive basis; therefore, a decrease in available funds results in a more competitive arena for potential grantees. It is Ecology's goal to ensure that the fund is distributed among those projects that address the state's highest priority water quality protection and water pollution control needs.

CENTENNIAL CLEAN WATER/STATE REVOLVING FUND

The Department of Ecology also administers the Centennial Clean Water Fund loan and SRF loan programs which provide low interest loans for water pollution control projects. Loans can be made for up to 100% of project costs at terms varying from 0% for 0- to 5-year loans to higher rates that vary with market rates for 15- to 20-year loans. Currently, both funds are offering 20-year loans at a 4.2% interest rate. The primary program requirements are to have an approved or approvable facilities plan for treatment works and to demonstrate the ability to repay the loan through a dedicated funding source. The SRF can be used to finance wastewater system replacement for the elimination of excessive infiltration and inflow and for the construction of facilities with reserve capacities to accommodate flows corresponding to the 20-year projected growth in the service area. Land acquisition is not eligible for SRF funding.

For projects over $1,000,000, design funding must be obtained separately from construction funding, and a design must be "approvable" by Ecology in order to be considered for construction funding.

PUBLIC WORKS TRUST FUND

The Public Works Trust Fund (PWTF) is a revolving loan fund designed to help local governments finance needed public works projects through low-interest loans and technical assistance. The PWTF, established in 1985 by legislative action, offers loans substantially below market rates, payable over periods ranging up to 20 years.

Interest rates are 1, 2, or 3%, with the lower interest rates providing an incentive for a higher financial share. A minimum of 10% of project costs must be provided by the local community to qualify for a 3% loan. A 20% local share qualifies the applicant for a 2% interest rate and a 30% local share qualifies for a 1% loan. The useful life of the project determines the loan term, with a maximum term of 20 years.

To be eligible, an applicant must be a local government such as a City, Town, County, or special purpose utility district, and have a long-term plan for financing its public work needs. If the applicant is a Town, City, or County, it must adopt the 1/4% real estate excise tax dedicated to capital purposes. Eligible public works systems include streets and roads, bridges, storm wastewaters, sanitary wastewaters, and domestic water. Loans are presently offered only for purposes of repair, replacement, rehabilitation, reconstruction or improvement of existing service users. Ineligible expenses include public works financing costs that arise from forecasted, speculative, or service area growth. Such costs do not make a project ineligible but must be excluded from the scope of their PWTF proposal.

The funding program operates on an annual cycle, with April and August application dates. The August application date is for preconstruction only, and preconstruction money is typically available by the end of the year. The April application date is for both

preconstruction and construction loans, with money available in May of the following year.

COMMUNITY ECONOMIC REVITALIZATION BOARD (CERB)

This low interest loan and grant program is sponsored the Department of Trade and Economic Development. Funding is available for infrastructure that supports projects which will result in specific private developments such as expansions of manufacturing or businesses that support the trading of goods and services outside the state's border. Funding is not available to support retail shopping developments or acquisition of real property. The projects must create or retain jobs. The average is one job per $3,000 of CERB financing. Interest rate fluctuates with the state bond rate.

REVENUE BONDS

The most common source of funds for construction of major utility improvements is the sale of revenue bonds. The tax-free bonds are issued by the Town. The major source of funds for debt service on these revenue bonds is from sewer service rates. In order to qualify to sell revenue bonds, the Town must show that its net sewer utility operating income (gross income less expenses) is equal to or greater than a factor, typically 1.2 to 1.4, times the annual debt service on all par debt issued. This 1.4 factor is commonly referred to as the debt coverage factor and is applicable to revenue bonds sold on the commercial market. The required debt coverage factor may be specified in previous revenue bond ordinances. If not, it will be determined at the time of bond issue.

GENERAL OBLIGATION BONDS

The Town, by special election, may issue general obligation bonds to finance almost any project of general benefit to the Town. The bonds are paid off be assessments levied against all privately-owned properties within the Town. This includes vacant property which otherwise would not contribute to the cost of such general improvements. This type of bond issue is usually reserved for municipal improvements that are of general benefit to the public, such as arterial streets, bridges, lighting, municipal buildings, firefighting equipment, parks, and water and wastewater facilities. General obligation bonds have the best market value and carry the lowest rate of interest of all types of bonds available to the Town. Disadvantages of general obligation bonds include the following:

- Voter approval is required which may be time-consuming, with no guarantee of successful approval of the bond.

- The Town may have a practical or legal limit for the total amount of general obligation debt. Financing large capital improvements through general obligation debt reduces the ability of the utility to issue future debt.

UTILITY LOCAL IMPROVEMENT DISTRICTS

Another potential source of funds for improvements comes through the formation of Utility Local Improvement Districts (ULIDs) involving an assessment made against properties benefited by the improvements. ULID bonds are further guaranteed by the revenues and are financed by issuance of revenue bonds.

ULID financing is frequently applied to water system extensions into areas previously not served. Typically, ULIDs are formed by the Town at the written request (by petition) of the property owner within a specific area of the Town. Upon receipt of a sufficient number of signatures on petitions, the local improvement area is defined. Each separate property in the ULID is assessed in accordance with the special benefits the property receives from the sewer system improvements.

A Town-wide ULID could form part of a financing package for large-scale capital projects such as pump station or trunk line expansion which benefit all residents in the service area. The Town-wide ULID would be formed by a majority vote of the Town Council.

There are several benefits to the Town in selecting ULID financing. The assessment places a lien on the property and must be paid in full upon sale of the property. Further, property owners may pay the assessment immediately upon receipt reducing the costs financed by the ULID. The advantages of ULID financing, as opposed to rate financing, to the property owner include:

1. The ability to avoid interest costs by early payment of assessments.

2. Low-income senior citizens may be able to defer assessment payments until the property is sold.

3. Some Community Development Block Grant funds are available to property owners with incomes near or below the poverty level. Funds are available only to reduce assessments.

The major disadvantage to the Town-wide ULID process is that it may be politically difficult to approve formation. The ULID process may be stopped if owners of 40 percent of the property are within the ULID boundary protest its formation.

DEVELOPER FINANCING

Developers may fund the construction of extensions to the sewer system to property within new plats. The Developer extensions are turned over to the Town for operation and maintenance when completed.

It may be necessary, in some cases, to require the developer to construct more facilities that those required by the development in order to provide either extensions beyond the plat and/or larger pipelines for the ultimate development of the wastewater system. The Town may, by policy, reimburse the Developer through either direct outlay, latecomer charges, or reimbursement agreements for the additional cost of facilities, including increased size of pipelines over those required to serve the property under development. Compensation for oversizing is usually considered when it is necessary to construct a pipe larger than eight inches in diameter in residential area to comply with the intent of the Comprehensive Plan. Construction of any pipe in commercial or industrial areas that is larger than the size required to service the development should also be considered as an oversized line possibly eligible for compensation. Developer reimbursement (latecomer) agreements provide up to 10 years or more for developers to receive payment from other connections made to the developer-financed improvements.

SYSTEM DEVELOPMENT CHARGES

The Town may adopt a system development charge to finance improvements of general benefit to the total sewer system which are required to meet future growth. System development charges are generally established as one-time charges assessed against new sewer customers as a way to recover a part of the cost of additional system capacity constructed for their use.

The system development charge or fee is deposited in a construction fund to construct such facilities. The intent is that all new system customers will pay an equitable share of the cost of the system improvements needed to accommodate growth. Typical items of construction financed by the system development charge are wastewater treatment facilities, pump stations, force mains, and other general improvements that benefit the entire system.