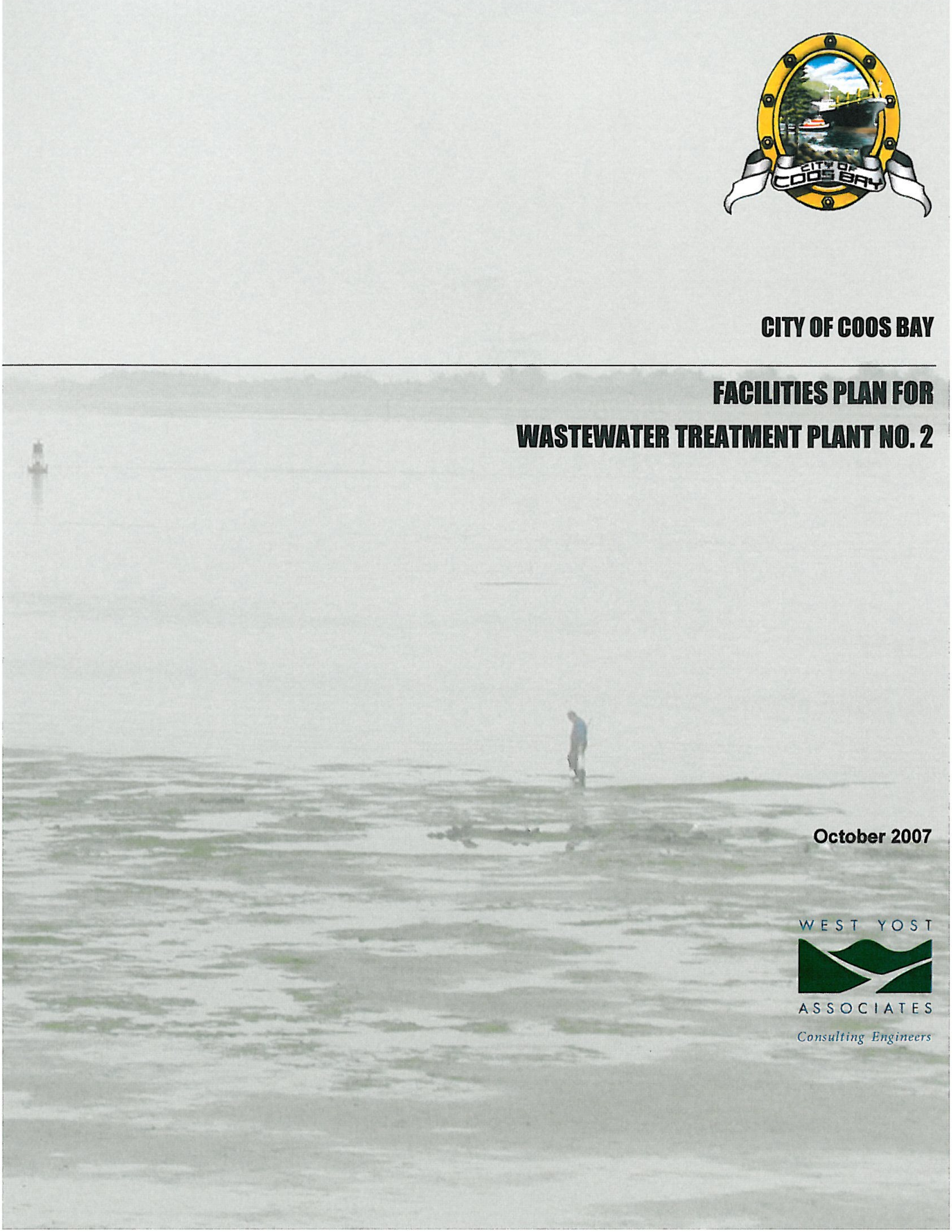

CITY OF COOS BAY

FACILITIES PLAN FOR WASTEWATER TREATMENT PLANT NO. 2

October 2007

WEST YOST ASSOCIATES

Consulting Engineers

City of Coos Bay

Wastewater Treatment Plant No. 2
Facilities Plan

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COOS BAY WASTEWATER TREATMENT PLANT NO. 2

FACILITIES PLAN

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COOS BAY WASTEWATER TREATMENT PLANT NO. 2

FACILITIES PLAN

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CHAPTER 1

EXECUTIVE SUMMARY

This facilities plan presents the results of the planning effort conducted for the City of Coos Bay's Wastewater Treatment Plant No. 2. The plan summarizes the service area and wastewater characteristics, identifies the components of the existing wastewater collection system and treatment system, evaluates the performance of the treatment system with respect to water quality and regulatory standards, and analyzes alternatives for improvements that will remedy system deficiencies and accommodate future growth. Based on this analysis, the facilities plan recommends specific projects for inclusion in the wastewater treatment system Capital Improvement Plan (CIP). These projects will ensure that Wastewater Treatment Plant No. 2 continues to provide adequate and reliable service for the community.

This wastewater management planning study has been conducted to ensure a cost-effective and environmentally responsible approach. Planning for community growth and meeting water quality requirements were both influential factors that guided the development of the recommended plan. Since the planning period for this study is 20 years, the projections and analysis are conducted through the year 2027. Following is a summary of the planning work that has been completed and subsequent recommendations.

SERVICE AREA CHARACTERISTICS

The City of Coos Bay is located on the southwestern Oregon coast, approximately 200 miles south of the Columbia River as shown on Figure 2-1. The eastern part of Coos Bay is in the Coaledo basin, which is a small area of low hills. These hills divide the City's service area into two primary basins for gravity collection, served by two treatment plants. Wastewater from the western area is treated at Wastewater Treatment Plant No. 2, while Wastewater Treatment Plant No. 1 treats wastewater from the eastern area. Together these treatment plants serve the City of Coos Bay, Charleston Sanitary District and Bunker Hill Sanitary District. Wastewater Treatment Plant No. 2 serves 3,213 acres, totaling 52 percent of the City's serviceable land area.

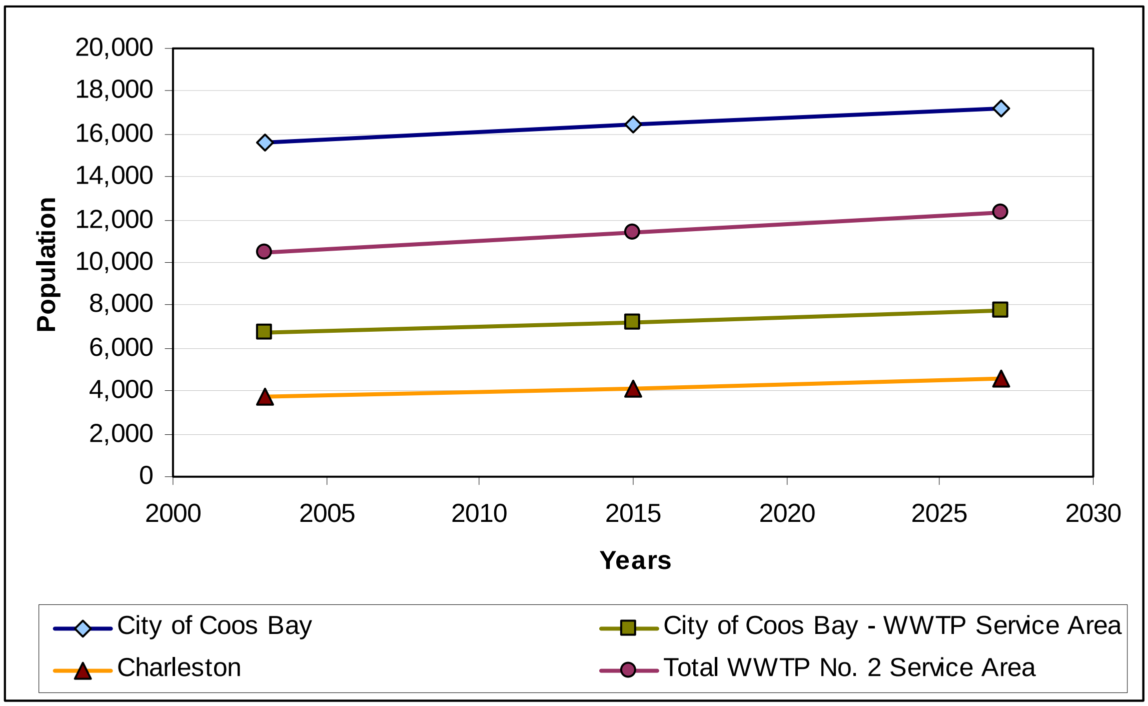
The current population and projected population growth within the service area are the key parameters in projecting future sewage flows and loads. These projections are used to assess the adequacy of existing infrastructure and develop design criteria for future treatment. Based on work by the for Population Research Center at Portland State University, the 2003 certified population estimate for Coos Bay is 15,650 people. This estimate refers to the number of people living within the city limits of Coos Bay. The population served by Wastewater Treatment Plant No. 2 was estimated based on information regarding service area boundaries provided by city personnel and a breakdown of the population developed for the City's *Transportation System Master Plan* (DKS Associates, 2004). The resulting year 2003 population within the Coos Bay city limits contributing to Wastewater Treatment Plant No. 2 is estimated to be 6,730.

The growth rate from 1990 to 2003 both in the city of Coos Bay and in Coos County was 0.3% according to Portland State University's Population Research Center. The City and the County have adopted the growth rate projected in the recently completed *Transportation System Master*

Plan which projects an annual growth rate of 0.75% until 2015 and thereafter a rate of 0.56% until the planning horizon. This projection is consistent with the latest amendment to the City's comprehensive plan.

The 2003 population for the Charleston Sanitary District was derived from Sanitary District data. The 2003 population is estimated to be 3,780. At a 0.79% growth rate provided by the District, the 2027 population is expected to be 4,570. Figure 1-1 illustrates the expected population growth for both the City and the Wastewater Treatment Plant No. 2 service area.

Figure 1-1. City of Coos Bay and Wastewater Treatment Plant No. 2 Service Area Population Projections



WASTEWATER CHARACTERISTICS

The key wastewater characteristics at a wastewater treatment plant are the flow, solids and organic loadings that are treated by the facility. Analysis of historical plant influent flow and loading data allows for a characterization of the City's system under current conditions and provides the basis for developing flow and load projections for the system in the future.

Table 1-1 summarizes current wastewater flows and Table 1-2 summarizes current loads.

Table 1-1. Current Wastewater Flows

Flow Parameter	Flow Rate, mgd
Average Dry Weather Flow (ADWF)	0.9
Average Wet Weather Flow (AWWF)	1.6
Average Annual Flow (AAF)	1.3
Maximum Month Dry Weather Flow (MMDWF)	1.2
Maximum Month Wet Weather Flow (MMWWF)	2.3
Maximum Week Wet Weather Flow (MWWWF)	3.1
Peak Day Flow (PDF)	4.5
Peak Wet Weather Flow (PWWF)	7.0

Table 1-2. Current Plant Influent Loads

Description	BOD, ppd	TSS, ppd
Dry Weather		
Average	1,800	2,000
Max Month	2,200	2,800
Peak Day	3,500	4,000
Wet Weather		
Average	1,800	2,000
Max Month	2,205	3,100
Peak Day	4,100	6,800
Average		
Average	1,800	2,000
Max Month	2,200	3,100
Peak Day	3,800	5,400

Flow and load projections are based on current flow and loads and anticipated community growth. Using population growth information, future flows and loads projections are developed. Table 1-3 presents flow projections and Table 1-4 presents load projections for the year 2027. The peak flow projections take into account the effect of ongoing infiltration and inflow (I/I) reduction activities as well as lower levels of I/I from future sewer system extensions.

Table 1-3. Coos Bay WWTP No. 2 Projected Flow

Parameter	Year 2027, mgd
Average Dry Weather Flow (ADWF)	1.0
Average Wet Weather Flow (AWWF)	1.9
Average Annual Flow (AAF)	1.4
Maximum Month Dry Weather Flow (MMDWF)	1.4
Maximum Month Wet Weather Flow (MMWWF)	2.4
Maximum Week Wet Weather Flow (MWWWF)	2.7
Peak Day Flow (PDF)	5.5
Peak Wet Weather Flow (PWWF)	8.6

Table 1-4. Coos Bay WWTP No. 2 Projected Plant Loads

	Year 2027	
Parameter	BOD, lbs/day	TSS, lbs/day
Annual Average	2,200	2,500
Maximum Month	2,700	4,000
Peak Day	4,700	6,800

TREATMENT REQUIREMENTS

The City of Coos Bay recognizes the importance of protecting the water quality of Coos Bay. The estuary provides recreational opportunities for tourists and local residents, serves as wildlife habitat, and is an important fisheries and harbor resource.

Because the NPDES permit has recently been revised to reflect current water quality issues, no major changes in discharge requirements are anticipated. The projected flow for the plant is well within the current designated NPDES capacity so no restrictions related to dry weather mass loads are anticipated.

The bacteria standard for discharge into marine waters and estuarine shellfish growing waters are more stringent than other waters. The existing permit stipulates these requirements and the Mutual Agreement and Order (MAO) provides a schedule for implementation of the plant improvements required to meet these limits.

The previous permit did not include a limit for ammonia. An analysis of ammonia toxicity indicates a reasonable potential that the water quality criteria for ammonia is exceeded with the existing discharge system. The MAO establishes an interim limit. The new permit includes an ammonia limit and the MAO provides a timetable for making improvements to meet the new permit limit.

Dechlorination equipment has been installed to ensure compliance with the chlorine toxicity requirements.

DEQ conducted a reasonable potential analysis for heavy metals as part of the permit renewal process. Only silver indicated a reasonable potential for exceeding water quality criteria. Based on this finding, DEQ required additional monitoring of silver but this requirement was suspended in the permit modification based on the evaluation of the additional data.

The only pending TMDL for the Bay is for bacteria. Since the existing permit requires the plant to comply with the water quality standard at the end of pipe, the allocations from the TMDL should not be more restrictive.

LIQUID STREAM ALTERNATIVES

The liquid stream treatment facilities at Wastewater Treatment Plant No. 2 are currently able to satisfy most of the requirements set forth in its National Pollution Discharge Elimination System (NPDES) permit. For those permit requirements that the plant currently does not meet, the City follows the requirements of a Mutual Agreement and Order (MAO) with the Department of Environmental Quality (DEQ). However, some process improvements are necessary in the near term to maintain regulatory compliance. In addition, long term upgrades are necessary to ensure that the facilities can handle increased flow and loads from the City's growing population and improve treatment as dictated by the new permit requirements.

Liquid Stream Improvement Alternatives by Treatment Process

Several of the liquid stream unit processes at Wastewater Treatment Plant No. 2 will require improvements over the next twenty years. For each process area, an evaluation was performed to determine the most appropriate approach to the improvements.

Headworks

The influent pump station and the headworks lack sufficient capacity to convey existing peak flows into the plant, which results in overflows which are not permitted. Two alternatives were considered for improvement of the headworks:

Alternative H1. Demolish the existing headworks facilities and construct new headworks with the influent pumping located upstream of screening and grit removal.

Alternative H2. Demolish the existing headworks facilities and construct new headworks with screening located upstream of the influent pumps and grit removal.

Evaluation of Headworks Alternatives. Alternative H1, construction of the headworks with the influent pumping located upstream of the screening and grit removal, is the least cost alternative because it involves less excavation to construct the facilities. It is therefore the preferred alternative.

Treatment Facilities

New treatment facilities are required to comply with new NPDES permit requirements. Five treatment alternatives were considered:

Alternative T1. Eliminate primary sedimentation and increase the wall height of the aeration basins to eliminate the need for the intermediate pump station, increase basin volume and treatment capacity. Upgrade return sludge pumping to improve process performance. Convert Secondary Clarifier No. 1 to a chlorine contact basin and construct a new, larger, secondary clarifier.

Alternative T2. Retain primary sedimentation for treatment of flow up to 5.5 mgd. Maintain current aeration basin volume and replace the existing aerators with larger units. Upgrade return sludge pumping to improve process performance. Convert Secondary Clarifier No. 1 to a chlorine contact basin and construct a new, larger, secondary clarifier. The existing Clarifier No. 2 would be modified to improve performance and upgrade the intermediate pump station to accommodate peak flows.

Alternative T3. Add pumping to allow for blended treatment. When influent flows exceed the capacity of the primary sedimentation basin, pump a portion of the wastewater from the headworks directly to the aeration basins. When the capacity of the secondary clarifier is reached, pump excess primary effluent to the chlorine contact basin. Add effluent pumping to transfer flow to an outfall with less stringent bacterial limits.

Alternative T4. Increase primary treatment facilities to accommodate peak flows. Do not increase the capacity of the secondary system. When flows exceed secondary capacity, pump primary effluent to the chlorine contact basin. Do not expand chlorine contact basin volume but add a final effluent pump station and pump to a new outfall to discharge at a location subject to the fresh water bacteria standard.

Alternative T5. Demolish Wastewater Treatment Plant No. 2 and pump all flow to Wastewater Treatment Plant No. 1.

Alternative T6. This alternative consists of replacing a portion the aeration basin with a membrane bioreactor (MBR) sized for maximum month dry weather flow and bypassing flow in excess of the MBR around the unit.

Evaluation of Treatment Alternatives. Alternatives T3 and T4 both rely on incorporating blended treatment to maximize the use of existing facilities and minimize the need for new construction. Because of this, however, they also both require a new outfall to a location subject to the non-shellfish growing bacteria standard. Since the shellfish growing bacteria standard may someday be applied to all of Coos Bay, it is not prudent to base long-term planning on such an outfall. Therefore, Alternatives T3 and T4 were eliminated from consideration.

The loss of the City's investment in the Wastewater Treatment Plant No. 2 and the cost of pumping the flow to Wastewater Treatment Plant No. 1 and replacing that investment eliminated the Alternative T5 from further consideration.

The cost of the installed MBR alone is in excess of $12 million and preliminary calculations do not confirm that the effluent quality of blended effluent would meet discharge standards so Alternative T6 was not considered further.

Alternatives T1 and T2 both provide suitable treatment for discharge to shellfish waters. Treatment Alternative T2 was lower cost than Alternative T1 and is therefore the preferred alternative.

Discharge Options

The following were alternatives considered for discharge for WWTP No. 2:

Alternative D1. Maintain the existing outfall. The existing outfall has a capacity of 9 mgd, which is adequate for current and future peak flows. The Bay in the vicinity of the existing outfall is subject to bacteria standards for shellfish growing waters.

Alternative D2. Pump to an alternate existing outfall that discharges to the Pacific Ocean off the North Spit. However, like the Bay in the vicinity of the Plant No. 2 outfall, shellfish growing is a designated beneficial use of the Pacific Ocean. Therefore, ocean discharges are subject to the same stringent bacteria standard as the Bay. Consequently, there would be no benefit to using this new outfall off the North Spit, despite the considerable costs in pumping and transmission that would be required. In light of the additional costs and minimal benefits compared to continued use of the existing outfall, the alternative of using the new North Spit outfall is removed from further consideration.

Alternative D3. Discharge to non-shellfish growing waters. In non-shellfish growing waters, the less restrictive conventional bacteria limit would apply, allowing blended treatment during peak flows and reducing the required chlorine contact. There are some areas of Coos Bay that currently fit this description. However, there is some uncertainty as to whether these areas will remain designated as non-shellfish growing since they are currently located upstream of shellfish growing waters. With these uncertainties, it is prudent to plan for the more stringent bacteria standard. In light of this, there is no compelling reason to explore alternate outfall locations since the existing outfall is in good condition and has adequate capacity for future flows.

Alternative D4. A zero discharge alternative should be included as part of a facilities plan treatment system evaluation. For the City of Coos Bay, a zero discharge alternative would include wastewater treatment system upgrades as presented previously; a pipeline and pump station to transport the effluent to an irrigation site; an effluent storage pond; an irrigation site; an irrigation pump station; and irrigation equipment.

Evaluation of Alternatives. Since Treatment Alternatives T3 and T4 were eliminated from consideration, Discharge Alternatives D2, D3 and D4 were also eliminated as they only pair feasibly with Treatment Alternatives T3 and T4.

SOLIDS PROCESSING ALTERNATIVES

Alternative S1

Continue to thicken primary sludge primary sedimentation basin, thicken WAS separately, continue on-site anaerobic digestion, haul biosolids to the City's facultative lagoons and land apply.

Alternative S2

Continue to thicken primary sludge in the primary sedimentation basin and thicken WAS separately. Retain the existing digesters for solids storage only. Haul solids to WWTP No. 1 for anaerobic digestion and pumping to the City's facultative lagoons. Land apply biosolids.

Alternative S3

Store primary sludge and WAS separately at WWTP No. 2 and transfer to WWTP No. 1 for thickening, anaerobic digestion and pumping to the City's facultative lagoons. Land apply biosolids.

Evaluation of Alternatives

The solids processing alternatives were evaluated according to both economic and non-economic factors. Based on these evaluations, Alternative S2, hauling thickened sludge to Wastewater Treatment Plant No. 1 for digestion was selected as the preferred alternative. This alternative has the lowest capital and life cycle cost.

RECOMMENDED PLAN

Based on an assessment of the capacity of the existing unit processes and alternatives for improvements, recommendations are made for the wastewater treatment system CIP. Estimated costs for the recommended improvements are summarized in Table 1-5. These costs are shown at year 2004 cost levels and are adjusted when planning for projects that will be implemented in the future. CIP projects are organized according to the anticipated improvement period.

The recommended plan also includes a recurring $350,000 per year for inflow and infiltration (I/I) improvements in the City's WWTP No. 2 service area.

Table 1-5. Recommended Plan Cost Summary**

(2004 Dollars at ENR CCI 7314)

Description	Cost, $1000			
	Const	Contingency 25%	Engineering and Admin 20%	Total
Phase 1 Improvement Projects (Present – 2008)				
Relocate influent sewer	193	48	48	289
Influent pump station	989	247	247	1,483
Construct aeration basin improvements	550	137	137	825
Construct new secondary clarifier with RAS/WAS pumping	1,718	429	429	2,577
Expand intermediate pumping	170	42	42	255
Convert Secondary Clarifier No. 1 to chlorine contact basin	96	24	24	144
Relocate Control Building	144	36	36	216
Relocate Storage Building	58	14	14	87
Construct new waste gas burner	43	10	10	64.5
Construct standby power	216	54	54	324
Total Phase 1 Cost	4,177	1,041	1,041	6,264.5
Phase 2 Improvement Projects (2012-2017)				
Replace headworks	994	248	248	1,491
Construct primary sludge handling improvements	88	22	22	132
Convert digesters to storage tanks	282	70	70	423
Digester building improvements	216	54	54	324
Replace primary clarifier mechanism	576	144	144	864
Total Phase 2 Cost	2,156	538	538	3,234
Phase 3 Improvement Projects (2018-2023)				
Construct gravity belt thickener	1,076	269	269	1,614
Construct secondary clarifier improvements	194	48	48	291
Total Phase 3 Cost	1,270	318	318	1,905
TOTAL COST	**7,603**	**1,901**	**1,901**	**11,403.5**

**In addition to the one time costs presented herein, a recurring cost of $350,000 per year have been included in the CIP for the planning period. This cost covers the I/I improvements in the WWTP No. 2 service area.

CHAPTER 2

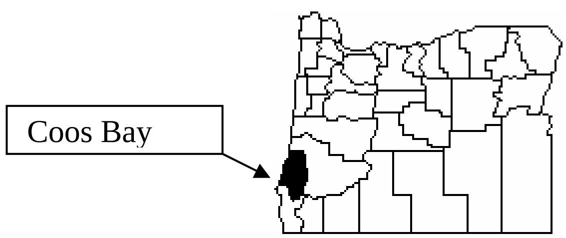
STUDY AREA CHARACTERISTICS

A review of the region's study area characteristics is an important initial step in the process of developing facility plans for wastewater treatment plants in the City of Coos Bay. The description of the study area characteristics includes the study area location, physical environment and socioeconomic environment. These characteristics provide the context for evaluating alternative strategies for long-term wastewater treatment and disposal.

STUDY AREA

The City of Coos Bay is located on the southwestern Oregon coast, approximately 200 miles south of the Columbia River as shown on Figure 2-1. The eastern part of Coos Bay is in the Coaledo basin, which is a small area of low hills. These hills divide the City's service area into two primary basins for gravity collection, served by two treatment plants. Wastewater from the western area is treated at Wastewater Treatment Plant No. 2, while Wastewater Treatment Plant No. 1 treats wastewater from the eastern area. Together these treatment plants serve the City of Coos Bay, Charleston Sanitary District and Bunker Hill Sanitary District. Figure 2-2 shows the service area of Wastewater Treatment Plant No. 2. In total, Wastewater Treatment Plant No. 2 serves 3,213 acres, totaling 52 percent of the City's serviceable land area.

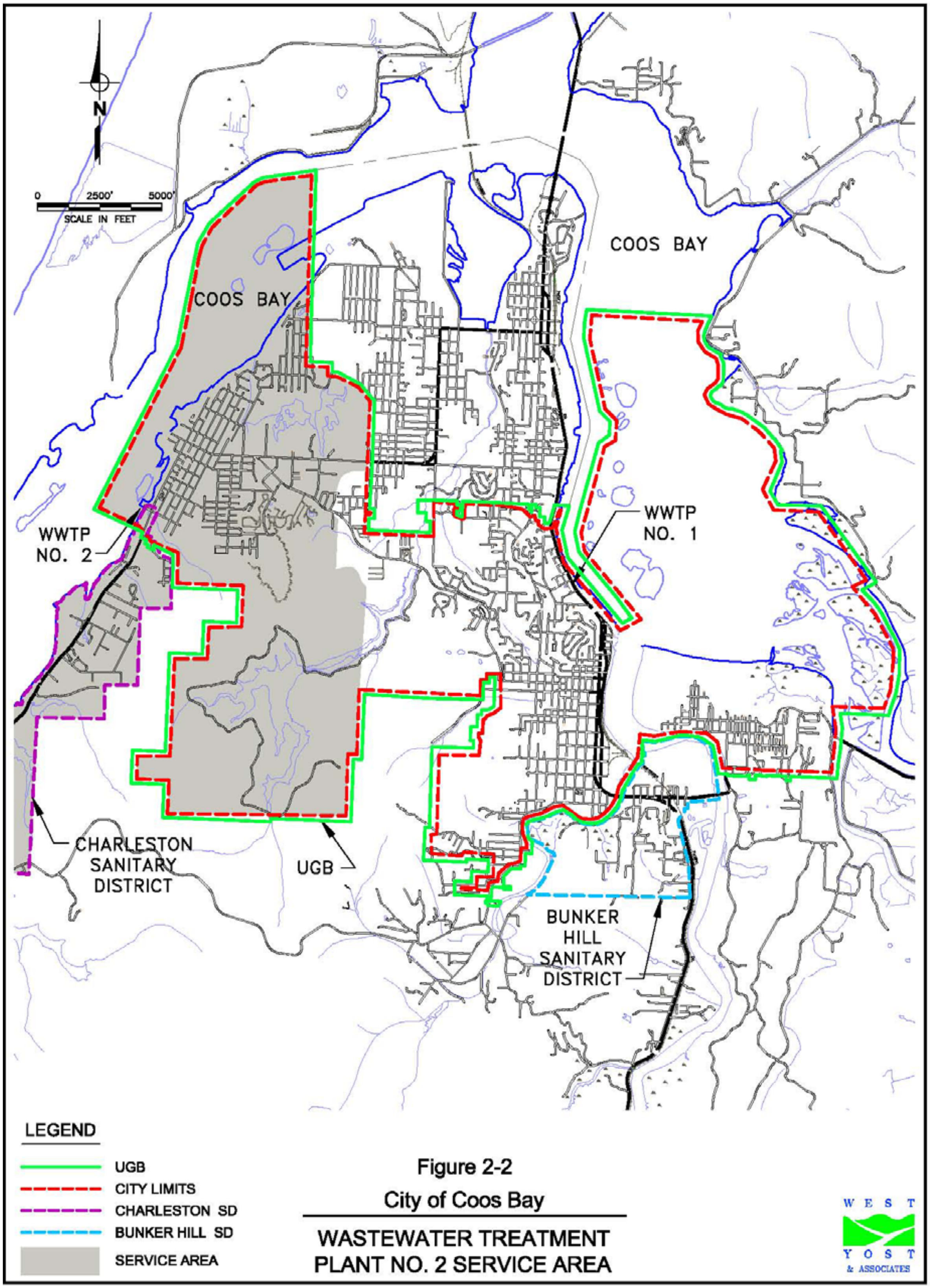
Figure 2-1. Location of Coos Bay in Oregon



PHYSICAL ENVIRONMENT

The physical environment includes the topography, geology, soils, and climate of the region. This section presents a brief overview of these physical characteristics as they relate to wastewater facilities planning. A detailed environmental assessment is presented in Appendix A. The topography, geology and soils of a region can have a significant impact on the design and construction of wastewater collection and treatment systems. Climatic characteristics such as precipitation and temperature influence the amount of wastewater entering the system, treatment system performance, and the potential for temperature impacts on discharges to Coos Bay.

Figure 2-2. City of Coos Bay Wastewater Treatment Plant No. 2 Service Area



Topography

The City of Coos Bay is bordered to the east and west by Coos Bay, by the City of North Bend to the north and by the Coast Mountain Range to the south. A ridge running north to south just west of 35th Street defines the City's drainage basins. Wastewater Treatment Plant No. 2 serves the population west of the ridge.

Climate

The climate of Coos Bay can be described as mid-latitude marine with mild summers and wet, cool winters. Although the nearest weather station is located in North Bend, the weather data is applicable to Coos Bay due to its proximity and similarity in geographic and topographic conditions. Monthly average temperatures and precipitation are summarized in Table 2-1. Extreme temperatures are usually not experienced in the area due to the moderating influence of the Pacific Ocean. As shown in Table 2-1, there is only a 15-degree difference between the mean temperature during the coldest and warmest months.

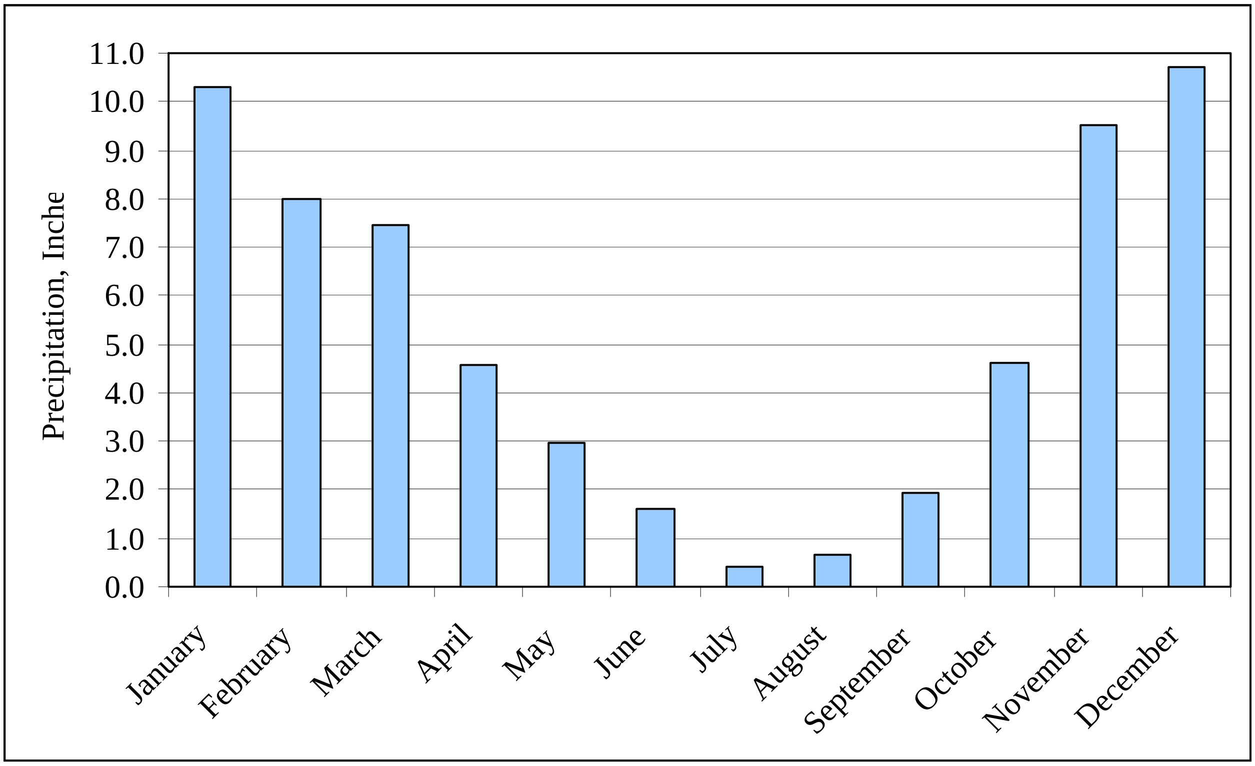
Figure 2-3 illustrates the variation in monthly average precipitation over the course of a year. Most of the precipitation occurs in the months of November through March in the form of rain. Only mild, occasional snowfall is seen in the area. Figure 2-4 shows the historical annual precipitation for last 30 years.

Table 2-1. Climatic Summary for North Bend

Month	Temperature, degrees F			Precipitation
		Average Daily		Average,
	Average	Maximum	Minimum	Inches
January	46.05	52.59	39.52	10.31
February	47.63	54.56	40.7	7.98
March	48.26	55.26	41.26	7.44
April	49.83	56.84	42.82	4.55
May	53.69	60.57	46.8	2.96
June	57.29	63.93	50.65	1.60
July	59.53	66.39	52.68	0.42
August	60.24	67.46	53.01	0.65
September	58.8	67.18	50.43	1.94
October	54.77	63.19	46.35	4.61
November	50.21	57.15	43.28	9.52
December	46.62	52.97	40.28	10.71
Annual	52.72	59.81	45.62	62.70

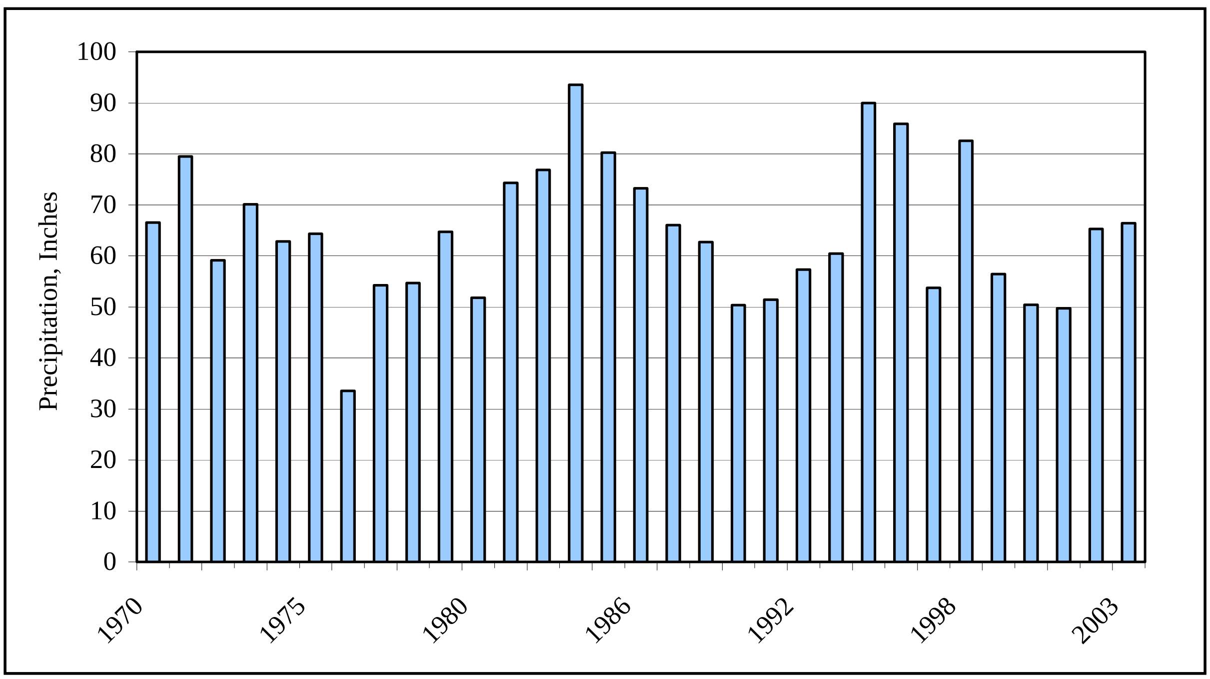
For the temperature data, averages were calculated for years 1961 to 2003; for the precipitation data, averages were calculated for the years 1911-2002.
Source: Oregon Climate Services, for North Bend, OR

Figure 2-3. North Bend Monthly Average Precipitation (1911-2002)



Source: Oregon Climate Services, North Bend, OR

Figure 2-4. North Bend Historical Annual Precipitation



Soils

Coos Bay is underlain with bedrock, clayey and silty material, sandstone and marine terraces. Minable coal deposits can be found in the sandstone layer. There are no significant beaches in Coos Bay. Stabilized dunes, mountainous areas and filled land, generally characterize the City's geology.

A survey conducted by the Natural Resources Conservation Service and the United States Department of Agriculture identifies approximately 46 different named soils in Coos County. The City of Coos Bay is dominated primarily by loamy and sandy soils that are either poorly or excessively drained. Sandy soils, including the Bandon and Westport soils, that are formed in eolian material are common in sand dune areas on the west side of the city and near the bay. This area is also dominated by the alluvial or water-deposited soils that appear as sand and gravel deposits. The eastern and central parts of the City have sandy and silty soils (Bullard soils). A major problem associated with these soils is erosion; particularly after protective vegetative covering is removed.

Geologic Hazards

The Coos Bay area is prone to flooding, tsunamis, earthquakes, erosion, high groundwater and ponding, and windthrow.

The existing WWTP No. 2 site is located in an area between the limits of the 100-year floodplain and the 500-year floodplain of Coos Bay (FEMA, 1984). This area, referred to as Zone B on the flood insurance rate map, may also be subject to 100-year flooding with average depths less than one foot. Additionally, Zone B includes areas protected by levees from the base flood and areas where the contributing drainage area is less than one square mile (FEMA, 1984). The existing outfall and the debris stockpile site just south of Fulton Avenue (adjacent to WWTP No. 2) occur in an area mapped as Zone A2 or the 100-year floodplain of Coos Bay (FEMA, 1984). The existing flow monitoring station is located on the northeast corner of Fulton Avenue and Empire Boulevard in an area mapped as Zone C – an area of minimal flooding.

Earthquakes are generally not a major hazard in the area, however earthquakes centered in California are capable of causing some local damage.

The WWTP No. 2 is in the tsunami hazard zone. A tsunami is a series of sea waves usually caused by a displacement of the ocean floor by an undersea earthquake. As tsunamis enter shallow water near land, they increase in height and can cause great loss of life and property damage. For the Coos Bay – North Bend area, the tsunami evacuation routes were developed by local officials and reviewed by the Oregon Department of Emergency Management. These maps are published by the Oregon Department of Geology and Mineral Industries.

Public Health Hazards

The WWTP No. 2 service area within the city limits of Coos Bay is fairly new and has very few problems with the existing sewer system. However, in the Charleston Sanitary District, the area along 7 Devils Road has experienced instances of septic system failure.

Energy Production and Consumption

The principal energy source utilized in the Coos bay area is electricity, most of which is consumed by the growing residential sector. Few, in any non-renewable sources exist in the Coos Bay area and there are no hydro-electric, thermal, or nuclear energy-producing plants. Utilization of alternative energy sources such as solar, wind, waste biomass, and tides is minimal.

Water Resources

The Coos Bay estuary, a sub-basin of the South Coast Watershed, covers approximately 13,348 acres and is fed by a number of creeks and rivers including Coos River, Willanch Creek, Kentuck Creek, Larson Creek, and Palouse Creek. The town of North Bend and the City of Coos Bay are situated on a peninsula that roughly divides Coos Bay into a western and an eastern portion. The western portion of Coos Bay is protected by North Spit - a narrow landmass with sand dunes. The tidally influenced mud flats along the shores of Coos Bay are ideal for shellfish production. Land use surrounding the bay includes agriculture, private and public timberlands, the Oregon Dunes National Recreation Area, wildlife reserves, urban centers.

Domestic Water Supply

The domestic water supply for City of Coos Bay and surrounding areas are served by the Coos Bay North Bend Water Board from the Pony Creek Reservoir. The reservoir water is treated by the Pony Creek Treatment Plant located on Ocean Boulevard. This plant was placed in service in 1991 and produces water meeting or exceeding all United States Environmental Protection Agency (EPA) and Oregon Health Division (OHD) primary water quality standards.

The water treatment plant's current design capacity is 8.0 million gallons per day. Current annual daily average demand for treated water is 4.0 million gallons per day with occasional summer demands of 7.1 million gallons per day.

Flora and Fauna

The presence of fish, wildlife, and vegetation types in the study area were determined from a review of the Oregon Natural Heritage Information Center database (ONHIC, 2005), and a site visit on January 26, 2005. The affected environment includes the existing WWTP site, the debris stockpile site, First Creek in the vicinity of the existing influent sewer pipe, and Coos Bay in the vicinity of the existing effluent outfall. The existing WWTP site is developed and provides limited wildlife habitat. Gulls and crows commonly congregate at the facility. Wildlife species anticipated to occur adjacent to the WWTP include terns, osprey, thrushes, chickadees, wrens, woodpeckers, squirrel, and small rodents.

The little amount of vegetation present on the WWTP No. 2 site includes mowed grass, weedy herbaceous plants, and one or two shore pines (*Pinus contorta*) near the operations building. Vegetation on the outside of the fenced facility is also mowed grass and weedy herbaceous plants. Vegetation on the banks of First Creek includes Lyngby sedge (*Carex lyngbyei*), reed canarygrass (*Phalaris arundincea*), red-osier dogwood (*Cornus sericea*), red alder (*Alnus rubra*), and rush species (*Juncus sp*.). Vegetation along the perimeter of the cleared stockpiling area includes Scot's broom (*Cytisus scoparius*), Himalayan blackberry (*Rubus discolor*), and a few mature conifers. Salt marsh habitat is located just north of the WWTP site and includes such species as the western marsh-rosemary (*Limonium californicum*), *Jaumea carnosa*, *Salicornia vi*rginica, and *Distichlis spicata*.

The effluent outfall is located at RM 3.8 in Coos Bay. In general, estuaries are highly productive systems that provide habitat for a multitude of resident and migratory species, including fish, marine mammals, terrestrial mammals, and birds (Johnson and O'Neil, 2001). The intertidal mudflats in Coos Bay provide habitat for oysters and clams while the salt marshes support shorebirds, juvenile fish, and other aquatic organisms. Fish and aquatic species present in Coos Bay near the outfall include: rock fish, Dungeness crab, Pacific lamprey, sturgeon, anchovy, herring, chum salmon, coho salmon, steelhead, surf perch, and lingcod. While salmonid habitat is not mapped for First Creek, the stream is likely to support other native fish species including coastal cutthroat trout and three-spine stickleback.

Air Quality

The climate of Coos Bay is characterized by mild summers and wet, cool winters. The average wind velocity for North Bend is approximately 8 miles per hour with gusting up to 29 and 38 mph (National Weather Service, 2005). Wind direction is variable. Sufficient wind is present in the project area the year to disperse air pollutants released into the atmosphere.

Existing odor and air pollutant-producing activities on the site include the primary sedimentation, aeration, and the digester. The waste gas burner is not working and digester gas (methane) is being discharged to the atmosphere. Nearby sources of odor include exhaust from vehicles on the Cape Arago Highway and exposed mud and sand at low tide.

No significant sources of air pollution are designated by the Environmental Protection Agency (EPA) for the project site or vicinity (EPA, 2004). The nearest area that exceeds ambient air quality standards is the Eugene-Springfield area. A few odor complaints have been made in the past (during the summer months).

Noise

Three residences are located between 100 and 150 feet away from the WWTP No. 2 site and are]\separated from the site by trees, shrubs, and First Creek. During the January 2005 field visit the operating equipment at the existing facility was barely audible from perimeter of the site on Fulton Road. The human ear responds to a wide range of sound intensities. The decibel scale used to describe sound is a logarithmic rating system that accounts for the large differences in audible sound intensities. This scale accounts for the human perception of a doubling of loudness as an increase of 10 decibels (dBA). Hence, a 70 dBA sound level will sound twice as loud as a 60 dBA sound level. People generally cannot detect differences of 1 dBA, but a 5 dBA change would likely be perceived under normal conditions.

Factors affecting the impact that a given noise will have on a person include the frequency and duration of the noise, the absorbency of the ground and surroundings, and the distance of the receptor from the noise source. The receptor and the usual background noise levels also determine the degree of impact. A noise level analysis has not been conducted for the project area. Local governments have primary responsibility for controlling noise sources and regulating outdoor noise levels in the environment.

Floodplains

The existing WWTP No. 2 site is located in an area between the limits of the 100-year floodplain and the 500-year floodplain of Coos Bay (FEMA, 1984). This area, referred to as Zone B on the flood insurance rate map, may also be subject to 100-year flooding with average depths less than one foot. Additionally, Zone B includes areas protected by levees from the base flood and areas
The existing WWTP No. 2 site is located in an area between the limits of the 100-year floodplain and the 500-year floodplain of Coos Bay (FEMA, 1984). This area, referred to as Zone B on the flood insurance rate map, may also be subject to 100-year flooding with average depths less than one foot. Additionally, Zone B includes areas protected by levees from the base flood and areas
where the contributing drainage area is less than one square mile (FEMA, 1984). The existing outfall and the debris stockpile site just south of Fulton Avenue (adjacent to WWTP No. 2) occur in an area mapped as Zone A2 or the 100-year floodplain of Coos Bay (FEMA, 1984). The existing flow monitoring station is located on the northeast corner of Fulton Avenue and Empire Boulevard in an area mapped as Zone C – an area of minimal flooding.

Environmentally Sensitive Areas

At the existing WWTP No. 2 site, the affected area includes a cleared area just south of Fulton Avenue between the WWTP site and Empire Boulevard, and First Creek. According to the National Wetlands Inventory (NWI), tidally influenced wetlands are mapped in the project vicinity and palustrine, scrub-shrub wetlands are mapped along First Creek near the existing WWTP site (see appendix A). The mapped soil unit on the project site and site vicinity, Heceta fine sand, 0-3 percent slopes, is considered a hydric soil. The existing WWTP is built on historic fill and is protected by riprap on all sides except where accessed by Fulton Avenue. No wetlands are mapped on the existing WWTP site and no wetlands were observed at the facility during a January 2005 visit. The debris stockpile site just south of Fulton Avenue also did not contain wetland characteristics. The banks of First Creek, however, contained hydrophytic vegetation (sedges, reed canarygrass) and are possible jurisdictional wetlands.

Land Use Issues

Plant 2 is zoned Coos Bay Estuary Management Plan (CBEMP) 55-UD (urban development). The underlying zone is I-C, Industrial Commercial, although the CBEMP zone overrides I-C.

SOCIOECONOMIC ENVIRONMENT

The City of Coos Bay's population and land use patterns have the most important influence on flows and loads to the wastewater treatment system. The current population and projected population growth within the service area are the key parameters used in projecting future sewage flows and loads. These projections are used to assess the adequacy of existing infrastructure and develop design criteria for future treatment systems.

The planning period for this study is 20 years. Since the planning period should extend 20 years beyond the time when plant improvements are implemented, projections are provided for the year 2027.

Economic Conditions

The median family income for the City of Coos Bay residents in the year 1999 was $38,721 (Census 2000 Summary File 3, Series P-77, Median Family Income, U.S. Census Bureau, 2003). Approximately 90 percent of the residents of the City of Coos Bay are white, with 5 percent a mix of two or more races and the rest of the ethnic groups in the population representing 2 percent or less. In comparison, Coos County residents are 92 percent white, 4 percent a mix of other races, 3 percent American Indian, and the remaining ethnic groups in the population representing 1 percent or less (Census 2000 Summary File 3, Series P-6 Race, U.S. Census Bureau, 2003).

Low-income populations were identified using statistical poverty thresholds from the Census 2000 Summary File 3, Series P-87 Poverty Status in 1999 by Age (U.S. Census Bureau, 2003). These thresholds were derived from information collected in the Census 2000. Poverty status is defined by a set of income thresholds that vary by family size and composition. Families or individuals with income below their appropriate poverty thresholds are classified as poor. In 1999, 17 percent of City of Coos Bay residents were at or below poverty level standards compared to 15 percent of Coos County residents. The percentage of residents at or below poverty level at the national and state level is approximately 12 percent. No readily identifiable groups of low-income persons living in geographic proximity to the project area were identified from the income data.

Population Projections

Based on work by the for Population Research Center at Portland State University, the 2003 certified population estimate for Coos Bay is 15,650 people. This estimate refers to the number of people living within the city limits of Coos Bay. The population served by Wastewater Treatment Plant No. 2 was estimated based on information regarding service area boundaries provided by city personnel and a breakdown of the population developed for the City's Transportation System Plan (DKS Associates, 2004). In the modeling work that was done for the Plan, the city's population was broken down into Transportation Analysis Zones (TAZ). Using the TAZ estimates and mapping data, the population was proportionately allocated to each of the city's two treatment plants based on the plants' service areas.

The resulting year 2003 population within the Coos Bay city limits contributing to Wastewater Treatment Plant No. 2 is estimated to be 6,730.

The growth rate from 1990 to 2003 both in the city of Coos Bay and in Coos County was 0.3% according to Portland State University's Population Research Center. The city and the county have adopted the growth rate projected in the recently completed Transportation Master Plan which projects an annual growth rate of 0.75% until 2015 and thereafter a rate of 0.56% until the planning horizon. This projection is consistent with the latest amendment to the City's comprehensive plan.

The 2003 population for the Charleston Sanitary District was given by the Charleston Sanitary District. The 2003 population was estimated to be 3,780 based on a 2007 population of 3,900. At a 0.79% growth rate, the 2027 population is expected to be 4,570. All of the current population is served by Coos Bay.

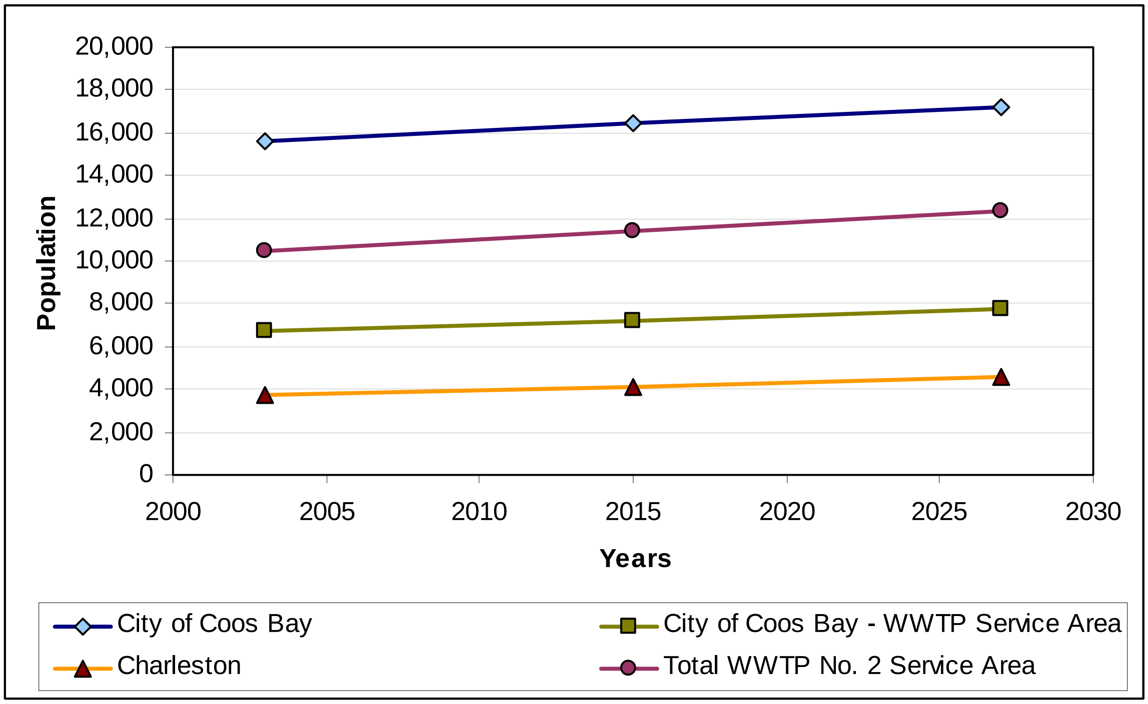
There are several subdivisions in various stages of development in Charleston and in the Wastewater Treatment Plant No. 2 service area. The total new construction could include nearly 2000 single-family dwellings. The schedule for development of dwellings is not currently known. Should all the units be constructed, the projected service area population for Wastewater Treatment Plant No. 2 would be realized sooner than 2027 and plant improvements would have to be constructed on an accelerated schedule.

Table 2-2 summarizes current and future population estimates for the City and the Wastewater Treatment Plant No. 2 service area including the Charleston Sanitary District. Figure 2-5 illustrates the expected population growth. These population projections are used later in the Facilities Plan to project 2027 flows and loads.

Table 2-2. City of Coos Bay and Wastewater Treatment Plant No. 2 Service Area Population Projections

	2003	2015	2027
City of Coos Bay	15,650	17,123	18,301
City of Coos Bay WWTP No. 2 Service Area	6,730	7,364	7,871
Charleston Sanitary District	3,780	4,150	4,570
Total WWTP No. 2 Service District	10,510	11,514	12,441

Figure 2-5. City of Coos Bay and Wastewater Treatment Plant No. 2 Service Area Population Projections



Land Use and Land Use Regulations

Land use in the City of Coos Bay and surrounding service areas consists of a typical mix of urban development including residential, commercial, industrial, and public land. Table 2-3 identifies the acreage within each of the primary land use categories for properties within the city limits and within the service areas of the city's wastewater treatment plants.

Table 2-3. Land Use Designations Within the Coos Bay City Limits and Surrounding Service Districts[1]

Land Use Category	Acreage			
	Within City Limits[2]	Bunker Hill	Charleston	Total
Developed Residential	800	362	732	1,894
Commercial	320		14	334
Industrial	70	33		103
Public and Semi-Public	540		4	544
Total Developed	1730	395	750	2,875
Vacant and Open	2160		474	2,634
Not Developable	3010	155	892	4,057
Total Area	6900	550	2,116	9,566

1. City limits include 3,561 acres in Coos Bay. This acreage is not included in the total land acreage.
2. Estimated from City mapping and City's Comprehensive Plan (2000)

Along with land inside the city limits there is an additional inventory of land within the urban growth boundary (UGB) that will become eligible for wastewater service upon annexation to the city. This land totals 81 acres and is currently unzoned. Upon annexation 66 acres would be served by WWTP No. 2 and 15 acres would be served by WWTP No. 1. Figure 2-6 illustrates these land use designations within the service area.

City Comprehensive Plan

The most recent Comprehensive Plan was completed in 2000. The document merged the previously developed Eastside Comprehensive Plan and Comprehensive Plan to provide an encompassing plan for the City. The City has subsequently developed a Transportation Master Plan which was financed and approved by the Department of Land Conservation and Development (DLCD). A growth rate of 0.4% for the area was developed in the Transportation Plan and has been adopted by the City and County.

City or County Zoning Ordinance

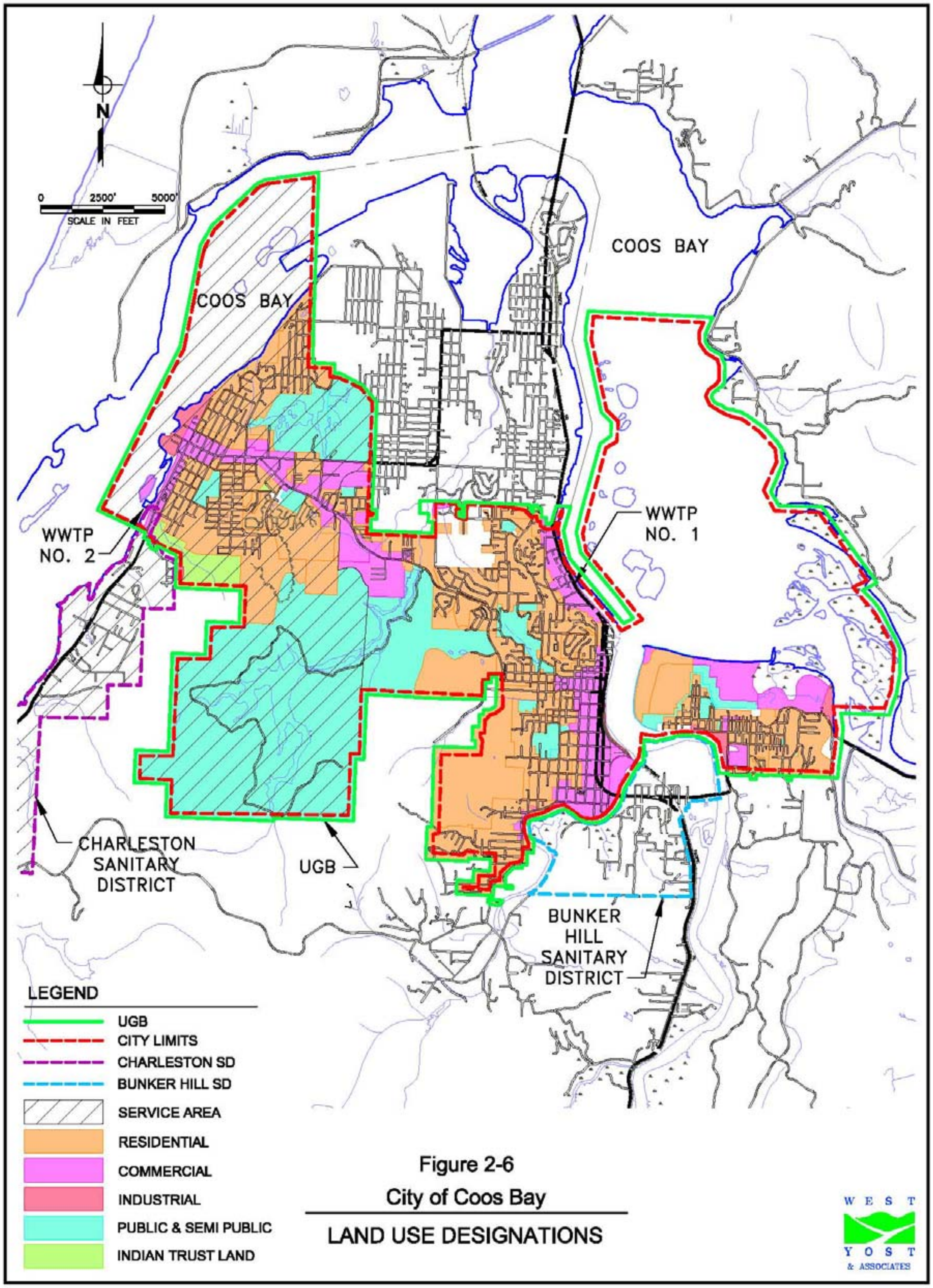
A high intensity utility use is allowed by 55-UD. However, the Land Development Ordinance (LDO) states that all uses are to be reviewed. Therefore, a review would be required when the plant is expanded. Because of the lack of impacts to the surrounding area, the review would probably be done administratively.

Intergovernmental Agreements

The City and Charleston Sanitary District hold reciprocal Intergovernmental Agreement (IGA) allowing residents of one jurisdiction to connect to the other jurisdictions sanitary system. The original 1974 Agreement with 1991 Amendments Section 13(c) remains in effect providing for wastewater treatment by the City of Coos Bay and repayment at an equitable rate. An IGA was executed in 2007 which will allow Charleston Sanitary District to collect wastewater treatment plant system development charges for new connections and remit to the City of Coos Bay.

The City also holds an IGA with North Bend allowing a handful of North Bend residences to discharge to the City while a similar number of Coos Bay residences discharge to North Bend. The arrangement is the result of topography which makes the interconnections the most reasonable approach to serving the residences.

Figure 2-6. City of Coos Bay Land Use Designations



CHAPTER 3

WASTEWATER COLLECTION SYSTEM

The collection system conveys wastewater from residential, commercial, and public users to the City's wastewater treatment facilities. Wastewater Treatment Plant No. 2 serves the City's west side and the Charleston Sanitary District. The City is responsible for operating and maintaining the collection system within the City's boundaries. The Charleston Sanitary District operates and maintains facilities within its service area. This chapter describes the existing collection system, and estimates the influence of infiltration and inflow (I/I) in the system.

SYSTEM DESCRIPTION

The City's collection system contributing to Wastewater Treatment Plant No. 2 consists of 114,200 ft of gravity sewers, 3,870 ft of force mains and four pump stations. The area is served by a separate storm drain system. The collection system generally flows south and west from the ridge in the central area of town toward the treatment plant. The existing collection system is shown in Figure 3-1.

Table 3-1 provides an inventory of pipes in the collection system according to size. The tables below include only public sewer piping sections and do not include sanitary service laterals or other private sewer systems.

Table 3-1. Coos Bay Collection System Inventory – Gravity Sewers

Pipe Diameter, inches	Pipe Material	Pipe Length, feet
4	ABS	790
6	Concrete, PVC, AC, Cast Iron	8,430
8	Concrete, AC PVC, B&S	84,100
10	Concrete, PVC, AC	11,630
12	Concrete	2,790
14	Concrete	1,510
15	Concrete	90
16	Concrete	2,710
18	Concrete	610
24	Concrete	560
30	Concrete	980
Total		114,200

The Charleston Sanitary District is located west of the treatment plant. It is described in detail in the Charleston Sanitary District Wastewater Collection System Master Plan (November, 1996).

Gravity Sewers

The gravity sewers are composed primarily made of PVC, concrete, and transite. Most of the system is 8-inch diameter pipe with some 6-inch pipe in the upper reaches of the system and 10-inch pipe in the lower elevations.

Manholes in the WWTP No. 2 gravity system vary in diameter, depth, age, and condition. The City has a rehabilitation program in place to repair manholes and gravity sewers in poor condition when identified to minimize inflow/infiltration.

Pump Stations

Four pump stations convey flow to Wastewater Treatment Plant No. 2 from the City. Run times for the pumps provide an indication of the ability of the pump stations to meet demand. A review of these run times indicates all pump stations have adequate capacity. Pump Station No. 7 logs the most run time, but during the wettest months can meet capacity. Records show that the maximum month run time for Pump Station 7 is one pump running continuously. Basic design data for the pump stations are shown in Table 3-2.

Figure 3-1. Wastewater Treatment Plant No. 2 Collection System

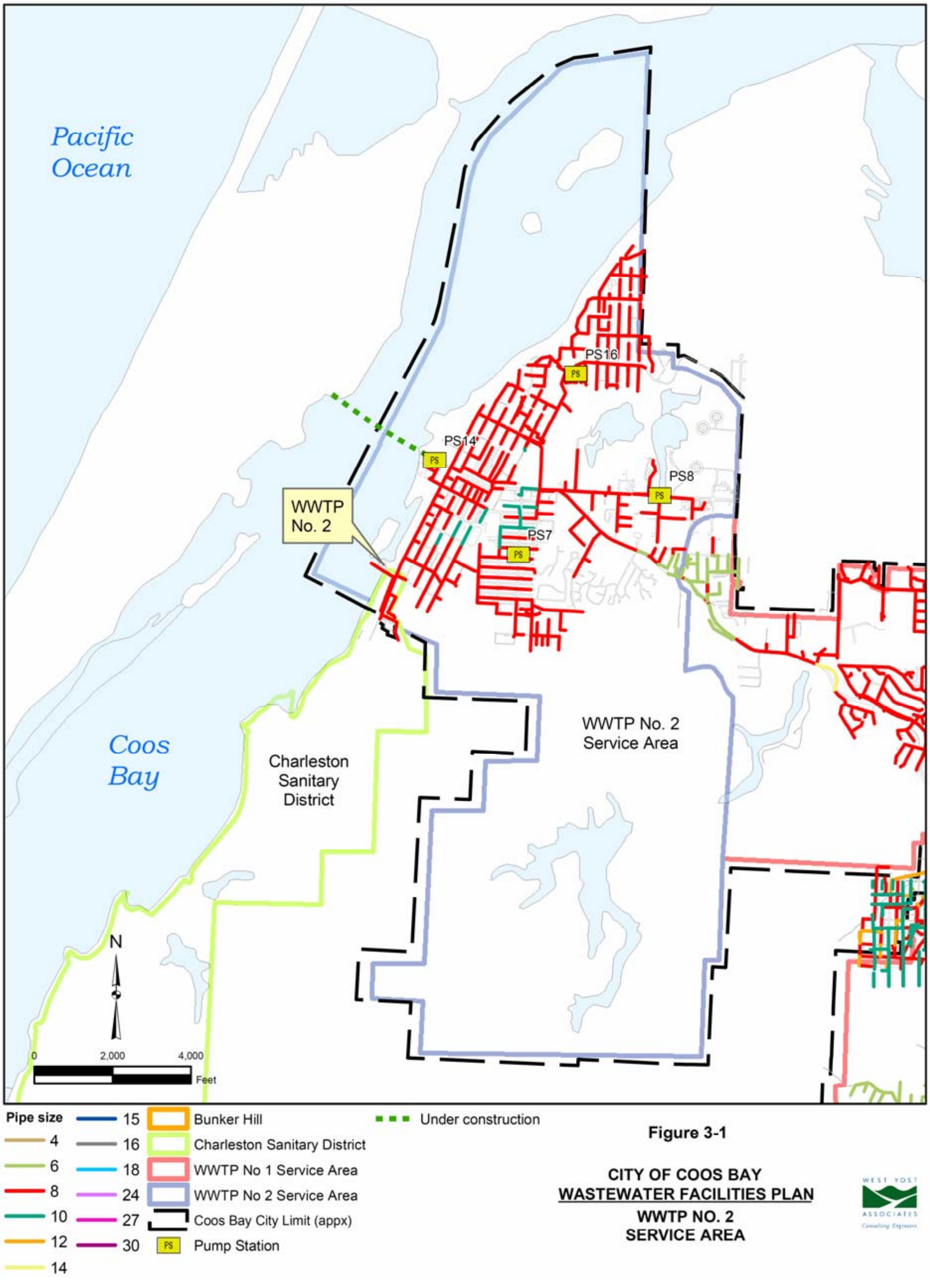


Table 3-2. Wastewater Treatment Plant No. 2 Collection System Pump Stations

Item	Pump Station 7	Pump Station 8	Pump Station 14	Pump Station 16
Location	421 Morrison Street	1812 Newmark Ave.	150 Mill Street	999 Lakeshore Dr.
Date Constructed	Originally constructed in the 50's. Upgraded in 2003.	Originally constructed in the 1956. Upgraded in 1975.	Originally constructed in 1971 and upgraded in 1992.	1978
Pumps				
Type	ITT Flygt Submersible Solids Handling.	Paco Model 495-11 vacuum-prime suction pumps.	ABS (Model AF60-8) submersible solids handling.	Hydromatic (Model 40MMP) self-priming suction pumps.
Number	2	2	2	2
Capacity, each, gpm	650 at 66 feet TDH	200 at 50 feet TDH	350 at 46 feet TDH	225 at 41 feet TDH
Firm Capacity, gpm	650	200	350	225
Horsepower, each	10	15	8	7.5
VFDs	None	None	None	None
Wetwell	Circular concrete wetwell.	Rectangular concrete wetwell below pump area; two level wetwell below main station.	Circular concrete wetwell.	Circular concrete wetwell below pump area.
Overflow point	Gravity overflow to Chicksees Creek and, ultimately to Coos Bay. Outfall number 002, discharge point to Coos Bay river mile 6.0.	Gravity overflow to storm drainage system and, ultimately to Coos Bay. Outfall number 003, discharge point to Coos Bay at river mile 6.0.	Gravity flow to Coos Bay. Outfall number 004; discharge point to Coos Bay river mile 5.25.	Gravity overflow to Chicksees Creek and, ultimately to Coos Bay. Outfall number 005, discharge point to Coos Bay river mile 6.0.
Time to Oveflow	N/A (dedicated generator)	N/A (dedicated generator)	N/A (dedicated generator)	N/A (dedicated generator)
Level Control	Multitrode with redundant floats.	Float	Float	Float
Standby Power	50 kW (240 V) Kohler Generator; diesel powered; fuel consumption measured at 4.1 gal/hr.	50 kW (480 V) Onan Generator; diesel powered; fuel consumption measured at 4.5 gal/hr.	None[1]	30 kW (240 V) Onan generator; diesel powered; fuel consumption measured at 3.1 gal/hr.

Table 3-2. Wastewater Treatment Plant No. 2 Collection System Pump Stations, cont'd...

Item	Pump Station 7	Pump Station 8	Pump Station 14	Pump Station 16
EPA Reliability Class	I	I	I	I
Forcemain				
Diameter, inches	6" PVC to discharge manhole.	4" asbestos cement (AC) to discharge manhole	6"	6" AC to discharge manhole.
Length, ft	565	750	246	340
Discharge Manhole	17CD-31	20AA	20BB-9	17DB-21
Location	Plant 2 Headworks	Pump Station 7	Plant 2 Headworks	Pump Station 7
Condition	Good. Fairly new (2003)	Needs improvement. **Building:** Flat roof has caused problems with leaks in the building and corrosion of metals in the system. **Controls/Autodialer:** Old autodialer system needs to be replaced to standardize to City's system. **Pumps:** Vacuum priming pumps are problematic. **Generator:** The generator is over 30 years old, therefore it is difficult to maintain and obtain replacement parts.	Good. **Standby Power:** A manual transfer switch and plug should be installed to allow a portable generator to provide power to the station. This would be preferred solution to trucking sewage during extended outages. **Site:** Enclosure for station and controls are not completely secure and could be accessed and damaged.	Needs improvement. **Building:** Flat roof has caused problems with leaks in the building and corrosion of metals in the system. **Controls/Autodialer:** Old autodialer system needs to be replaced to standardize to City's system. **Pumps:** Self priming pumps are problematic. Long history of maintenance and operation issues. **Generator:** Old generator, therefore it is difficult to maintain and obtain replacement parts.

[1]The Pump Station No. 14 does not have a generator to provide on-site and automatic standby power generation. It also does not have a generator connection or manual transfer switch. However, according to the Wastewater Collection System Master Plan completed by HBH Consulting Engineers in January 2006, the pump station service area is very small and the wetwell has the storage capacity to outlast most power outages before overflow becomes an issue. In an event of extended power outage, the City uses vac-trucks to empty the wetwell and provide additional storage time until power is restored.

CONDITION ASSESSMENT

Inspection of the City's collection system is done on an as-needed basis. Televised inspections are conducted on pipelines suspected of problems and repairs are made. The City has also conducted limited smoke testing. The sewers are cleaned on a rotating basis so that pipes are cleaned approximately every five years.

Infiltration is groundwater that enters the system from the surrounding soil through defective pipes, joints, or manholes. Inflow is stormwater that directly enters the system from sources such as illicit drainage connections, flooded manhole covers, roof downspouts, and other rain induced flow.

The City's NPDES permit does not require implementation of comprehensive infiltration and inflow (I/I) removal program. However, operating staff regularly monitors sources of I/I as part of regular sewer maintenance and cleaning.

INFILTRATION AND INFLOW ANALYSIS

Flows associated with I/I use some of the available capacity of the collection system. I/I is also an indicator of the condition of the system. High peak flows can signify system deterioration.

EPA Guidelines for Infiltration and Inflow

EPA guidelines for the evaluation of I/I flows in a wastewater collections system are based upon per capita flow rates. If the measured per capita flow rate of the collection system exceeds EPA guidelines (120 gallons per capita per day (gpcd)) during dry periods of high groundwater season, then the sources of infiltration in the collection system may warrant active management to reduce peak wet weather flows. The 120 gpcd flow rate includes domestic wastewater flow, infiltration, and nominal industrial and commercial flows. These regulations provide that no further I/I analysis work is necessary if the 120 gpcd guideline is not exceeded.

The EPA guideline for infiltration is based on a high groundwater dry weather flow rate defined as the highest 7-day average flow recorded over a seven to fourteen day period during high groundwater season. In Oregon, this condition occurs during the winter months when there is little or no precipitation for a continuous period of seven to fourteen days. For the population of 9,830 contributing to Wastewater Treatment Plant No. 2, the EPA guideline translates into a total system flow of 1.18 million gallons per day (mgd). The average high groundwater dry weather flow at the treatment plant is 0.97 mgd (99 gpcd) shows that there is minimal groundwater infiltration is contributing to the wastewater flow. This is likely due to the sandy soils that drain rapidly. During wintertime dry periods in the past five years, 7-day average flows range between 0.78 and 1.00 mgd as summarized in Table 3-3. None of these periods exceeded the EPA guideline of 1.18 mgd

Table 3-3. High Groundwater Dry Weather Flows

Period	7-Day Average Flow, mgd	7-Day Average Flow, gpcd	Total rainfall, inches
4/1/2000 - 4/11/2000	0.97	99	0
12/2/2000 - 12/10/2000	0.78	79	0
12/24/2000 – 12/31/2000	0.89	91	0
2/24/2002 – 3/4/2002	1.00	102	0
3/27/2002 – 4/9/2002	0.95	97	0
2/3/2003 – 2/13/2003	1.25	127	0
Average	0.97	99	0
EPA Guidelines	1.18	120	0

The EPA guideline for evaluating inflow is based on the highest daily flow recorded during a storm event. The EPA suggests that inflow problems may warrant attention if the measured high daily flow is greater than 275 gpcd. For Wastewater Treatment Plant 2, this results in a total system flow of 2.70 mgd. A review of plant records (Table 3-4) shows that the highest recorded daily flow was 3.54 mgd (360 gpcd) on December 13, 2003. The current peak day flow is estimated at 5.3 mgd (539 gpcd). Because EPA's I/I guidelines are exceeded, an analysis should be performed to determine if an I/I reduction program for the City is cost effective.

Table 3-4. Wastewater Treatment Plant No. 2 Peak Day Flows

Date	Flow, mgd	Flow, gpcd
12/13/03	3.54	360
12/15/02	3.36	342
1/6/02	3.02	307
12/30/02	2.98	303
EPA Guideline	2.7	275

COST EFFECTIVENESS ANALYSIS FOR I/I REMOVAL

Because the City's flows exceed EPA I/I guidelines, an analysis is performed to determine if I/I can be removed cost effectively. The following factors affect the analysis:

- Limited collection system flow monitoring has been conducted. The available flow monitoring data was not part of a coordinated, comprehensive monitoring effort. Therefore, the data does not pinpoint problem areas.
- Comprehensive potable water use information show that water usage rates are approximately the same as dry weather sewage flow rates, about 70-80 gpcd.

Estimation of I/I Contribution to Plant Flow

Municipal wastewater can be split into three components: sanitary wastewater, base infiltration, and rainfall dependent infiltration and inflow (RDI/I). Sanitary wastewater is the wastewater produced by residents and businesses in the service area. Base infiltration is the groundwater that leaks into the collection system during periods of no rainfall and low groundwater levels. RDI/I is normally defined as the flow associated with direct inflow of rainfall and snowmelt, and infiltration due to rainfall-induced high groundwater.

In order to determine the amount of I/I in the collection system, it is first necessary to estimate sanitary wastewater flows. The City experiences lowest flows during the summer months, when little or no precipitation occurs.

These conditions are most likely to occur during July through September. Table 3-5 lists flows and rainfall for recent summer months. Figure 3-2 presents a plot of the daily plant flow versus rainfall for the period of record. Based on this information, it appears that low summer flows range from 0.73 to 0.82 mgd. This is representative of the base sanitary wastewater flow.

Table 3-5. Summer Dry Weather Wastewater Flows

Month	Average Flow, mgd
July 1999	0.82
August 1999	0.78
September 1999	0.74
July 2000	0.78
August 2000	0.75
September 2000	0.73
July 2001	0.75
August 2001	0.74
September 2001	0.73
July 2002	0.79
August 2002	0.76
September 2002	0.75
July 2003	0.82
August 2003	0.78
September 2003	0.76
July 2004	0.83
August 2004	0.81
September 2004	0.86
July 2005	0.85
August 2005	0.82
September 2005	0.79

Figure 3-2 Daily Plant Influent Flow vs. Rainfall

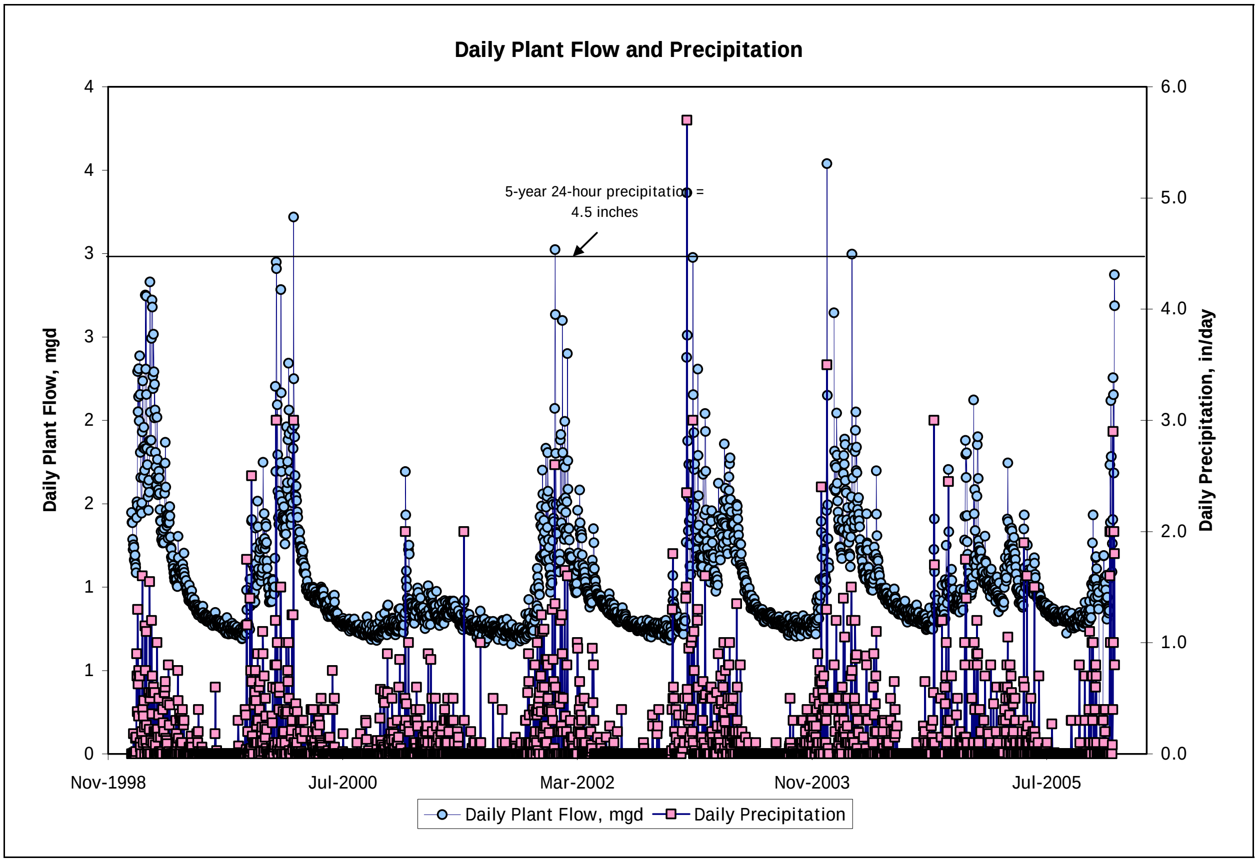


Table 3-6 lists winter wastewater flows for November through January when groundwater levels are low. These flows represent base sanitary and base infiltration flows and range from 0.86 to 1.58 mgd.

Table 3-6. Winter Low Groundwater Wastewater Flows

Month	Rainfall, inches/month	Average Flow, mgd
November 1999	11.4	1.06
December 1999	5.6	1.14
January 2000	14.5	1.58
November 2000	3.8	0.95
December 2000	5.0	0.86
January 2001	3.2	0.86
November 2001	8.0	0.90
December 2001	12.6	1.31
January 2002	13.6	1.57
November 2002	6.4	1.29
December 2002	21.2	1.38

Table 3-6. Winter Low Groundwater Wastewater Flows, cont'd...

Month	Rainfall, inches/month	Average Flow, mgd
January 2003	9.0	1.40
November 2003	2.4	0.92
December 2004	8.0	1.21
January 2005	6.0	1.24
November 2005	6.5	1.04
December 2005	17.0	1.34

Typical wastewater unit flow rates for a service area such as the City's are 80 to 100 gallons per capita per day (gpcd), including an allowance for commercial sources and Table 3-7 shows that actual rates of 74 – 83 gpcd are within this range. A base infiltration range of 0.20 to 0.80 mgd can be determined as the difference between the low wintertime flow and sanitary wastewater flow.

For an average annual flow of 1.0 mgd with largely residential sources and a small amount of commercial and industrial flow, the textbook sanitary wastewater peaking factor is 3.5 (*Wastewater Engineering*, Metcalf and Eddy, 3nd Edition, 1991). Applying this factor to the base sanitary flow range of 0.7 to 0.8 mgd gives a peak sanitary flow range of 2.5 to 2.8 mgd. RDI/I can be estimated as the difference between the peak wet weather flow (PWWF, or peak instantaneous flow) and the sum of the peak sanitary flow plus the base infiltration. The current PWWF is listed in Chapter 5 as 7.0 mgd; therefore, RDI/I can be estimated between 5.0 and 5.9 mgd. Wastewater flow component ranges are summarized in Table 3-7.

Table 3-7. Wastewater Flow Component Ranges

Item	Low End of Range	High End of Range
Low wintertime flow, mgd	0.9	1.6
Base sanitary flow, mgd	0.7	0.8
Base infiltration, mgd	0.2	0.8
Peak sanitary flow, mgd	2.5	2.8
RDI/I, mgd	4.3	3.4

Cost Effectiveness Analysis

The city of Coos Bay completed a *Collection System Master Plan* (HBH Consulting Engineers, 2006) which is a first step in characterizing the collection system. Through observation following a storm event the City has identified priority sewer lines and manholes on which to focus their efforts. It is believed these facilities contribute significant portions of I/I. Line replacement projects include the following:

- 8th & Underwood sanitary sewer line replacement.

- Kingwood canyon sanitary sewer line replacement.
- Date Avenue sanitary sewer line replacement.
- Michigan Avenue alley sanitary sewer line replacement.
- 5th Avenue sanitary sewer line replacement.
- Coos River Highway sewer line replacement.

Manhole replacement projects include the following:

- Priority 1: Basin R with special attention given to the pipeline and manholes along 12th Street Terrace, Commercial Avenue, and North 12th Street.
- Priority 2: Basin A with special attention given to the pipeline and manholes along west Howard Avenue, Fenwick Street and Virginia Avenue.
- Priority 3: Basin W with special attention given to the pipeline and manholes along Anderson Avenue and South 8th Street.
- Priority 4: Basin Y with special attention given to the pipeline and manholes along Lockhart Avenue from the western edge of the basin all the way to the eastern end at Y-7.
- Priority 5: Basin B with special attention given to the pipeline and manholes along Lakeshore Drive, Margaretta Street and Augustine Street.
- Priority 6: Basin D with special attention given to the pipeline and manholes along Harris Avenue and between manholes D-23 and D-35.
- Priority 7: Basin V with special attention given to the pipeline and manholes between manholes V-45 and V-28, along Donnelly Avenue and along South 6th Street.
- Priority 8: Basin G with special attention given to the pipeline and manholes along Norman Avenue, Schoneman Street and along Wallace Street between G-29 and G31.
- Priority 9: Basin N with special attention given to the pipeline and manholes between N-45 and N-51, between N-45 and N-47, and along 6th Street.
- Priority 10: Basin Z with special attention given to the pipeline and manholes between Z-1 and Z-9, and along West Lockhart Avenue.
- Priority 11: Basin GG with special attention given to the pipeline and manholes along E Street between GG-81 and GG-69, and along F Street.
- Priority 12: Basin F with special attention given to the pipeline and manholes between F-10 and F-42 and between F-12 and F-44.
- Priority 13: Basin P with special attention given to the pipeline and manholes between P-50 and P-30 along 14th Street and Koos Bay Boulevard.

A detailed cost effectiveness analysis would include the following steps:

- Determine peak inflow rates by subarea.
- Determine average and peak infiltration rates by subarea.

- Estimates of flows bypassed from the system including locations.
- Projected peak flow tributary to major transport components.
- Projected average and peak flow tributary to the treatment plant.
- Capacities of all major existing transport components and the treatment plant.
- Estimates of I/I reduction levels and costs by subarea.

The cost effectiveness analysis would result in an approach that defines the level of I/I removal in collection system that is cost effective to remove. Because many cities find I/I removal efforts to be expensive with little return on investment, cities often find that transporting the flow to treatment is most economical. For example, the service area for Treatment Plant No. 2 is 1650 acres including Charleston Service District to give an I/I rate of 3600 gpad. If the collection system was completely rehabilitated, including service lateral replacement, the peak I/I would be reduced to that of a well-constructed system or 1500 gpad. Further assuming a range of cost for comprehensive collection system rehabilitation in a residential area to be $20,000 to 45,000/acre, the unit cost for I/I reduction would be $9 to $12/gallon removed.

The wastewater treatment facilities impacted by the high peak flows at WWTP No. 2 are the influent pumping and headworks, intermediate pumping, secondary clarification and chlorine contact basin. The cost of improvements to the influent pump station includes moving the pump station to improve accessibility. Therefore the estimated cost of the treatment plant improvements strictly associated with increasing treatment plant capacity is $6.5 million including engineering and contingencies. Therefore, if peak I/I were reduced by 6.0 mgd through collection system rehabilitation, treatment plant expansion costs would be reduced by $6.5 million or put another way, it costs $1/gallon to treat peak I/I. Therefore, it appears to be more cost effective to treat rather than to remove the flow.

It appears that the cost for rehabilitation that would be required to reduce peak flows would be much higher than the cost for providing the required treatment capacity. Upon completion of a more detailed analysis, the City's effort to remove I/I should reflect the most cost effective approach for the ratepayers.

CAPACITY ASSURANCE, MANAGEMENT, OPERATION AND MAINTENANCE (CMOM)

Proper operation and maintenance of sanitary sewer systems is vital to protect public health, property, and waterways. While the EPA has no plans to implement CMOM in the near future, the EPA may propose a new rule in the future to support sanitary sewer overflow (SSO) control. The objectives of CMOM are briefly described below:

- Address capacity, management, operation and maintenance requirements for municipal sanitary sewer collection systems.
- Minimizes SSOs.
- Establish requirements for reporting, public notification, and record keeping for discharges from municipal sanitary sewer system.

Conforming to the above-proposed rules will help the City to upgrade its wastewater collection system and potentially reduce SSOs. More specifically, CMOM will require the City to:

- Establish general performance standards. A CMOM program will ensure that the collection system can collect and transport all base and appropriate peak flows to the City's treatment facility and, develop a procedure for notifying those who could be affected by SSO.
- Implement a management program. A management program should address the program goals; identify administrative and maintenance personnel responsible for implementing the CMOM program; establish legal authority through collection system use ordinances, service agreements, or other legally binding documents to manage flow effectively; identify existing system deficiencies and appropriately design performance requirements; and monitor the progress of the CMOM program.
- Create an Overflow Response Plan (ORP). An ORP should be designed to provide quick response to SSOs and notify all affected parties (public, media, NPDES authority, and water supply utilities) of such occurrences.
- System Evaluations and Capacity Assurance Plan (SECAP). SECAP will identify deficient parts of the collection system and prioritize maintenance programs to assure that the collection system has sufficient capacity.
- Submit to periodic audits of the CMOM program. CMOM will require regular, comprehensive audits, done by the City's personnel. These audits will help identify non-compliance of CMOM regulations so problems can be addressed quickly. All findings, proposed corrective actions, and upcoming improvements, should be documented in the audit report.

The WWTP No. 2 service area experiences overflows at the last manhole upstream of the treatment plant.

CONCLUSIONS

While it is likely that a comprehensive program to remove I/I would not be cost effective, the City should nevertheless implement a program of I/I identification and removal as part of their overall maintenance program. The following program elements are recommended:

- Appropriate flow monitoring in areas with suspected high I/I.
- Systematic sewer televising to identify problem areas.
- A user-friendly collection system maintenance management program that provides a comprehensive database of the system; provides locations and descriptions of I/I sources and structural defects; and helps with work orders, customer complaint tracking, and generates system management.
- Repair of structural defects and leaks as part of a program to reduce significant quantities of infiltration.
- Elimination of significant inflow sources.

CHAPTER 4

EXISTING WASTEWATER TREATMENT FACILITIES

A review of the City of Coos Bay's existing wastewater treatment facilities forms the framework for the development of a long-term plant upgrade strategy. Analysis of historical plant operating data can reveal any ongoing performance deficiencies. Identification of the design capacity of each existing unit process can indicate the need to expand facilities when compared to the projections of future flows and loads. In addition, the existing facilities information allows for the determination of how new facilities can be best integrated into the system to meet long-term upgrade requirements.

TREATMENT PLANT DESCRIPTION

Coos Bay Wastewater Treatment Plant (WWTP) No. 2 is owned by the City of Coos Bay and managed and operated by Operations Management International, Inc. (OMI). Located in the southwest corner of the City on Fulton Avenue, the plant serves the West Side of Coos Bay and the Charleston Sanitary District. It has been in service since 1973 and was upgraded in 1990 to meet National Pollutant Discharge Elimination System (NPDES) permit requirements. At that time a new headworks and a second secondary clarifier were added to the plant. Other plant processes include an influent pumping, primary clarification, activated sludge secondary treatment, secondary clarification, disinfection, dechlorination and anaerobic digestion of sludge.

The existing layout of Wastewater Treatment Plant No. 2 is shown in Figure 4-1. The site is bordered by Highway 240 to the east and Coos Bay to the west. On the north and south there is currently undeveloped land that is zoned commercial.

Figure 4-2 shows a flow schematic of Wastewater Treatment Plant No. 2 and Figure 4-3 presents the hydraulic profile. Table 4-1 summarizes the existing plant data. Treatment processes are described below.

Figure 4-1. Treatment Plant No. 2 Plant Layout

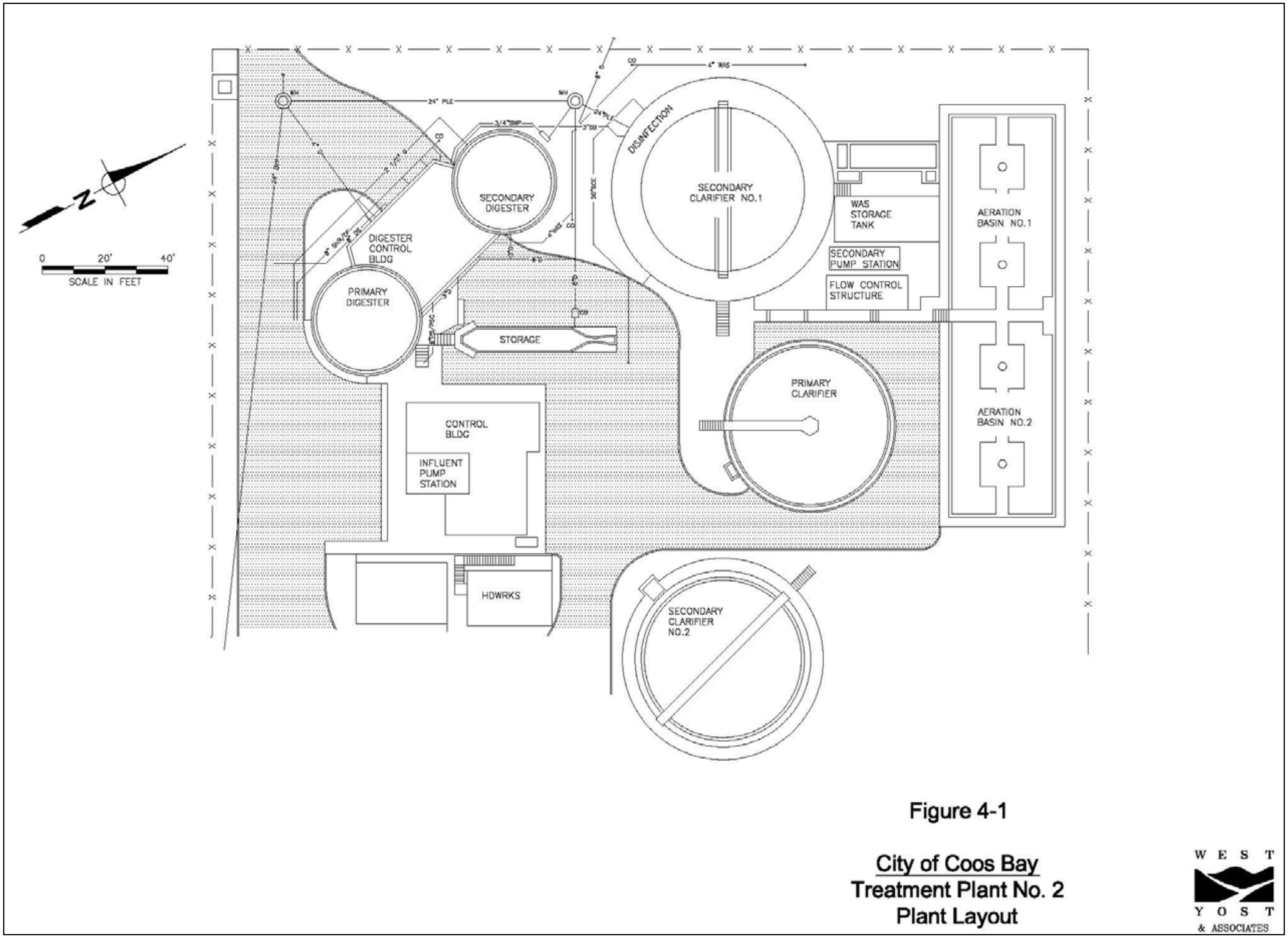


Figure 4-2. Plant 2 Facilities Plan

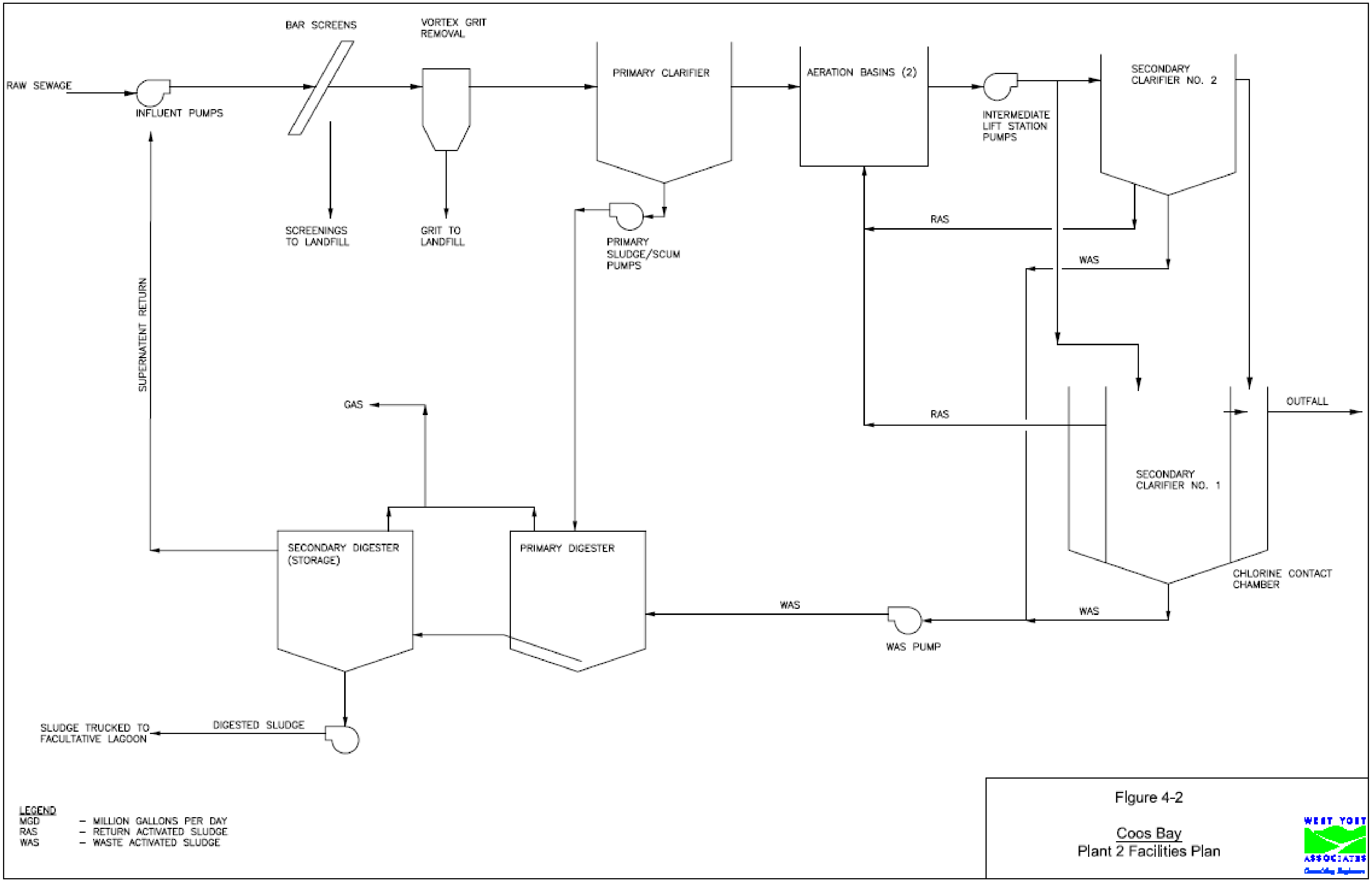


Figure 4-3. Hydraulic Profile

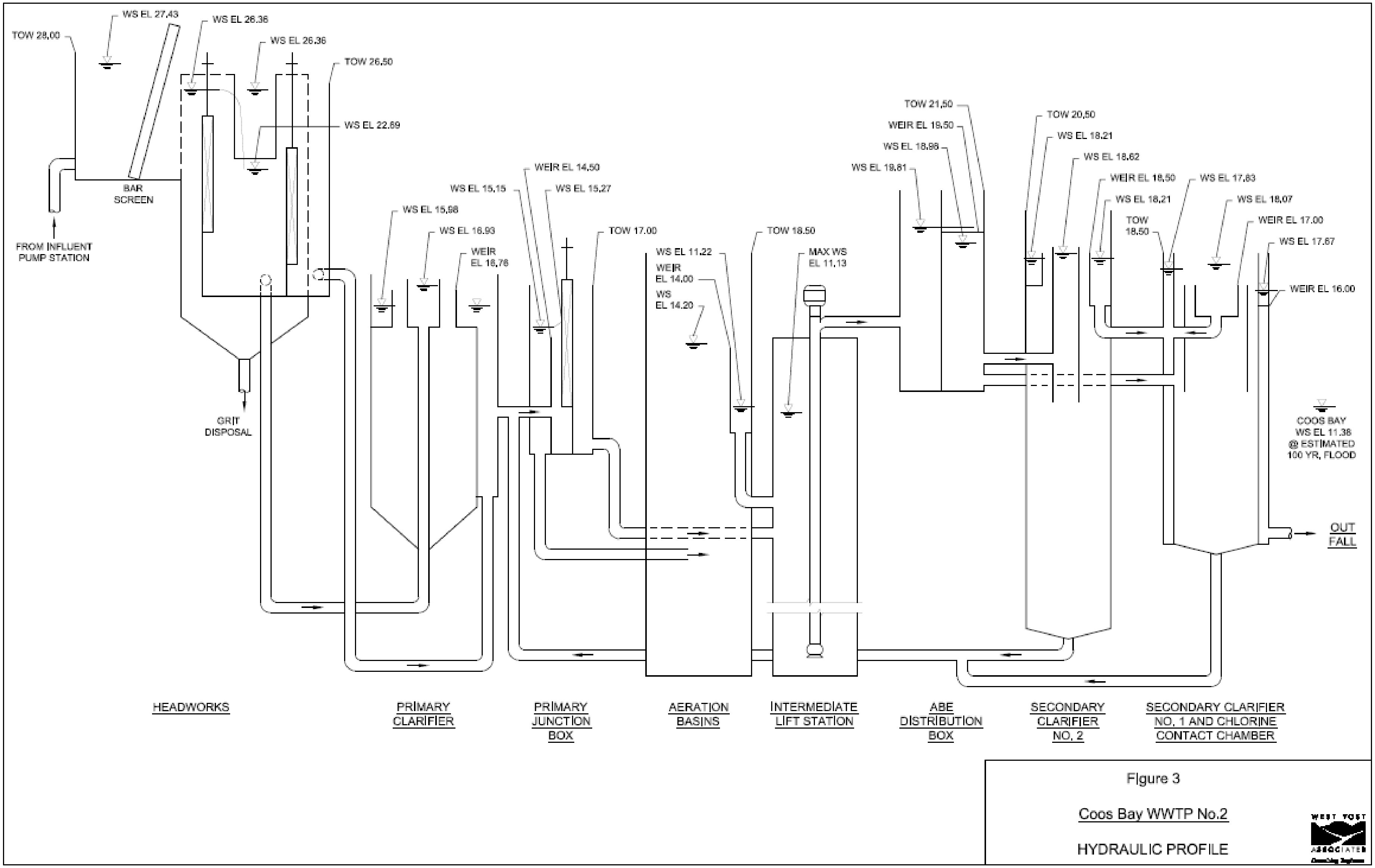


Table 4-1. Design Data for the Existing Wastewater Treatment Plant No. 2

Description	Value
GENERAL DESIGN CRITERIA	
Design Flows, mgd	
Average Dry Weather Flow (ADWF)	1.0
Average Wet Weather Flow (AWWF)	1.4
Maximum Month Dry Weather Flow (MMDWF)	1.2
Maximum Month Wet Weather Flow (MMWWF)	1.7
Maximum Day Flow (MDF)	3.2
Peak Wet Weather Flow (PWWF)	4.8
Design Loadings, lbs/day	
BOD Loading	
Average Day	2,595
Maximum Month	3,373
Suspended Solids Loading, lbs/day	
Average Day	2,595
Maximum Month	3,503
INFLUENT PUMPING	
Number of pumps Typ	3
Capacity, each, gpm	1 @ 1200
	2 @ 1700
Type	Nonclog centrifugal
Drive	Variable speed
HP	1@ 15
	2 @ 20
FLOW MEASUREMENT	
Type	Magnetic Meter
PRELIMINARY TREATMENT	
Mechanical Bar Screen	
Number	1
Type	Back Cleaned
Bar Spacing, in	5/8
Manual Bar Screen	
Number	1
Bar Spacing, in	1¼

Table 4-1. Design Data for the Existing Wastewater Treatment Plant No. 2, cont'd...

Description	Value
Grit Removal	
Number	1
Type	Gravity vortex
Peak Capacity, mgd	4.8
PRIMARY TREATMENT	
Primary Sedimentation Basin	
Number	1
Diameter, ft	50
Sidewater Depth, ft	8.5
Overflow rate, gpd/sf	
ADWF	509
PWWF	2,445
Primary Sludge/Scum Pumps	
Number	2
Type	Piston
Capacity, each, gpm	75
SECONDARY TREATMENT	
Aeration Basins	
Number	2
Width, ft	32
Length, ft	60
Sidewater Depth, ft	14
Volume, each, gal	202,000
MLSS, mg/l	1,300
Operational Mode	Complete Mix
Aerators	
Number	4
Type	Surface, low speed
Horsepower, each	15
Intermediate Lift Station	
Number of pumps	3
Type	Submersible
Capacity, each, gpm	2,000
HP	20
Drive type	Variable speed

Table 4-1. Design Data for the Existing Wastewater Treatment Plant No. 2, cont'd...

Description	Value
Secondary Clarifiers	
Clarifier 1	
Diameter, ft	52
Sidewater Depth, ft	11.5
Clarifier 2	
Diameter, ft	56
Sidewater Depth, ft	13.5
Overflow Rate, gpd/sf	
ADWF	218
PWWF	1,047
WAS Pumps	
Number of pumps	1
Type	Submersible
Capacity, gpm	150
Drive	Variable Speed
WAS Storage Pit	
Volume, gal	28,300
WAS Auxiliary Storage Tank	
Volume, gal	9,750
WAS Thickener	
Number	1
Type	Rotary Drum Screen
Capacity, gpm	150
CHLORINATION AND DECHLORINATION	
Chlorination Facilities	
Type	Sodium Hypochlorite
Contact Tank	
Number	1
Volume, gal	116,000
Hydraulic detention time, minutes	
ADWF	167
PWWF	34
Sodium Hypochlorite Storage Tanks	
Number	3

Table 4-1. Design Data for the Existing Wastewater Treatment Plant No. 2, cont'd...

Description	Value
Total Storage Volume, gal	2,550
Flash Mixer	
Horsepower	3
Velocity gradient, fps/ft	900
Feed pumps	
Number	2
Type	Diaphragm
Capacity, each, gph	20
Dechlorination Facilities	
Type	Sodium bisulfite
Sodium Bisulfite Storage Tanks	
Number	2
Total Storage Volume, gal	2900
Metering Pumps	
Number	2
Type	Diaphragm
Capacity, each, gph	4
OUTFALL	
Length, ft	1,826
Diameter, inches	24
Number of Diffusers	5
Outfall Pipe Material	Concrete
Discharge Point	Coos Bay at River Mile 3.8
ANAEROBIC DIGESTION	
Primary Digester	
Number	1
Diameter, ft	32
Depth, ft	17
Volumetric Loading, lb VSS/cf/day	
Average Month	0.13
Maximum Month	0.19
Average Hydraulic Detention Time at 6% solids, days	16
Mixer	
Type	Screw Impeller

Table 4-1. Design Data for the Existing Wastewater Treatment Plant No. 2, cont'd...

Description	Value
HP	5
Secondary Digester	
Number	1
Diameter, ft	30
Depth, ft	16.5
Average Storage Capacity at 8% solids, days	41
Digested Sludge/Recirculation Pump	
Number	1
HP	5
UTILITIES	
Nonpotable Water Pumps	
Number	2
Type	Centrifugal
Capacity, each, gpm	30
Emergency Generator	
Size, kW	200
Fuel	Diesel

RELIABILITY/REDUNDANCY CRITERIA

Reliability/redundancy criteria were developed for the major unit processes at the Coos Bay WWTP No. 2. System reliability and redundancy classifications and requirements for wastewater facilities were established by the EPA and are described in the EPA's Technical Bulletin "Design Criteria for Mechanical, Electric, and Fluid System and Component Reliability" EPA (430-99-74-001). These requirements are intended to maintain a minimum level of treatment if there is a failure of a process component. The Coos Bay WWTP No. 2 is a Class I facility as defined in the EPA criteria because its discharge:

1. Is into public water supply, shellfish, or primary contact recreation waters, or
2. As a result of its volume and/or character, could permanently or unacceptably damage or affect the receiving waters or public health if normal operations were interrupted.

The criteria for reliability/redundancy applicable to the Coos Bay No. 2 WWTP and the design features that address these criteria are summarized in Table 4-2.

Table 4-2. Process Reliability/Redundancy Criteria

Process	EPA Requirements[1]	Coos Bay WWTP No. 2 Design
INFLUENT PUMP STATION		
	Parallel pumps with ability to pump maximum day flow with single largest unit out of service, and peak wet weather flow with all units in service.	Parallel pumps with ability to pump maximum day flow with single largest unit out of service, and peak wet weather flow as defined in the plant design criteria with all units in service.
PRELIMINARY TREATMENT		
Screening System	At least two screens must be provided. WWTPs with only two bar screens must have one bar screen designed to permit manual cleaning.	Parallel screens sized to pass peak wet weather flow with all units in service.
Grit Removal System	Where a single grit removal unit is utilized, a bypass must be provided.	One grit basin sized to pass the peak wet weather flow is provided with a bypass channel.
PRIMARY TREATMENT		
Primary Clarifiers	Parallel clarifiers designed for maximum month wet weather flow with all units in service. Redundant clarifier provided for maximum month dry weather flow.	Single clarifier is designed for peak wet weather flow.
Primary Sludge/Scum Pumps	Parallel pumps with ability to pump maximum sludge load with single largest unit out of service.	Parallel pumps with ability to pump maximum sludge load with single largest unit out of service.
SECONDARY TREATMENT		
Aeration Basins	At least two equal volume basins shall be provided.	Two equal volume basins are provided to treat the primary effluent flow.
Aeration Blowers/Mechanical Aerators	There shall be a sufficient number of mechanical aerators to enable the design oxygen transfer to be maintained with the largest capacity unit out of service. The backup unit may be uninstalled, provided that the installed unit can be easily removed and replaced. At least two units shall be installed.	Two installed surface aerators per basin are provided.
Secondary Clarifiers	There must be at least two units designed so that, with the largest capacity unit out of service, the remaining unit(s) can handle at least 75% of the design flow.	Two clarifiers designed to handle peak wet weather flow with all units in service. The small clarifier alone can handle 2.2 mgd at peak overflow rate.

Table 4-2. Process Reliability/Redundancy Criteria, cont'd...

Process	EPA Requirements[1]	Coos Bay WWTP No. 2 Design
DISINFECTION		
Chlorine Contact Basins	The basins shall be sized such that with the largest flow capacity unit out of service, the remaining units shall have a design flow capacity of at least 50 percent of the total design flow to that unit operation.	One basin with a minimum contact time of 30 minutes during peak wet weather flow conditions is provided. During average conditions, a portion of the basin can be taken out for service for maintenance.
SOLIDS TREATMENT		
Anaerobic Digestion	At least two digestion tanks shall be provided.	Two digesters are provided. One digester is used for storage.
Biosolids Storage	Biosolids Storage	Designed for 6 months wet weather storage

Notes:

1. "Design Criteria for Mechanical, Electric, and Fluid System and Component Reliability" EPA Technical Bulletin No. 430-99-74-001.

TREATMENT PROCESS DESCRIPTION

Influent Pumping Station

Wastewater Treatment Plant No. 2 has a design peak flow of 4.8 mgd. Three influent non-clog, variable speed, centrifugal pumps with a firm capacity of 4.2 mgd are used to deliver raw sewage to the headworks. A temporary submersible pump has been placed in the wet well to help with peak demands. The temporary submersible influent pump connects to the raw sewage line upstream of the meter and pumps into the manual bar screens, so its flow is not measured.

Influent Pump Station

Influent flow is measured with a magnetic flow meter. Influent pump discharge piping has recently been modified so that flow through the both the permanent and temporary pump is metered. The flow meter has been calibrated.

Operators report that the pumps regularly clog with rags if their speed is less than about 80% of maximum. The layout of the influent pump station is cumbersome for maintenance and removing pumps. The dry well is located below the floor of the lab. There are removable plates in the floor of the lab through which a davit and wench is used. There is no in-place hoist for lifting pumps.

Headworks

The headworks were constructed in 1990 and consist of a mechanical bar screen and a vortex grit removal unit. The screen is a back-cleaned type screen. Accumulated material is collected in a screenings container and discharged to a dumpster for land fill disposal. Operators report that during high flows, material passes through the screen to the primary clarifier. The screens flood during high flows due to capacity limitations of the downstream grit removal unit.

Headworks

Grit Removal

Following screening, the wastewater flows into a single 80-foot diameter vortex grit removal unit. Flows above 4.8 mgd bypass the unit. The grit removed from this unit is discharged to a dumpster which is hauled to the headworks at WWTP No. 1 where it is introduced into the aerated grit chamber. The operations personnel report poor performance of the grit removal unit at both low and high flows. It is typical that vortex grit removal units operate most efficiently over a narrow band of flow and less efficiently at the flow extremes.

It is recommended that the grit removal unit be further inspected to determine the actual cause of poor performance. At the minimum, the maintenance personnel should verify that the submerged paddles are in place and the hopper plates are still in proper position.

It also suggested that the City perform corrosion inspection of air line and plumbing valves. Corrosion could be caused by a number of reasons including: incompatible materials, loss of protective coatings, excessive moisture, saline environment, and corrosive gases.

Primary Treatment

The circular primary clarifier is 50-feet in diameter and has an 8.5-foot side water depth. The clarifier configuration consists of a center-feed well with perimeter overflow weirs and hopper bottom. The clarifier mechanism draws sludge into a central pit where suction lines draw off the primary sludge and convey it to the primary digesters. Primary effluent flows by gravity to the aeration basin for secondary treatment. Primary sludge and, scum are pumped to the digesters. Operators report that the primary clarifier sweeps are corroded.

Primary Sedimentation Basin

Activated Sludge

There are two aeration basins, each with a volume of 202,000 gallons. Each basin is equipped with two low speed mechanical surface aerators. The basins are operated in a complete mix mode. The aerators are equipped with variable speed drives. Operators report that the aerators are inadequate, as it is not possible to maintain dissolved oxygen (DO) concentrations above 0.5 mg/l in the basins during summer months.

Aeration Basin

Secondary Clarification

The Coos Bay WWTP No. 2 has two secondary clarifiers – one larger 56-foot diameter tank and a smaller 52-foot diameter tank. The clarifier configuration consists of a hopper bottom, center-feed well with perimeter overflow weirs. Mixed liquor from the aeration basins is transferred to two secondary clarifiers via the intermediate lift station and flow control structure that splits the flow to the clarifiers. Operators report that the small clarifier does not have adequate capacity to operate alone, so the large clarifier cannot be taken out of service. They also report that the drain valves in both clarifiers have seized over time and

Secondary Clarifier

are no longer operable so neither clarifier can be dewatered except by temporary pumps.

Waste activated sludge is sent to the anaerobic digesters via the waste activated sludge (WAS) pump station. WAS is pumped on a timer with a set point controller that will shut down the pumps at a preset daily limit. Since WAS concentrations fluctuate widely, digester loading is inconsistent. The operators sample total suspended solids (TSS) and adjust operation as necessary.

Return activated sludge (RAS) is directed back to the aeration basins by gravity. The flow rate is controlled by throttling valves, which are operated manually. Automatic control is provided and is based on a percentage of influent plant flow; however, spikes in influent flow occur when pumps from the Charleston Sanitary District collection system operate making automatic operation of the RAS system challenging.

At high flows, the amount of RAS returned is limited by the gravity flow hydraulics. In addition, there is no access for RAS sampling.

Chlorination/Dechlorination

Chlorine, in the form of sodium hypochlorite, is added to the treated effluent from the secondary clarifiers with a diaphragm pump and mixed using a flash mixer. The contact basin is a covered exterior ring around the small secondary clarifier. The hydraulic detention time in the contact basin at peak wet weather flow of 4.8 mgd is 34 minutes.

Sodium bisulfite dechlorination facilities were constructed in 2004 and consist of two storage tanks with spill containment; and metering, feed and mixing equipment. The bisulfite is injected at the chlorine contact basin overflow weir. The effluent is sampled for chlorine residual in a manhole prior to discharge into Coos Bay.

Outfall

Treated effluent is discharged to Coos Bay at River Mile 3.8. The outfall is a 24-inch lined and coated concrete pipe and is equipped with 5 diffuser ports spaced at 7.5 feet apart. The total length of the outfall is 1,826 feet and the end is marked with a timber pylon.

Anaerobic Digestion

Wastewater Treatment Plant No. 2 has one fixed cover 32-foot diameter primary and one floating cover 30-foot diameter secondary digester with 17 feet and 16.5 feet side water depth, respectively. The primary digester is mechanically mixed. The secondary digester is used for storage and is neither mixed nor heated.

Anaerobic Digesters

While the digesters themselves are in relatively good condition, the cover on the primary digester is cracked and the roof of the digester control building and the piping in it is in poor condition.

The digester roofs drain into the vault between the digesters. The drain lines are in bad shape and regularly flood the control room. There is no access in the side of the primary digester for cleaning. The boiler is reaching the end of its useful life. There is no fire escape in the upstairs digester building room.

The waste gas burner has almost never been used due to a lack of drainage in the gas line and the flare being regularly extinguished by ocean spray. Since its construction some corrosion has occurred.

Biosolids Storage

Digested sludge is trucked to the facultative sludge lagoon on the east side of town where it is combined with digested sludge from Wastewater Treatment Plant No. 1 for storage.

The bentonite clay-lined lagoon has a surface area of approximately 4 acres and is 11 feet deep and contains two inlet ports. The supernatant from the lagoon is aerated and pumped into the City sewer system for return to Wastewater Treatment Plant No 1.

A floating dredge removes the sludge, which is land applied to approximately 250 acres of private farmlands and forest sites between June and October each year.

Plant Utilities

The treatment plant has the following utility systems:

- **Non-potable Water (NPW) Pumps**. The plant is equipped with two 30-gpm NPW pumps.
- **Standby Power**. The standby generator is nearly 30 years old and is not reliable. It is equipped with an automatic transfer switch and is used five to six times per year

UNIT PROCESS CAPACITY

The capacities of each unit process were estimated based on calculation and information available in operating manuals and are summarized in Table 4-3.

The following sections provide additional information on the capacity evaluation for each unit process.

Influent Pumping Station

Pump stations are rated according to their firm capacity, which is the capacity of the station with the largest pump out of service. With two of the three installed pumps operating the firm capacity of the station is 4.2 mgd.

Bar Screen

The headworks include one mechanical bar screen and one manual bar screen. The capacity of the screen is typically calculated based on the mechanical bar screen only with the manual bar screen reserved for back-up service. The manual bar screen has wider bar spacing which allows more debris into downstream processes and is therefore only used when the mechanical bar screen must be bypassed.

The mechanical bar screen is rated at 4.8 mgd according to design drawings. At 4.8 mgd, the velocity through the bars assuming 35% blinding is calculated to be approximately 4.3 feet per second and the headloss is estimated at 0.35 feet. The recommended velocity range is 1 to 4 feet per second. Therefore, at peak flow, the screen's effectiveness is reduced. However, under these conditions the raw sewage is dilute so the higher velocities are allowable for brief periods. The headloss through the screen is such that the water level is well below the operating floor upstream of the screen at peak flow.

Vortex Grit Unit

The vortex grit unit removes grit by gravity. The force is a function of the velocity or flow through the unit. The unit is rated at 4 mgd. Flow above this point will cause the velocity to exceed the effective range of the unit and the efficacy of the unit will be reduced.

Primary Sedimentation

The primary sedimentation tank capacity is based on the surface overflow rate. Using the criteria listed in Table 4-2, the capacity of the sedimentation tank is 4.9 mgd. The overflow rate at the rated capacity is 2500 gpd/sf/d.

Table 4-3. Unit Process Capacity Summary

Unit Process	Basis of Capacity	Design Criteria	Firm Capacity	Total Capacity	Power Demand
Influent Pump Station	Peak Wet Weather Flow (PWWF)[1]	Firm Capacity	4.2 mgd	6.6 mgd	55 hp
Bar Screen	PWWF	Screen Headloss	4.8 mgd	9.6 mgd	1.5 hp
Vortex Grit Removal	PWWF		4.2 mgd	4.2 mgd + bypass channel	—
Primary Sedimentation	Peak Day Flow (PDF)	2500 gpd/sf	—	4.9 mgd	15 hp
Aeration Basins	SRT at Max Month Load HRT at Max Month Flow	4 days SRT 4 hours HRT	870 lb BOD/day[2] 1.2 mgd	1740 lb BOD/day[2] 2.4 mgd	—
Aeration System	BOD loading	1.1 lb O_2/lb BOD 2.5 lb O_2/hp-hr	1875 lb/BOD/day[3]	2500 lb BOD/day[3]	60 hp
Intermediate Pumping	PWWF	Firm Capacity	5.4 mgd	8.1	60 hp
Secondary Clarification	PDF	1200 gal/sf/d	2.2 mgd	5.5 mgd	12 hp
Chlorine Contact Basin	PWWF	15 minutes	5.5 mgd	11 mgd	3 hp
Outfall	PWWF	100 year flood elevation of 11.38	N/A	9 mgd	—
RAS Pumping	25% PWWF	Firm Capacity		N/A	N/A
Anaerobic Digestion	Hydraulic Detention Time at Annual Average Loading	15 days	—	6100 gallons/day	5 hp
Sludge Lagoon	Average Organic Loading, lbVSS/ksf//day	20 lb VSS/ksf/day		3500 lb/day VSS/day	3500 lb/day

1. PWWF is defined as the highest flow at the plant sustained for one hour. Also referred as peak hour flow (PHF).
2. Influent BOD.
3. BOD loading to aeration basins with MLSS concentration 1,300 mg/l.

Aeration Basins

Aeration basins that treat municipal wastewater are typically based on solids retention time (SRT) and to a lesser extent, hydraulic retention time (HRT). To maintain an SRT of 4 days at mixed liquor suspended solids (MLSS) concentration of 1300 milligrams per liter (mg/l), the influent BOD load to the aeration basins should be approximately 1,220 lbs/day. The actual annual average primary effluent BOD load for 2005 was 1,260 lbs/day.

HRT is a secondary design criterion that serves as a check of SRT. In general, a 4-hour HRT at maximum month flow is considered reasonable. The aeration basins could accommodate a maximum month flow of 2.4 mgd with an HRT of 4 hours.

Aeration System

The capacity of the aeration equipment is based on the estimated oxygen transfer rate and the oxygen requirements of the wastewater. Also, since the capacity should be based on the firm capacity of the aeration equipment, the calculation assumes that only three of the four aerators are in operation. Based on an oxygen transfer rate of 2.5 pounds of oxygen per horsepower hour and oxygen requirements of 1.1 pounds of oxygen per pound of BOD, the aeration equipment capacity is 2500 lbs per day of BOD.

Intermediate Pumping

The intermediate pumps lift flow from the aeration basins to the secondary clarifiers. The firm capacity of the intermediate pumping station is 5.7 mgd.

Secondary Clarification

The surface overflow rate at the maximum flow condition is typically the criteria considered for secondary clarifier capacity. The typical criteria are 1200 gpd/sf. Above this overflow rate, performance will begin to decline. At 4.8 mgd, the rated maximum flow to the secondary treatment system, the overflow rate of the secondary clarifiers is 1050 gpd/sf. At 1200 gpd/sf, the capacity is 5.5 mgd.

Chlorine Contact Basin

The capacity of the chlorine contact basin is based upon hydraulic detention time to achieve acceptable disinfection. A minimum hydraulic retention time of 30 minutes is used for designing and evaluating chlorine contact basins. At the rated peak capacity of 4.8 mgd, the detention time is 34 minutes. At a 30-minute detention time, the PWWF capacity for the chlorine contact basin is 5.5 mgd.

Outfall

The outfall is a 27-inch diameter concrete pipe that discharges into Coos Bay. The calculated outfall capacity under 100-year flood conditions is approximately 9 mgd.

Anaerobic Digestion

The capacity of the anaerobic digestion facilities was evaluated based on solids retention time criteria. The EPA 503 regulations require a solids retention time of 15 days at 35 deg C to 55 deg C for Class B biosolids. The digesters were designed to provide 16 days of detention at 6% solids. Using the capacity of the primary digester, the capacity of the digester is 6,800 gallons of sludge per day. The current annual average loading rate is 8,300 gallons per day.

Facultative Lagoons

The lagoons act as a storage facility for stabilized sludge. The loading rate to the lagoons should be kept below 20 lb volatile solids/1000 sf/day to avoid odors, although in the summer months, the loading rate can be increased for short periods of time. The lagoons receive digested sludge from both plants. With four acres of surface area, they have the capacity to receive 3500 lb VSS/day. They are currently loaded at an annual average rate of 600 lb VSS/day

WASTEWATER TREATMENT PLANT PERFORMANCE

A review of recent plant influent and effluent quality data is useful for characterizing the current performance of the wastewater treatment system. As shown in Table 4-4, the treatment plant produced high quality effluent in 2005.

Table 4-4. 2005 Plant Performance Summary

Month	Influent Flow, mgd		Influent Concentration, mg/L				Effluent Concentration, mg/L			
			BOD		TSS		BOD		TSS	
	Average Day	Maximum Day	Average Day	Maximum Day	Average Day	Maximum Day	Average Day	Maximum Day	Average Day	Maximum Day
January	1.24	1.90	197	223	234	267	13.7	27.7	12.8	22.4
February	1.01	1.11	224	251	252	283	6.5	8.4	7.4	10.5
March	1.04	1.75	205	250	247	318	8.3	20.0	12.8	35.2
April	1.12	1.35	181	214	203	230	8.9	13.1	9.6	19.4
May	1.05	1.43	202	272	229	291	11.2	29.2	9.8	26.3
June	0.97	1.18	224	266	282	404	10.8	18.6	10.5	15.1
July	0.85	0.91	226	270	283	331	12.2	16.3	12.1	17.5
August	0.82	0.86	272	312	307	324	13.0	15.8	11.4	13.7
September	0.79	0.84	257	322	251	340	9.9	12.9	11.5	15.3
October	0.82	0.92	293	332	310	348	8.6	10.9	11.3	14.5
November	1.09	1.50	247	312	271	322	8.2	14.1	7.3	9.1
December	1.34	2.87	167	396	176	367	9.2	10.8	8.1	11.7

CHAPTER 5

WASTEWATER CHARACTERISTICS

The Coos Bay Wastewater Treatment Plant No. 2 (WWTP No. 2) is operated by Operations Management International, Inc. (OMI). OMI personnel monitor important wastewater characteristics for the plant and report these plant conditions to the City of Coos Bay and to the Oregon Department of Environmental Quality (DEQ) on a monthly basis as required by their NPDES permit. This chapter summarizes data from the discharge monitoring reports (DMRs) and analyzes recent data to define the flows and loads that characterize the City's wastewater under current conditions. Current flow and load estimates are used along with the population projections presented in Chapter 2 to develop flow and load projections for future conditions. The flow and load projections serve as the basis for assessing the adequacy of existing treatment systems and sizing new treatment facilities.

CURRENT FLOWS AND LOADS

Analysis of flows and load data forms an important initial step in developing wastewater flow projections. The following assessment of current flow and load conditions for the Coos Bay WWTP No. 2 is based on operational data from the plant. The flow and load analysis presented herein were developed based on the data from 1995 through 2005 so that larger storms that occurred between 1995 and 1999 could be included in the analysis. A review of the data showed that there was no significant difference between the peak flows resulting from data analysis for a period from 1995-1999 and 1999-2005. Therefore, average and maximum month flows and loads were developed based on data from January 1999 through December 2005.

Wastewater Flows

Because wastewater flow rates can be variable, a number of different flow conditions are important in sizing and evaluating wastewater treatment plants. This section defines the flows of interest and develops estimates of monthly and peak flows.

Definitions

The flow rates and related parameters discussed in this chapter are defined below:

- The *average annual flow* (AAF) is the average flow for the entire year.
- The *average dry weather flow* (ADWF) is the average flow at the plant during the dry weather season, typically May through October.
- The *average wet weather flow* (AWWF) is the average flow at the plant during the wet weather season, typically November through April.
- The *maximum month dry weather flow* (MMDWF) is defined as the flow recorded at the plant when total rainfall quantities are at the 1-in-10 year probability level for the month of May. The *maximum month wet weather flow* (MMWWF) is defined as the plant flow when total rainfall quantities are at the 1-in-5 year probability level for the month of January. However, the wet season maximum month for the plant is December. Therefore,

based on DEQ's recommendation, December rainfall data was to determine the MMWWF.

- The *Maximum Week Wet Weather Flow* (MWWWF) is the flow with a recurrence probability of 1.92 percent in a given year.
- The *peak day flow* (PDF) is the flow rate that corresponds to a 24-hour storm event with a 1-in-5 year recurrence interval that occurs during a period of high groundwater and saturated soils.
- The *peak wet weather flow* (PWWF) is expected to occur during the peak day flow. The PWWF is the highest flow at the plant sustained for one hour. The PWWF dictates the hydraulic capacity of the treatment system. PWWF is also referred to as the peak instantaneous flow.
- *Infiltration and inflow* (I/I) refers to water that enters the wastewater collection system due to deterioration or illicit connections. Infiltration is groundwater that enters the system from the surrounding soil through defective pipes, joints, or manholes. Inflow is stormwater that directly enters the system from sources such as drainage connections, flooded manhole covers, and sewer defects that respond quickly to saturated ground conditions.

Flow Records and Measurement

When analyzing the flow monitoring records, it is important to identify any limitations or inconsistencies in the data or flow measurement equipment. For Coos Bay WWTP No. 2, the limitation was that the existing flow meter was not capable of complete measurement during high flow conditions at the plant. The high flow conditions in this plan are an estimate based on run time of a temporary pump installed in the influent pump station. The downstream piping has since been modified to include the flow from this pump through the influent flow meter. The influent flow meter has recently been recalibrated to accommodate the increased flow. Subsequent wet weather flows will include all flow into the plant. Plant flows reported herein should be verified with accurate data prior to constructing any future improvements.

Rainfall Records

Since rainfall has a large effect on wastewater treatment plant flow rates, DEQ flow projection guidelines recommend that rainfall records and statistical analyses be considered when analyzing WWTP flows. Daily rainfall data are collected at WWTP No. 2.

The National Oceanic and Atmospheric Administration (NOAA) prepare statistical summaries of climatologic data for selected meteorological stations. The meteorological station with statistical summaries closest to Coos Bay WWTP No. 2 is located at the North Bend Airport. The most recent climatologic summary for areas of Oregon was issued in 2004 and is based upon data collected from 1971 through 2000. Table 5-1 compares the average monthly total rainfall recorded at WWTP No. 2 and rainfall statistics for the North Bend Airport Meteorological Station obtained from the climatologic summary. The relative similarity in rainfall totals indicates that historical data from the North Bend Airport Meteorological Station provides a reasonable representation of rainfall distribution at the Coos bay WWTP No. 2.

Table 5-1. Average Monthly Rainfall at Coos Bay WWTP No. 2, 1999-2005 and Statistical Rainfall Summary for the North Bend AP Meteorological Station, 1971-2000

Month	1999-2005 WWTP No. 2 Average Rainfall, inches	1999-2005 OCS Average Rainfall, inches (North Bend)	1971-2000 NOAA Average Rainfall, inches (North Bend)	Greatest Monthly Rainfall, inches (North Bend)	Greatest Daily Rainfall, inches (North Bend)	1-in-5 Year Monthly Rainfall, inches (North Bend)	1-in-10 Year Monthly Rainfall, inches (North Bend)
January	9.48	10.26	9.54	20.96	4.02	13.67	17.07
February	6.66	6.95	8.12	16.26	5.16	11.10	13.36
March	4.19	5.82	7.94	14.13	4.02	10.74	12.83
April	2.77	5.21	5.19	11.13	2.65	7.43	9.25
May	1.89	3.03	3.40	9.30	4.35	5.04	6.50
June	0.87	1.72	1.72	4.80	2.72	2.62	3.46
July	0.13	0.33	0.51	2.79	1.29	0.84	1.23
August	0.35	0.49	0.88	2.72	1.51	1.45	2.16
September	0.44	1.50	1.73	5.70	2.05	2.87	4.46
October	2.51	3.87	4.62	12.46	11.17	7.09	9.47
November	7.72	7.32	10.36	22.69	6.67	14.58	17.94
December	9.01	12.33	10.42	20.76	5.60	14.95	18.70
Wet Season	38.83	47.89	51.57	22.69	6.67	14.95	18.70
Dry Season	6.19	10.94	12.86	12.46	11.17	7.09	9.47

Flow Analysis

Analysis of plant influent flows provides the basis for developing flow projections for the system in the future.

Average dry weather flow (ADWF) is the average flow during the dry weather season months of May through October. Since little rainfall occurs during these months, rain dependent I/I sources do not significantly affect ADWF. Average wet weather flow (AWWF) is the average flow during the wet weather season months of November through April. Table 5-2 presents a summary of the wet and dry season rainfall and flows for the period 1999 through 2005. ADWF is estimated to be 0.9 mgd and AWWF is estimated to be 1.6 mgd. The difference between the ADWF and AWWF indicates that the seasonal variations in wastewater flow are caused by rainfall dependent infiltration and inflow (I/I).

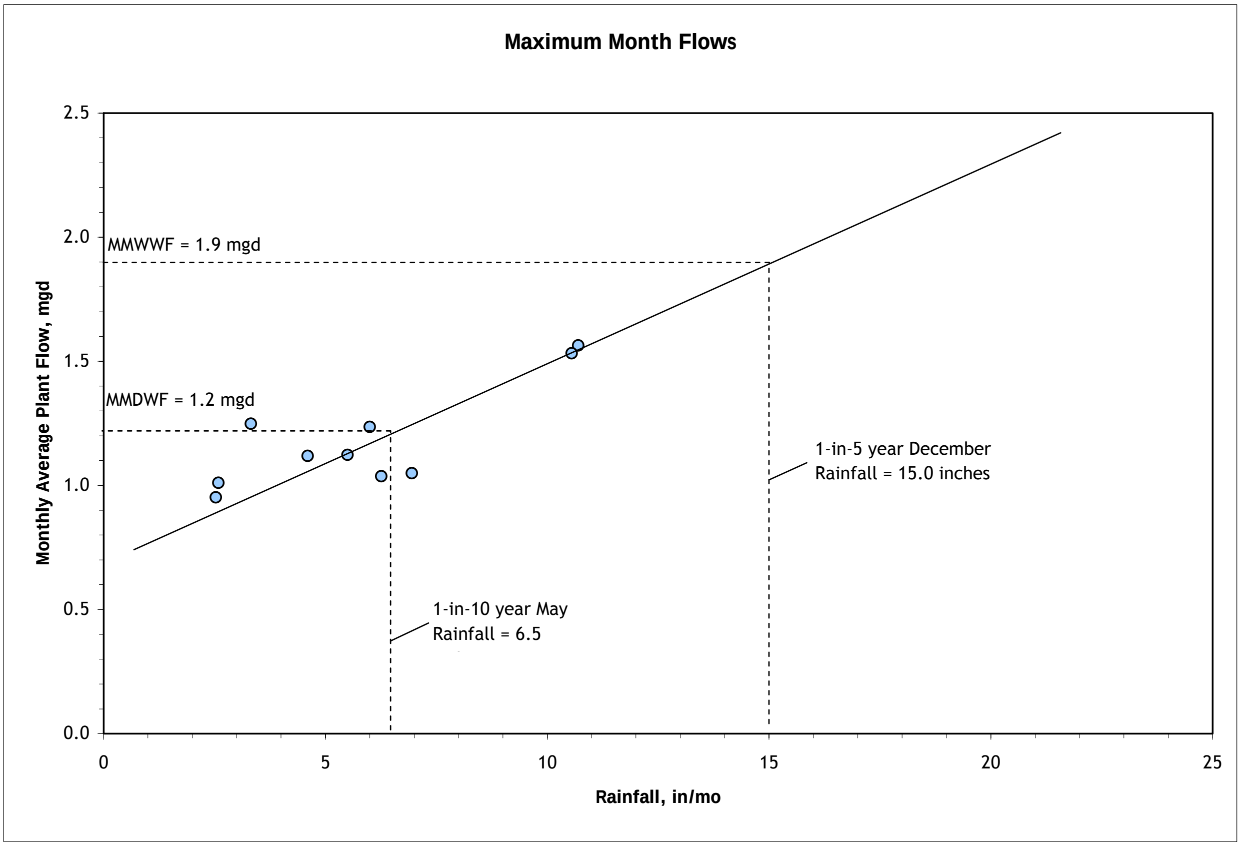
Table 5-2. Summary of WWTP No. 2 Wet and Dry Season Rainfall and Influent Flow

Season	Water Year[a]	Total Rainfall, in	Average Plant Influent Flow, mgd
Dry Season[b]	1999	8.64	1.57
	2000	9.69	1.43
	2001	6.87	1.32
	2002	2.67	1.28
	2003	3.10	1.53
	2004	14.79	1.59
	2005	13.08	1.58
Average Dry Season		8.41	1.47
Wet Season[c]	1999	31.42	3.50
	2000	44.85	3.11
	2001	16.45	2.00
	2002	41.27	2.90
	2003	48.52	3.05
	2004	33.23	2.79
	2005	27.30	2.34
Average Wet Season		34.72	2.81

[a]Water year runs from the preceding November through October.

The maximum month dry weather flow (MMDWF) is defined by DEQ as the flow that would be expected to occur when rainfall is at the 1-in-10 year probability level for the wettest month of the dry weather season. For the Coos Bay area, October is the wettest dry weather month for the area but the average May rainfall is used for this analysis because groundwater levels are higher in the spring. From Table 5-1, the 1-in-10 year May rainfall at the North Bend Airport Meteorological Station is 6.50 inches. DEQ guidelines for projecting the MMDWF rely on relating the monthly average flow for January through May against the total rainfall for each respective month. Data from the 2004 and 2005 seasons were used. By approximating a linear relationship, as illustrated in Figure 5-1, the MMDWF is estimated to be approximately 1.2 mgd. Similarly, the maximum month wet weather flow (MMWWF) is defined by DEQ as the flow expected to occur when rainfall is at the 1-in-5 year probability level for the month of December. The 1-in-5 year December rainfall is approximately 15.0 inches. As illustrated in Figure 5-1, the MMWWF is estimated at 1.9 mgd.

Figure 5-1. Coos Bay WWTP No. 2 Monthly Influent Flow vs. Rainfall, January 2004 - May 2005



The peak day flow (PDF) is defined as the daily average plant flow rate that occurs during the 1-in-5 year, 24-hour storm event. For the Coos Bay area, this is approximately 4.5 inches of rainfall, based on isopluvial map found in the NOAA Atlas 2, Volume X. Figure 5-2 presents flows and corresponding rainfall totals from significant wet season storm events between January 1999 and December 2005. In order to ensure that soils were saturated and infiltration/inflow was significant, this analysis considered only those days with over 1.25 inches of daily recorded rainfall and at least two inches of cumulative rainfall in the previous 4 days. The DEQ methodology for estimating the PDF assumes that there is an approximately linear relationship between influent flow and rainfall, where influent flows steadily increase with larger rainfall events. Based on Figure 5-2, the PDF is estimated at 3.5 mgd.

Peak wet weather flow (PWWF) and maximum week wet weather flow (MWWWF) were estimated by projecting flow on a log-probability graph using average, maximum month and peak day flows as presented in Figure 5-3.

Table 5-3 summarizes the current wastewater flows and peaking factors for Wastewater Treatment Plant No. 2.

Figure 5-2. Daily Influent Flow vs. Rainfall for Significant Events

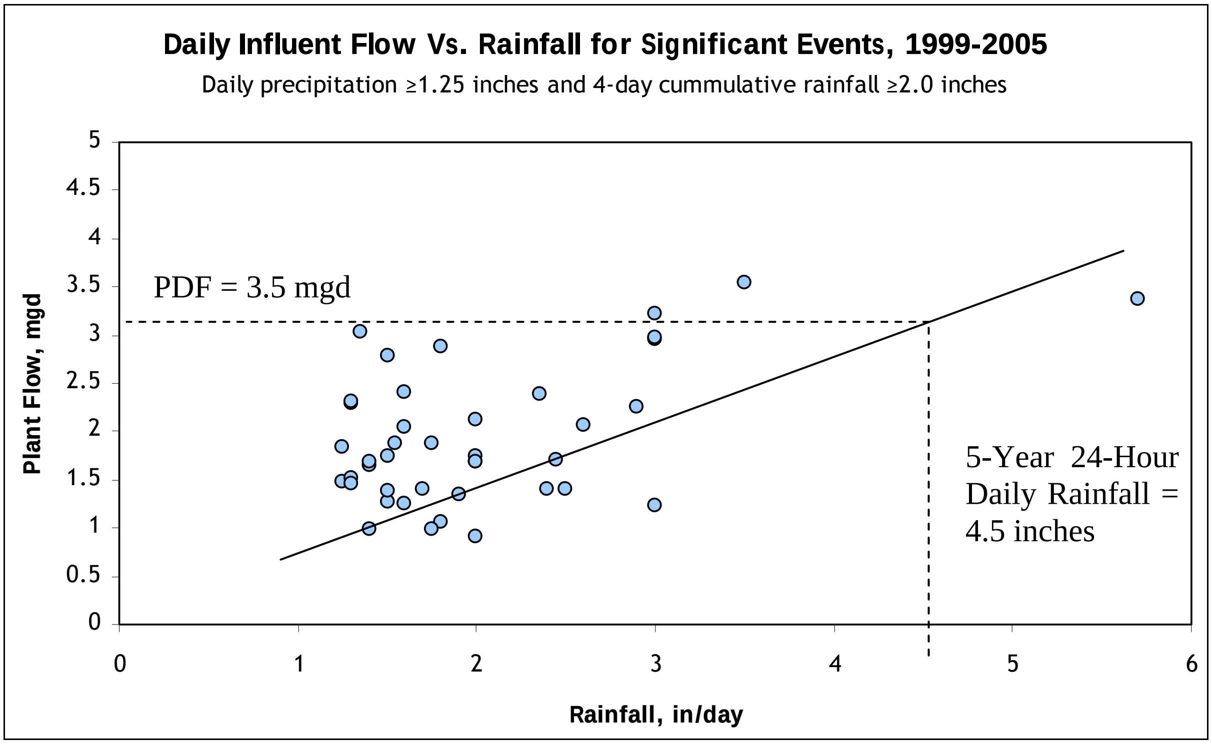
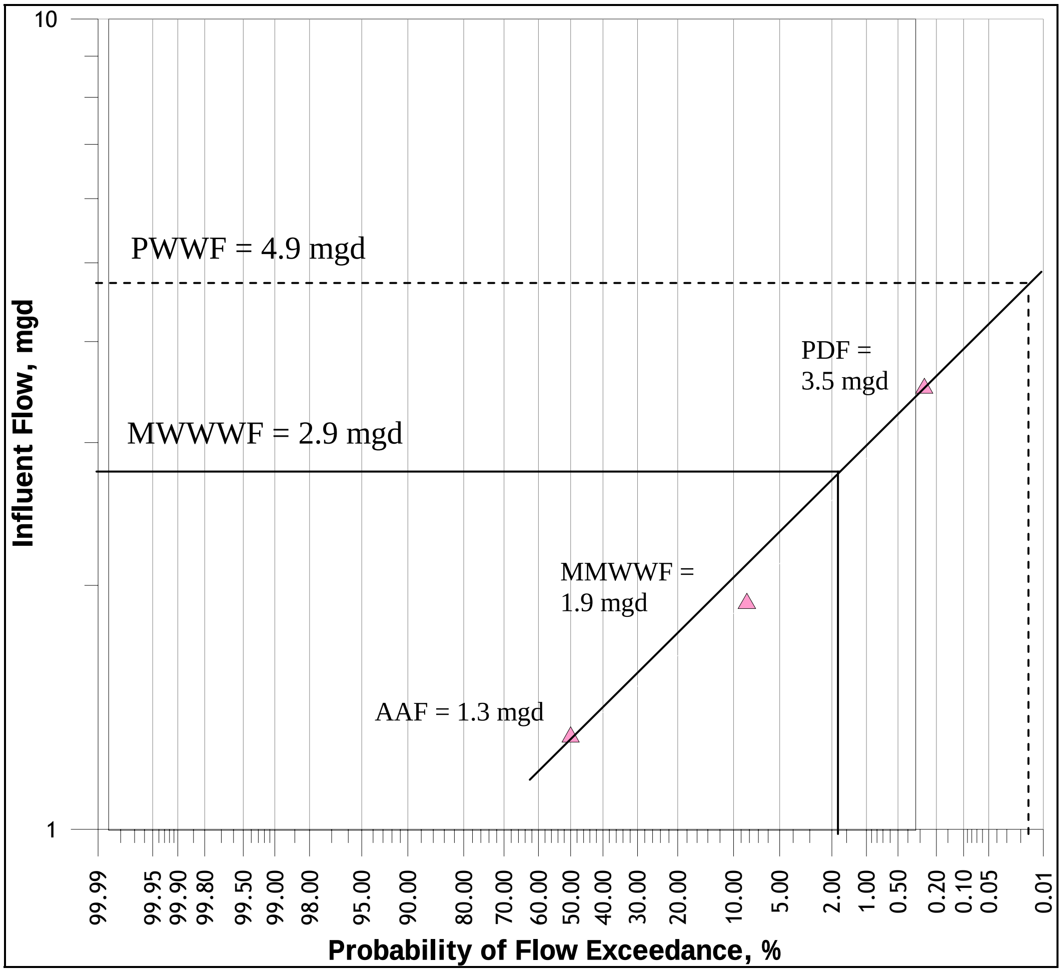


Figure 5-3. Probability Analysis for PWWF Determination



As mentioned previously, Coos Bay WWTP No. 2 has several deficiencies in the collection of accurate plant influent flow data. As a result, the estimates made using the DEQ method and historical data from the plant are not representative of the actual flow that is delivered to the plant via the collection system. To account for the flow that is not measured, estimates of unaccounted-for flow were made by plant staff on peak days based on pump run time. Based on these estimates, adjusted flow rates have been developed for WWTP No. 2. Table 5-3 summarizes the current measured and adjusted wastewater flows and peaking factors.

Table 5-3. Current Wastewater Flows

Flow Parameter	Measured Flow Rate, mgd	Adjusted Flow Rate, mgd	Peaking Factor (using adjusted flow)
Average Dry Weather Flow (ADWF)	0.9	0.9	1.0
Average Wet Weather Flow (AWWF)	1.6	1.6	1.8
Average Annual Flow (AAF)	1.3	1.3	1.4
Maximum Month Dry Weather Flow (MMDWF)	1.2	1.2	1.4
Maximum Month Wet Weather Flow (MMWWF)	1.9	2.3	2.6
Maximum Week Wet Weather Flow (MWWWF)	2.6	3.1	3.4
Peak Day Flow (PDF)	3.5	4.5	5.0
Peak Wet Weather Flow (PWWF)	4.9	7.0	7.8

Another useful flow analysis parameter is the wet weather I/I rate for the community in terms of gallons per acre per day (gpad). Since the wet weather I/I rate is approximately equal to the difference between the PWWF and the ADWF, the I/I rate for Coos Bay WWTP No. 2 is 6.1 mgd. Based on an estimated overall developed area of 2,480 acres as reported in Chapter 2 and the combined PWWF of both treatment plants of 23 mgd and a total ADWF of 2.6, the I/I rate for the system is estimated at 7820 gpad. This I/I rate is very high relative to the 1,500 gpad typically associated with new construction.

BOD and TSS Loads

Biochemical oxygen demand (BOD) and total suspended solids (TSS) are indicators of the organic loading on a wastewater treatment facility. BOD is a measure of the amount of oxygen required to biologically oxidize the organic material in the wastewater over a specific time period. A 5-day BOD test is conventionally used for wastewater testing. As its name suggests, TSS is a measure of the particulate material suspended in the wastewater. The BOD and TSS loading on the WWTP influence the following:

- **Treatment Process Sizing.** The size of biological treatment units, such as aeration basins, is approximately proportional to a plant's organic loading.
- **Aeration System Sizing.** Treating higher BOD loads requires higher capacity aeration equipment. A wastewater treatment facility's aeration system is typically sized to provide oxygen during peak day BOD loading conditions.
- **Sludge Production.** BOD and TSS removed by the plant are converted into sludge. Higher BOD and TSS loads result in increased sludge quantities.

BOD and TSS Records

Daily BOD and TSS concentrations are recorded approximately twice per week. The daily plant loadings for BOD and TSS from January 1999 to December 2005 are shown in Figures 5-4 and 5-5 respectively. The figures illustrate that the highest BOD and TSS loads recorded for this period occurs in the late fall. Investigation into the rainfall data revealed that the high concentrations of BOD and TSS correspond to the first major storm event that occurs at the end of a dry season. Thus, the spikes in the BOD and TSS levels are likely due to the flushing of accumulated solids from the sewer system after the extended dry, low flow period. Spikes in BOD and TSS also result from periodic high loads from the Charleston Sanitary District.

Figure 5-4. Daily Plant Loading: Biochemical Oxygen Demand (BOD)

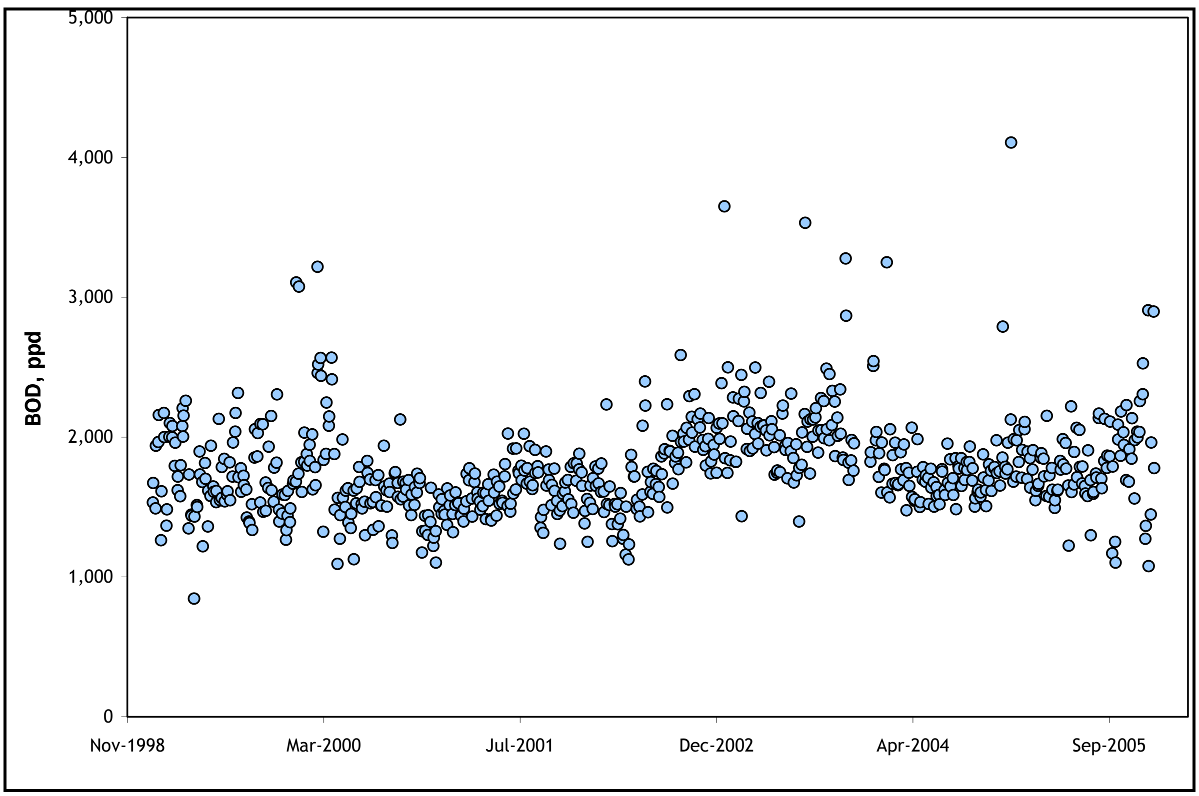
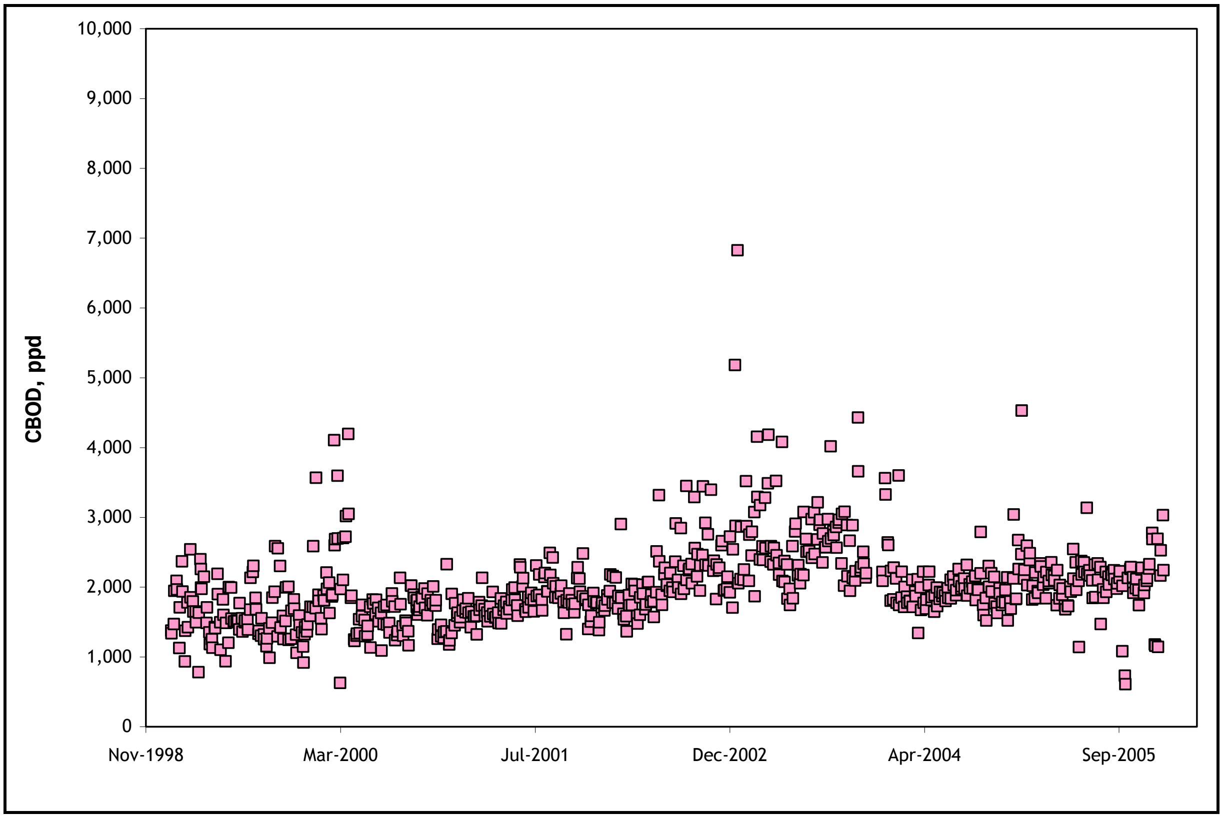


Figure 5-5. Daily Plant Loading: Total Suspended Solids (TSS)



Unit Loading Values

The development of unit loading values provides the basis for future loading projections. Analysis of loading levels and population allows for the calculation of the unit design values for the wastewater loads. The average unit loading value in pounds per capita per day (ppcd) can be applied to the population projections to estimate future sanitary loads. Table 5-4 presents the unit design loads for BOD and TSS for the WWTP No. 2 service area. These values are consistent with textbook average loading rates for communities with largely residential and commercial developments. Table 5-5 reports the estimated maximum and average BOD and TSS loads for the WWTP No. 2 service area.

Table 5-4. Current Unit Design Loads

Period	Population	Average BOD, ppd	Average TSS, ppd	BOD Unit Load, pcd	TSS Unit Load, pcd
2003 Wet Weather	10,510	1,800	2,100	0.17	0.20
2003 Dry Weather	10,510	1,800	2,000	0.17	0.19
Average	10,510	1,800	2,050	0.17	0.19

Table 5-5. Current Plant Influent Loading

Description	BOD, ppd	Peaking Factor	TSS, ppd	Peaking Factor
Dry Weather				
Average	1,800	1.0	2,000	1.0
Max Month	2,200	1.2	2,800	1.4
Peak Day	3,500	1.9	4,000	2.0
Wet Weather				
Average	1,800	1.0	2,000	1.0
Max Month	2,205	1.2	3,100	1.6
Peak Day	4,100	2.3	6,800	3.4
Average				
Average	1,800	1.0	2,000	1.0
Max Month	2,200	1.2	3,100	1.6
Peak Day	3,800	2.1	5,400	2.7

Nutrients

Nutrients of primary concern at a wastewater treatment facility are nitrogen and phosphorus. Typically, the majority of the nitrogen in raw sewage is in the form of ammonia; concentrations usually range from 15 to 30 mg/L. Raw sewage phosphorus concentrations are usually between 4 and 8 mg/L, with the majority of the phosphorus in a soluble form, such as phosphate. Influent ammonia is measured at 15-40 mg/l. Phosphate is not regularly sampled at Coos Bay WWTP No. 2.

FLOW AND LOAD PROJECTIONS

The flow and load projections are based on current flows and loads and anticipated community growth. The WWTP No. 2 service area, comprised of a portion of Coos Bay and Charleston, is projected to grow to a population of 12,440 by 2027.

To complete the projection analysis, the current flows, loads, and population were used to create unit design values. For example, based on the current ADWF of 0.9 mgd and the current population of 10,510, the unit ADWF value is approximately 85 gallons per capita per day (gpcd). This figure is close to the value calculated in the *Wastewater Collection System Master Plan for Charleston Sanitary District* (Dyer Partnership, 1996). Similarly, based on the current average BOD loading of 1,800 pounds per day, the unit value is 0.17 pounds of BOD per capita per day. The unit design values were used in conjunction with projected future populations to estimate future flows and loads for the City.

Flow Projections

The sanitary flow generated in the WWTP No. 2 service area comes from a wide variety of collection system users. The average wastewater flows from these users are expected to grow at approximately the same rate as the overall population. Therefore, future sanitary flows are projected by applying the anticipated population growth rate to the current sanitary flows.

Projection of ADWF, AWWF, MMDWF and MMWWF are made using this unit design value method.

Projection of the future peak wet weather flows requires additional consideration due to the variability of I/I rates among existing and future developments. The peak flows are estimated using current wet weather I/I rates for existing portions of the collection system while using lower rates in areas with new sewers. The current PWWF of 7.0 mgd is greatly influenced by the presence of collection system deficiencies in the older parts of town. Since improved construction materials and techniques in new portions of the collection system should exclude most I/I sources, the projections of future peak wet weather flow must account for lower wet weather I/I rates in new developments. Therefore, for the purposes of the PWWF projections, new developments are assigned a wet weather I/I rate of 3,000 gpad. Calculations give a PWWF of 8.6 mgd. A 0.5 mgd allowance has been added for new industrial area that is being developed in the service area.

Similar to the PWWF, the PDF is sensitive to I/I rates in the collection system. To maintain consistency with the growth of the PWWF relative to the ADWF, the PDF is estimated by interpolating a linear relationship between the peak wet weather flow, average annual flow, and MMWWF on a logarithmic flow probability chart. Projected flow probabilities are shown in Figure 5-6 and flow projections are summarized in Table 5-6.

Figure 5-6. Projected Coos Bay WWTP No. 2 Flow Probabilities

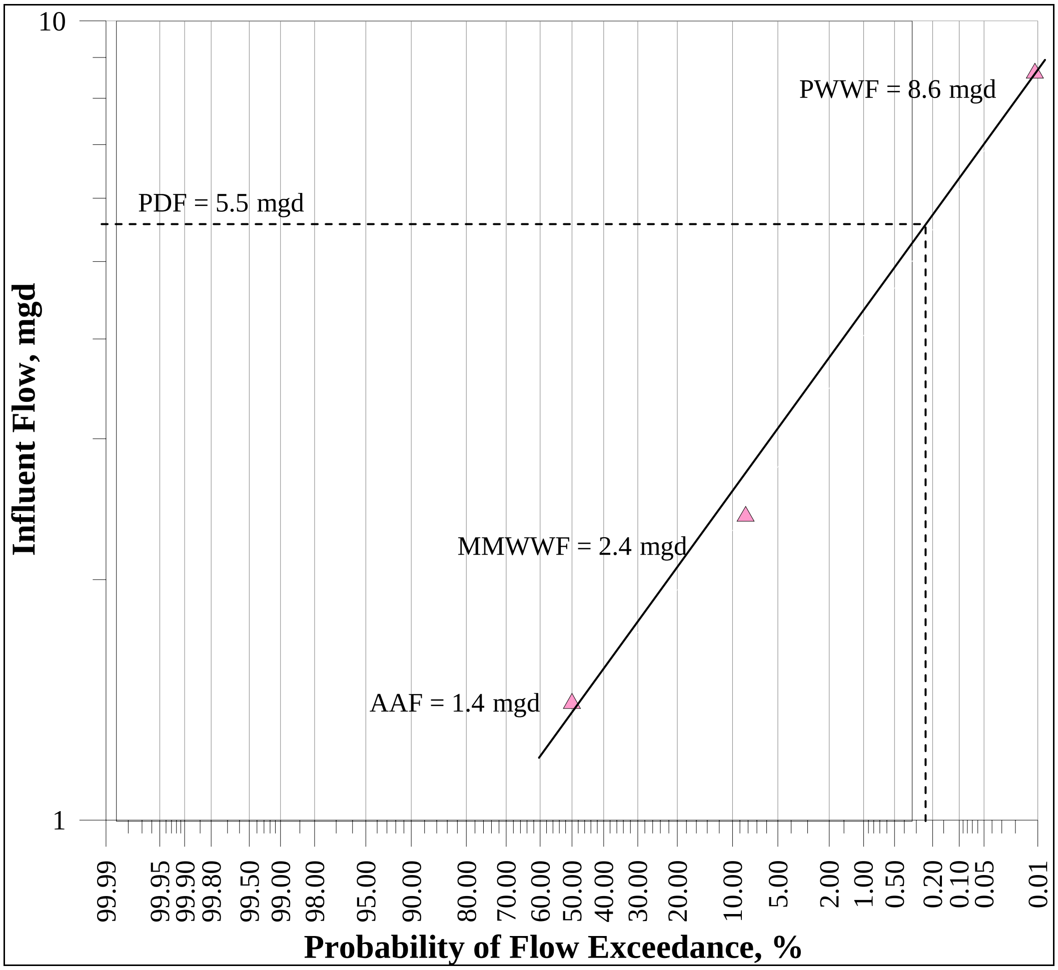


Table 5-6. Coos Bay WWTP No. 2 Design Flow Projection

Parameter	Year 2027, mgd
Average Dry Weather Flow (ADWF)	1.0
Average Wet Weather Flow (AWWF)	1.9
Average Annual Flow (AAF)	1.4
Maximum Month Dry Weather Flow (MMDWF)	1.4
Maximum Month Wet Weather Flow (MMWWF)	2.4
Maximum Week Wet Weather Flow (MWWWF)	2.7
Peak Day Flow (PDF)	5.5
Peak Wet Weather Flow (PWWF)	8.6

Load Projections

Future plant loads summarized in Table 5-7 are estimated by applying unit design factors to the year 2027 population of 12,440.

Table 5-7. Projected Plant Influent Loads

Parameter	Year 2027 BOD, lbs/day	Year 2027 TSS, lbs/day
Annual Average	2,200	2,500
Maximum Month	2,700	4,000
Peak Day	4,700	6,800

WASTEWATER CHARACTERISTICS SUMMARY

Table 5-8 summarizes the flow and load projections developed in previous sections.

Table 5-8. Wastewater Characteristics Summary

Wastewater Characteristics Factor	2003	2027
Flows, mgd:		
Average Dry Weather Flow (ADWF)	0.9	1.0
Average Wet Weather Flow (AWWF)	1.6	1.9
Average Annual Flow (AAF)	1.2	1.4
Maximum Month Dry Weather Flow (MMDWF)	1.2	1.4
Maximum Month Wet Weather Flow (MMWWF)	2.1	2.4
Maximum Week Wet Weather Flow (MWWWF)	2.3	2.7
Peak Day Flow (PDF)	4.5	5.5
Peak Wet Weather Flow (PWWF)	7.0	8.6
Loads:		
BOD, ppd		
Average	1,800	2,200
Max month	2,200	2,700
Peak day	3,800	4,700
TSS, ppd		
Average	2,000	2,500
Max month	2,500	4,000
Peak day	4,300	6,800

CHAPTER 6

REGULATORY REQUIREMENTS

The City of Coos Bay recognizes the importance of protecting the water quality of Coos Bay. The estuary provides recreational opportunities for tourists and local residents, serves as wildlife habitat, and is an important fisheries and harbor resource. This chapter discusses the regulatory aspects of protecting water quality, examines the water quality standards for the Bay, and presents the anticipated wastewater treatment requirements.

REGULATORY FRAMEWORK

The regulatory environment surrounding water quality protection in Oregon is relatively complex, requiring interaction and cooperation between a number of federal, state, and local agencies. The first step in the process is to assign beneficial uses to the water body. This task is the responsibility of the Oregon Water Resources Department (OWRD). A water body's beneficial uses depend on characteristics such as its size and location. The following are the designated beneficial uses for the South Coast Basin. (Oregon Administrative Rules—OAR 340-041-0300)

- Industrial Water Supply
- Anadromous Fish Passage
- Salmonid Spawning and Rearing[a]
- Resident Fish and Aquatic Life
- Wildlife & Hunting
- Fishing
- Boating
- Water Contact Recreation
- Aesthetic Quality
- Commercial Navigation & Transportation

[a] This is a basin-wide use and does not apply to the Bay.

It is the responsibility of the Oregon Department of Environmental Quality (DEQ) to establish and enforce water quality and waste treatment standards that ensure the Bay's beneficial uses are preserved. The DEQ's general policy is one of antidegradation of surface water quality. Discharges from wastewater treatment plants (WWTPs) are regulated through the National Pollutant Discharge Elimination System (NPDES). All discharges of treated wastewater to a receiving stream must comply with the conditions of an NPDES permit. The Environmental Protection Agency (EPA) oversees state regulatory agencies, and can intervene if the state agencies do not successfully protect water quality.

Local governments must operate their WWTPs so that they comply with all waste treatment standards and the requirements of the NPDES permit. If a WWTP is regularly out of compliance, the municipality typically enters into an agreement with DEQ to make improvements to the plant and ensure that standards are met. This agreement is known as a Mutual Agreement and Order (MAO).

This section summarizes the regulatory requirements pertinent to wastewater facilities planning for Coos Bay.

Oregon Administrative Rules for Wastewater Treatment

The state surface water quality and waste treatment standards for Coos Bay are detailed in the following sections of the Oregon Administrative Rules (OARs):

- OAR 340-041-0004 lists policies and guidelines applicable to all basins. DEQ's policy of antidegradation of surface waters is set forth in this section.
- OAR 340-041-0007 through 340-041-0036 describes the standards that are applicable to all basins.
- OAR 340-041-0300 through 340-041-0305 contain requirements specific to the South Coast basin including beneficial uses, water quality standards and the minimum design criteria for waste treatment in the South Coast basin.

The surface water quality and waste treatment standards in the OARs are viewed as minimum requirements. Additional, more stringent limits developed though the TMDL process supersede the basin standards.

Clean Water Act Section 303(d) List

DEQ issued the Section 303(d) list of water quality limited water bodies in January 2003. The list contains over 1,000 stream segments that are water quality limited for one or more parameters. Coos Bay has been designated water quality limited for bacteria in the vicinity of the two treatment plants. The bacterial criteria is the shellfish criteria (14 fecal coliform per 100 milliliters (ml) with not more than 10 percent of the samples exceeding 43 organisms per 100 ml). DEQ requires that the human health requirement (126 e.coli per 100 ml) be met prior to discharge and the shellfish criteria must be met at the edge of the mixing zone. Since the treatment plant discharge is located in a shellfish growing area, a mixing zone for bacteria cannot be established. Therefore, the shellfish growing criteria will need to be met prior to discharge.

Total Maximum Daily Loads

When a receiving water is water quality limited, DEQ is required to establish TMDLs for the pollutant(s) that are causing the problem. Since the Coos Bay estuary is listed for bacteria, a bacteria TMDL will be established. Because the City's effluent will need to comply with the bacteria standard, the bacteria TMDL will not have a significant impact in wastewater planning once improvements are made to Treatment Plant No. 2.

Groundwater Protection

OAR 340-040 details state standards for protection of groundwater quality. Paragraph 340-040-0030(3)(b) states that for new facilities, the groundwater pollutant concentration limits shall be at background levels for all contaminants. Historically, DEQ's interpretation of this standard has required that all earthen impoundments for wastewater or treated effluent—including sewage treatment lagoons, effluent holding ponds, and constructed wetlands—be lined with impervious material to prevent leakage into the underlying groundwater. This standard also precludes the discharge of treated effluent to groundwater unless all contaminants are first treated to background levels. All units at the treatment plant are concrete, therefore the potential for groundwater contamination is minimal.

Reliability Criteria

EPA has established reliability criteria for wastewater treatment plant treatment processes. The criteria are based to a large extent on the beneficial uses of the receiving water. Because the City's Plant No. 2 discharges to shellfish-bearing waters, it falls under Class 1 requirements, which are the most stringent. Class 1 facilities must comply with strict standards for equipment and process redundancy. OAR Chapter 340 Division 52 also contains reliability requirements.

Effluent Reuse

Requirements for reuse of treated WWTP effluent for irrigation are listed in OAR 340-055. State reuse standards are designed to ensure that groundwater resources are protected. Therefore, reclaimed water must be applied at agronomic rates. This requirement applies to the constituents in the water as well as the application of the water itself. Four reclaimed water treatment levels are defined in the OARs. In general, as the level of treatment is increased, public access is less restrictive, the number of approved uses is expanded, and the required size of buffer areas is reduced. For example, Level I requires only biological treatment and no disinfection. However, public access must be prevented, buffer zones must be established, and the water can only be used to irrigate non-food crops. Conversely, Level IV reclaimed water requires the highest level of treatment, including coagulation and filtration, and can be used essentially without restriction.

Biosolids Treatment and Reuse

OAR 340-050 describes state standards for biosolids treatment and reuse. The state standards are based on the federal sludge regulations, which are contained in Part 503 of Chapter 40 of the Code of Federal Regulations (40 CFR 503). The Part 503 Sludge Regulations were developed by EPA during the early 1990s. Both DEQ and EPA encourage the beneficial reuse of biosolids on agricultural land as a soil amendment; therefore, the Part 503 Regulations focus on treatment and application requirements for reuse. Biosolids must be applied at agronomic rates.

Vector Attraction Reduction. The Part 503 Regulations list two categories of treatment requirements: vector attraction reduction and pathogen reduction. Vector attraction reduction requirements concentrate on reducing the volatile solids content of the sludge. The Part 503 Regulations list 10 options for meeting vector attraction requirements. Sludge must comply with vector attraction reduction requirements before it is applied on agricultural land.

Pathogen Reduction. With respect to pathogen reduction requirements, the Part 503 Regulations recognize two categories of biosolids: Class A and Class B. Class A biosolids has low levels of pathogenic bacteria and is considered safe for public use. In addition to complying with bacteria population limits, Class A biosolids must treated through one of several specific methods, known as Processes to Further Reduce Pathogens (PFRPs). These include high pH treatment, high temperature treatment, composting, heat drying, irradiation, and pasteurization. The treatment requirements for Class B biosolids are less stringent than those for Class A. However, unlike Class A biosolids, Class B biosolids cannot be given directly to the public. In addition, public access to agricultural sites is restricted for at least 30 days after application of Class B biosolids. A number of methods are available for creating a Class B biosolids; these are known as Processes to Significantly Reduce Pathogens (PSRPs).

Producing a Class A biosolids expands a City's reuse options. However, the additional flexibility of a Class A biosolids must be weighed against the added cost. Treatment processes for creating Class A biosolids are more expensive, complex, and labor intensive than processes for Class B biosolids.

Metals. The metals concentration of biosolids applied to agricultural land is also a concern. Two types of metals concentration limits are of interest: Ceiling Concentration Limits and Pollutant Concentration Limits. Ceiling Concentration Limits are the maximum allowable metals concentrations that the biosolids can contain. If these limits are exceeded, the biosolids cannot be land applied.

Pollutant Concentration Limits are lower than Ceiling Concentration Limits. If a plant's biosolids comply with Pollutant Concentration Limits, application can take place without concern over cumulative metals loadings. If the metals content of the biosolids exceeds Pollutant Concentration Limits but complies with Ceiling Concentration Limits, agricultural reuse is allowed, but application of metals must be tracked to ensure that the total metals load does not exceed the cumulative capacity of the site. Generally, unless the wastewater system receives a significant industrial contribution, metals concentrations usually fall within Pollutant Concentration Limits.

Classification of Sludge. Sludge is categorized depending on degree of pathogen reduction and metals content. The four types of sludge in descending level of quality are:

- Exceptional Quality. Exceptional Quality sludge is the highest quality biosolids, meeting both the Class A pathogen reduction requirements and the Pollutant Concentration Limits for metals.
- Pollutant Concentration. Pollutant Concentration sludge complies with the stringent Pollutant Concentration Limits for metals, but is only treated to Class B pathogen reduction standards.
- Annual Pollutant Loading Rate. This sludge is treated to Class A pathogen reduction standards, but does not comply with Pollutant Concentration Limits for metals. It does, however, comply with metals Ceiling Concentration Limits.

- Cumulative Pollutant Loading Rate. The lowest quality sludge that can be applied to agricultural land, Cumulative Pollutant Loading Rate sludge meets Class B pathogen reduction requirements. Metals concentrations fall between Pollutant Concentration Limits and Ceiling Concentration Limits; therefore, site cumulative metals loading must be tracked.

To qualify for any of the sludge categories described above, the biosolids must also comply with vector attraction reduction requirements.

WATER QUALITY

This section discusses water quality issues applicable to Coos Bay.

Temperature

High water temperatures adversely affect salmonid fish, such as trout and salmon, as well as other cold-water aquatic species. Temperatures in the mid-to-high 70 degree F range can be lethal to adult salmonids. Temperatures in the mid 60 degree F to low 70 degree F range cause physiological stress which, when combined with other survival pressures, can increase mortality. Table 6-1 summarizes temperature limits for Spring Chinook and Coho salmon.

Temperature is also important because it controls the solubility of dissolved oxygen (DO) in water. As temperature increases, the DO saturation concentration decreases and it becomes more difficult to maintain adequate DO levels.

Table 6-1. Temperature Preference for Spring Chinook and Coho Salmon

Life-stage	Spring Chinook	Coho
Egg incubation	42.1°F to 55.0°F	39.9°F to 55.9°F
Juvenile rearing	50.0°F to 58.6°F	53.2°F to 58.3°F
Adult migration	37.9°F to 55.9°F	45.0°F to 60.1°F
Spawning	42.1°F to 55.0°F	39.9°F to 48.9°F
Upper lethal limit	71.6°F	77.0°F

Source: DEQ, 1995

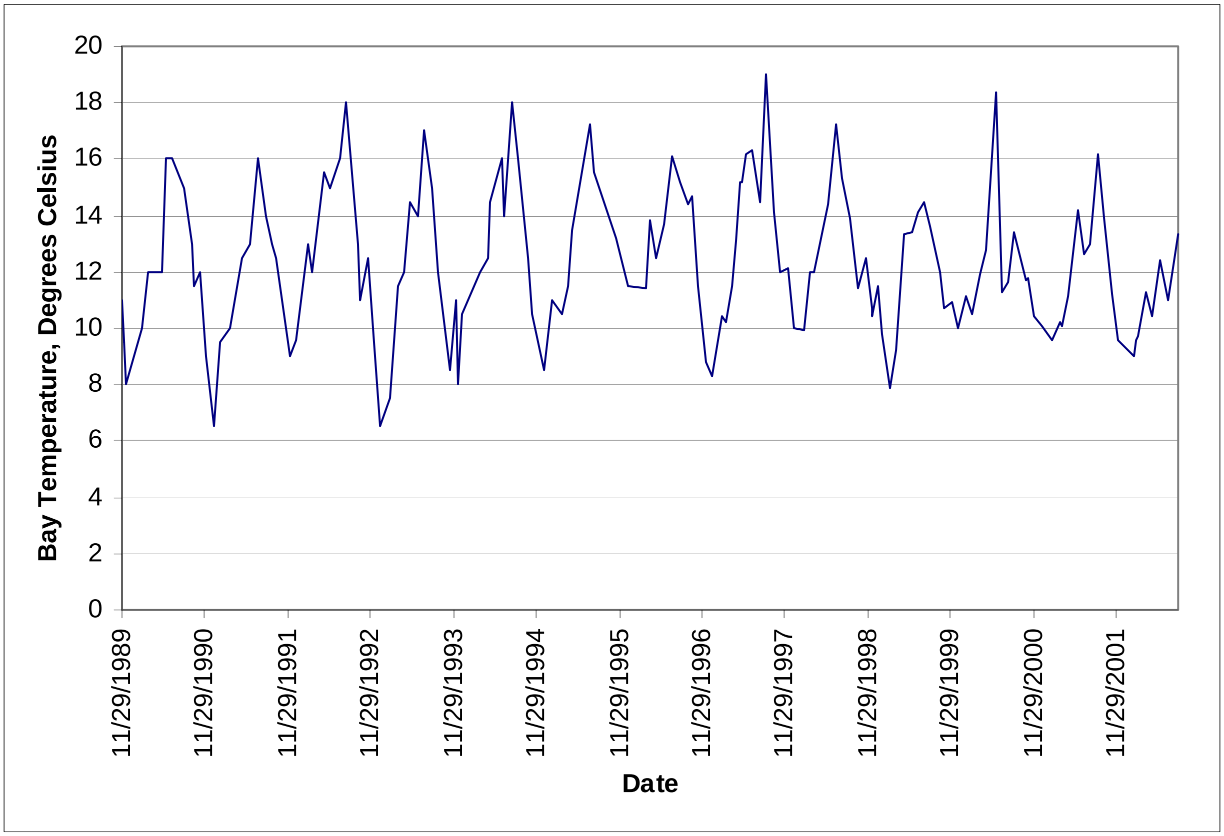
OAR 340-041-0028 establishes the temperature standards that apply to Coos Bay:

> *(7) Oceans and Bays: Except for the Columbia River above mile 7, ocean and bay waters many not be warmed by more than 0.3 degrees Celsius (0.5 degrees Fahrenheit) above the ambient condition unless a greater increase would not reasonably be expected to adversely affect fish or other aquatic life.*

Temperatures in the Bay near the outfall are shown in Figure 6-1. Temperatures range in value between a minimum of 7 degrees Celsius (44.6 degrees F) and a maximum of 19 degrees Celsius (66.2 degrees F). At Plant No. 2, the available mixing at the edge of the Regulatory Mixing Zone

(RMZ) is 41:1. Winter effluent temperatures are about 14 degrees Celsius (57.2 degrees F), which results in a temperature impact at the edge of the mixing zone that is well within the standard. Summer effluent temperatures average about 19 degrees Celsius (67.0 degrees F). Neither the summer nor winter temperature differential between the effluent and the Bay will cause the standard to be exceeded.

Figure 6-1. Coos Bay Water Temperature at Coos Bay Marker #12



Dissolved Oxygen

DO is necessary to support aquatic life. Salmonid fish are very sensitive to low DO levels, particularly during the early stages of development. The numeric DO standards consider two factors: whether salmonid fish are present and, if present, whether the fish are in the critical spawning, egg development, and fry emergence stages. The DO standard for the estuary stipulates that the concentration shall not be below 6.5 milligrams per liter (mg/L).

pH

The pH standard for the Coos Bay estuary states that pH must be maintained between 6.5 and 8.5 (OAR 340-041-0305 (1)(a). The permitted discharge pH ranges between 6.0 and 9.0. With the available mixing, no pH excursions will occur as a result of the Plant No. 2 discharge.

Bacteria

The bacteria standard for discharge into marine waters and estuarine shellfish growing waters are more stringent than other waters. The following standard applies to these waters:

> *A fecal coliform median concentration of 14 organisms per 100 milliliters, with not more than ten percent of the samples exceeding 43 organisms per 100 ml.*

The existing permit stipulates these requirements and the Mutual Agreement and Order (MAO) provides a schedule for implementation of the plant improvements required to meet these limits.

Toxic Substances

OAR 340-041-0033 regulates the discharge of toxic substances to Coos Bay. DEQ has adopted the toxicity limits set forth in EPA's *Quality Criteria for Water* (1986). This document lists toxicity limits for over 120 substances. *Quality Criteria for Water* lists standards for both acute toxicity and chronic toxicity. Acute toxicity limits are the values that cannot be exceeded for more than 1 hour every 3 years. Chronic toxicity limits represent the maximum 4-day-average value that cannot be exceeded more than once every 3 years.

OAR 340-041-0053 allows DEQ to designate an RMZ to allow for dilution of WWTP effluent with the Bay. The area within the RMZ must comply with all acute toxicity limits; however, chronic toxicity standards may be exceeded. The area outside of the RMZ must comply with chronic toxicity standards. DEQ may also designate a zone of immediate dilution (ZID) within which acute toxicity limits may be exceeded. If assigned, ZIDs are typically 10 percent of the size of the RMZ. DEQ has established an RMZ based on a 50-foot radius around the discharge and a ZID with a 5-foot radius. The respective mixing for these zones is 41:1 and 4:1.

DEQ conducted a reasonable potential analysis for heavy metals as part of the permit renewal process. Only silver indicated a reasonable potential for exceeding water quality criteria. Based on this finding, DEQ required additional monitoring of silver but this requirement was suspended in the permit modification based on the evaluation of the additional data.

Chlorine Toxicity. For freshwater streams, the chronic and acute toxicity limits for chlorine are 0.011 mg/L and 0.019 mg/L, respectively. For marine discharges, the chronic and acute toxicity limits fall to 0.0075 mg/L and 0.013 mg/L. Dechlorination equipment has been installed at the plant to ensure compliance with these limits.

Ammonia Toxicity. Ammonia toxicity is sensitive to the temperature and pH of the water. DEQ completed a reasonable potential analysis for ammonia and determined that ammonia toxicity could occur if high concentrations of ammonia are discharged. The new permit limits the ammonia concentrations and the MAO provides a schedule for compliance.

Other Parameters

A number of other water quality standards which are not considered to be problematic in the Coos Bay Estuary are detailed in OAR 340-041-0007. However, these parameters must be considered to ensure continued compliance:

- Turbidity. The maximum allowable cumulative increase in turbidity is 10 percent.
- Liberation of dissolved gases. The liberation of dissolved gases which cause objectionable odors or are harmful to aquatic life or recreational opportunities is not allowed.
- Objectionable tastes and odors. The creation of objectionable tastes and odors which adversely affect the potability of drinking water or the palatability of fish is not allowed.
- Bottom deposits. The formation of appreciable bottom deposits is not permitted.
- Objectionable water surface conditions. The creation of objectionable discoloration, a scum layer, floating material, or an oily sleek is not allowed.
- Aesthetic conditions. The creation of objectionable aesthetic conditions is not allowed.
- Radioisotopes. Radioisotope concentrations shall not exceed maximum acceptable values.
- Dissolved gas concentrations. The concentration of dissolved gases shall not exceed 110 percent of saturation.

TREATMENT REQUIREMENTS

DEQ has the responsibility to establish wastewater treatment requirements which ensure the protection of the Bay's beneficial uses and compliance with all water quality standards. This section discusses the Plant No. 2 discharge requirements.

Current Discharge Permit

Plant No. 2's NPDES permit was issued on August 21, 2003, and was modified on December 15, 2004. The permit is provided as Appendix B and is summarized in Table 6-2.

Table 6-2. Existing Discharge Permit

Parameter	Average Effluent Concentrations Monthly, mg/L	Average Effluent Concentrations Weekly, mg/L	Monthly average, ppd	Weekly average, ppd	Daily maximum, ppd
May 1 - October 31:					
BOD - 5	20	30	340	510	670
TSS	20	30	340	510	670
November 1 - April 30:					
BOD - 5	30	45	510	760	1000
TSS	30	45	510	760	1000
Other parameters:					
Fecal Coliform Bacteria	Shall not exceed a monthly mean of 14 organisms per 100 mL. Not more than10 percent of the samples shall exceed 43 organisms per 100 mL.				
pH (year round)	6.0 - 9.0				
BOD and TSS Removal Efficiency	Shall not be less than 85%				
Total Residual Chlorine	0.02 mg/l monthly 0.05 mg/l daily				
Ammonia-N (May 1 – October 31)	20 mg/l monthly 30 mg/l daily				
Excess Thermal Load (May 1 – October 31)	37 Million kcals/day				

The loads shown are based on an average dry weather flow of 2.02 mgd. Once the City of Coos Bay has acquired and accepted legal authority to implement the provisions of OAR 340-041-0061(10)(a)(G), the mass limits during the wet season will be increased for both BOD_5 and TSS. The wet weather monthly, weekly, and daily limits will be 700, 1100, and 1400 pounds per day respectively. The increase for the mass loads are conditional on the City obtaining operational control over the collection system and implementing an inflow elimination program.

Anticipated Discharge Permit

Because the NPDES permit has recently been revised to reflect current water quality issues, no major changes in discharge requirements are anticipated. The projected flow for the plant is well within the current design capacity so no restrictions related to dry weather mass loads are anticipated.

The only pending TMDL for the Bay is for bacteria. Since the existing permit requires the plant to comply with the water quality standard at the end of pipe, the allocations from the TMDL should not be more restrictive.

DEQ has initiated studies in anticipation of a modification of the turbidity standard. While the final promulgation of the standard is not expected for several years, it is believed that the new standard will be less restrictive than the current standard. It is not anticipated that additional treatment will be mandated to meet the new turbidity standard. Most of the current work has focused on streams and the impact on estuaries is not well defined at this time.

CHAPTER 7

LIQUID STREAM TREATMENT ALTERNATIVES

The liquid stream treatment facilities at Coos Bay Wastewater Treatment Plant (WWTP) No. 2 are currently able to satisfy most of the requirements set forth in its National Pollutant Discharge Elimination System (NPDES) permit. For those permit requirements that the plant is not able to meet, the City follows the requirements of a Mutual Agreement and Order (MAO) issued by the Department of Environmental Quality (DEQ). The MAO also includes a schedule for the completion of facility improvements that will address water quality concerns in Coos Bay. In addition to the improvements required by DEQ, other upgrades are necessary to ensure that the facilities can reliably handle increased flows and loads from Coos Bay's growing population and comply with potentially more restrictive future permit requirements. The planning and implementation of these improvements will ensure that Coos Bay WWTP No. 2 will continue to satisfy its permit requirements in the years to come.

The wastewater characteristics analysis contained in Chapter 5 provides the flow and load projections used in the development of the following liquid stream treatment alternatives.

CATEGORIES OF IMPROVEMENTS

Four general factors will guide the upgrade of the liquid stream treatment processes:

- The bacteria limits in the NPDES permit. The existing MAO incorporates the following bacteria limits:

  > *Fecal coliform Monthly Average Effluent Concentration of 200 and Weekly Average Effluent Concentration of 400*

  Because shellfish growing is a designated beneficial use of the Bay in the vicinity of the WWTP No. 2 outfall, the bacterial limits in the future permit will become more stringent. The new limit is the standard for shellfish growing waters. See Chapter 6 for a discussion of bacterial requirements. The more restrictive bacteria standard would affect the viability of plant upgrade alternatives that incorporate blended treatment – the combining of raw sewage or primary effluent with secondary effluent during peak flow conditions. Plant upgrade alternatives which incorporate blended treatment will include outfalls that convey effluent to areas anticipated retaining the fresh water bacteria limit.

- The ammonia limit in the NPDES permit. The existing MAO incorporates the following ammonia limit:

  > *Ammonia Monthly Average Effluent Concentration of 40 mg/l and Daily Maximum Effluent Concentration of 60 mg/l.*

  The new permit includes the following ammonia limit for May 1 – October 31 based on toxicity criteria:

  > *Ammonia-N shall not exceed a monthly average concentration of 20 mg/l and a daily maximum concentration of 30 mg/l.*

The ammonia limit is dependent on many factors (pH and temperature of the effluent and receiving stream, background concentration, sampling frequency, etc). Although DEQ is in the process of revising the freshwater limit, the saltwater criteria will not be revised unless factors on which the limit is based change.

- Optimize utilization of existing facilities to the extent possible to reduce costs. This goal is complicated by the fact that wastewater does not flow entirely by gravity from the headworks to the chlorine contact basin.
- Simplify plant hydraulics to the extent possible. The existing plant design requires that wastewater be pumped multiple times in the treatment process. Eliminating some pumping would reduce energy and maintenance costs.
- Optimize utilization of available space. The area available for new treatment units is limited. Alternatives, which require little additional space, would serve to increase the long-term capacity of the site.

The following sections analyze alternatives for potential improvements by grouping facilities into one of three categories:

- Headworks. The headworks category consists of the influent sewers and force mains; influent pumping; screening; and grit removal.
- Treatment. The treatment category consists of primary sedimentation, biological treatment, intermediate pumping, secondary sedimentation, and disinfection.
- Outfall. The outfall category includes outfall modifications and effluent pumping where required.

ANALYSIS OF LIQUID STREAM IMPROVEMENTS

Improvements to liquid stream treatment processes are examined in this section.

Improvements Common to all Alternatives

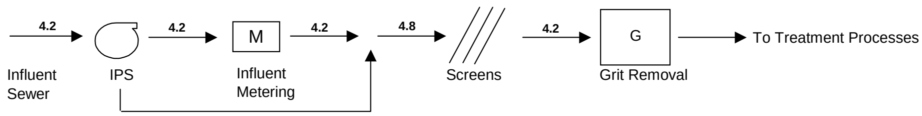
The following improvements are common to all combinations of alternatives:

- Stand-by power system. A standby power system is necessary to comply with EPA Class 1 reliability requirements. The standby generator would be sized to meet the demands of the entire plant.
- Improvements to the operations building. Improvements would include a new building roof and new walkway canopy.
- Replacing the influent sewer creek crossing. The existing pipeline is in poor condition just outside the plant entrance.
- Electrical and SCADA/process control improvements. The power distribution system would be upgraded as required to serve new equipment. Control system improvements would focus on reducing labor and energy costs.

Headworks

The existing headworks are shown schematically in Figure 7-1.

Figure 7-1. Existing Plant No. 2 Headworks



Note: All flows shown are in mgd. Flows shown represent current rated facility capacities.

The influent sewer currently crosses a creek bed just outside the plant site. The pipe is in poor condition and should be replaced as part of the plant upgrade. The existing influent pump station does not have adequate capacity to convey current or future peak flows. A submersible pump was added to the station, but capacity is still inadequate. Since there is inadequate space in the station's wet well for additional submersible pumps, this approach is not a permanent solution to the capacity shortage. The influent pumping station is located beneath the plant control building, impairing access and limiting expansion opportunities. Because of these significant shortcomings, the existing pump station should be replaced with a new station. The new station could be located on the existing treatment plant site or just offsite near the existing flow monitoring station. Since this variation will not significantly affect costs, the two options will not be analyzed as separate alternatives. The location of the new influent pump station should be determined as part of preliminary design.

The existing mechanical screen and manual bar rack are relatively new, but were not sized to accommodate the design year peak flows. Operators report that during high flows, material passes through the screen to the primary clarifier. Due to inadequate capacity and poor performance, this unit should be replaced.

The existing grit removal system has inadequate capacity and operators report poor performance at low and high flows—a common complaint with gravity vortex grit systems. This unit should be replaced.

For the purposes of this study, costs will be based on the following types of facilities:

- The influent pump station will incorporate submersible pumps.
- Screening equipment will consist of front-raked mechanical bar screens and screw-type washer/compactors. A manual bar rack and bypass channel is included.
- The grit removal system will include a vortex chamber, such as the Smith and Loveless Pista, recessed-impeller grit slurry pump, cyclonic separator, and screw classifier.

Alternative pumping, screening, and grit removal systems will be evaluated in detail and selected during the preliminary design process. Screening technology in particular has advanced significantly in recent years, creating many viable options to conventional bar screens. These options include perforated plate screens, step screens, basket-type screens, and traveling belt screens. Furthermore, new screening systems can have openings of 1/8 inch or less, resulting in improved material removal compared to conventional bar screens.

For treatment alternatives that do not incorporate primary clarifiers, installation of fine screens (openings less than 1/8 inch) is recommended to prevent pass-through of large solids to sensitive downstream treatment processes and equipment.

For treatment alternatives that include full primary sedimentation of all of the raw sewage, removing grit from the primary sludge using a cyclonic separator and classifier is a cost effective approach to grit removal. This would eliminate the grit tank.

Headworks Alternative H1. Alternative H1 consists of the demolition of the existing headworks facilities and construction of complete new headworks. Space near the existing flow monitoring station may be utilized for the influent pump station to conserve limited space at the treatment plant site. Figure 7-2 is a simplified schematic diagram of Alternative H1.

Figure 7-2. Headworks Alternative H1

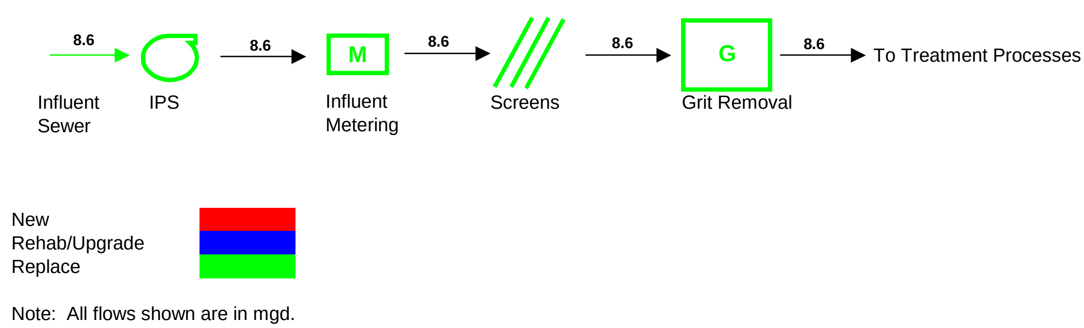


Table 7-1 shows existing and future design data for headworks facilities for Alternative H1.

Table 7-1. Alternative H1 Design Data

Description	Existing Value	New Value
INFLUENT PUMPING		
Number of pumps	3	4
Capacity, each, gpm	1 @ 1200	2,000
	2 @ 1700	—
Type	Nonclog centrifugal	Submersible
Drive	Variable speed	Variable Speed
HP	1@ 15	TBD
	2 @ 20	—
FLOW MEASUREMENT		
Type	Magnetic Meter	Magnetic Meter
PRELIMINARY TREATMENT		
Mechanical Bar Screen		
Number	1	1
Type	Back Cleaned	TBD
Bar Spacing, in	5/8	TBD
Manual Bar Screen		
Number	1	1
Bar Spacing, in	1¼	1
Screenings washer/compactor		
Number	—	1
Type	—	Screw
Capacity, cy/hr	—	35
Grit Removal		
Number	1	1
Type	Gravity vortex	Paddle vortex
Tank Diameter, ft	—	12
Peak Capacity, mgd	4.8	10.7
Grit Slurry Pump		
Number	—	1
Type	—	Recessed impeller
Capacity, gpm	—	200
Cyclonic Grit Separator		
Number	—	1
Grit Classifier		
Number	—	1

Headworks Alternative H2. Like Alternative H1, Alternative H2 replaces the entire headworks with new structures and equipment. In this alternative, however, screening would be located upstream of influent pumping, eliminating the possibility of pump clogging. New grit removal facilities would be constructed near the existing grit system. Figure 7-3 is a schematic diagram of Alternative H2.

Figure 7-3. Headworks Alternative H2

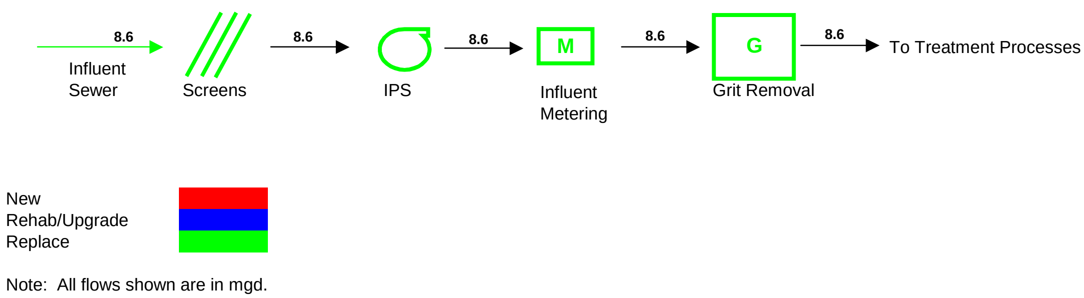


Table 7-2 shows existing and future design data for headworks facilities for Alternative H2.

Table 7-2. Alternative H2 Design Data

Description	Existing Value	New Value
SCREENING		
Mechanical Bar Screen		
Number	1	1
Type	Back Cleaned	TBD
Bar Spacing, in	5/8	TBD
Manual Bar Screen		
Number	1	1
Bar Spacing, in	1¼	1
Screenings washer/compactor		
Number	—	1
Type	—	Screw
Capacity, cy/hr	—	35
INFLUENT PUMPING		
Number of Pumps	3	4
Capacity, each, gpm	1 @ 1200	2000
	2 @ 1700	

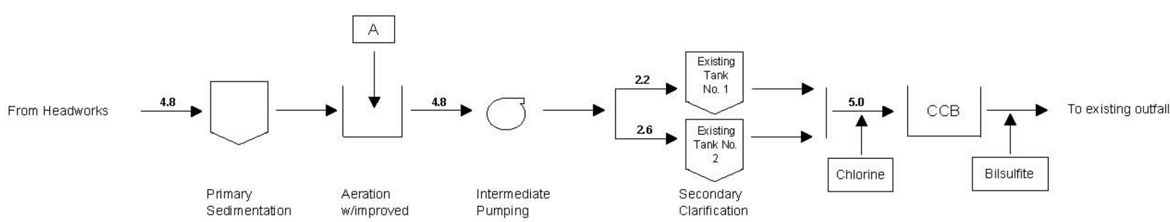
Table 7-2. Alternative H2 Design Data, cont'd...

Description	Existing Value	New Value
Type	Nonclog centrifugal	Submersible
Drive	Variable speed	Variable speed
HP	1@ 15	TBD
	2 @ 20	—
FLOW MEASUREMENT		
Type	Magnetic Meter	Magnetic Meter
GRIT REMOVAL		
Grit Tank		
Number	1	1
Type	Gravity vortex	Paddle Vortex
Tank Diameter, ft	—	12
Peak Capacity, mgd	4.8	10.7
Grit Slurry Pump		
Number	—	1
Type	—	Recessed Impeller
Capacity, gpm	—	200
Cyclone Grit Separator		
Number	—	1
Grit Classifier		
Number	—	1

Treatment

The existing treatment process is shown schematically in Figure 7-4. The hydraulic profile for the existing plant is included in Chapter 4.

Figure 7-4. Existing WWTP No. 2 Treatment Process



Note: All flows are in mgd. Flows shown represent currrent rated facility capacities.

The existing primary clarifier does not have adequate capacity for future peak wet weather flows. However, the tank is in relatively good condition and can be retained for future use with some improvements to the internal equipment.

Assuming primary treatment is provided, the existing aeration basins have adequate volume to treat projected peak loads and provide nitrification to meet the permit limits provided the process is operated at a MLSS concentration of 2500 mg/l or higher. Without primary treatment, the additional BOD load would require additional aeration basin volume. The aeration basins are capable of operating in complete-mix mode only. While resistant to shock loads, complete-mix mode encourages the growth of poor-settling filamentous bacteria, which can result in higher effluent suspended solids concentrations. Any aeration basin upgrade should include modifications to allow operation in multiple process modes. Providing process flexibility to plant operators allows them to respond to changing loading conditions to enhance effluent quality. Examples of common aeration basin operating modes include:

- Plug flow. Compared to complete-mix, plug flow offers improved BOD oxidation and nitrification.
- Anaerobic selector. Providing an unaerated, mixed zone at the upstream end of the aeration basin discourages the growth of filamentous bacteria.
- Anoxic selector. Similar to an anaerobic selector but with a pumping system that returns a high volume of nitrified mixed liquor to the upstream end of the basin, anoxic selector mode can be used during warm weather to provide denitrification, alkalinity recovery, and a reduction of filamentous bacteria growth.
- Contact stabilization. Storing return activated sludge (RAS) in a section of the basins apart from the main process stream is useful during periods of high flow to increase solids retention time, prevent solids washout, and decrease solids loading to the secondary clarifiers.
- Step feed. Often used to provide a more gradual transition between plug flow and contact stabilization, step feed mode increases solids retention time and reduces clarifier solids loading.

The existing mechanical aerators have insufficient capacity to accommodate projected loads. The aerators should be replaced with larger units or a fine-bubble aeration system. A dissolved oxygen (DO) control system should also be considered for long-term energy savings. This system would automatically vary air input to the basins to match the air demand of the incoming load. Energy savings are realized by eliminating over-aeration during periods of low demand.

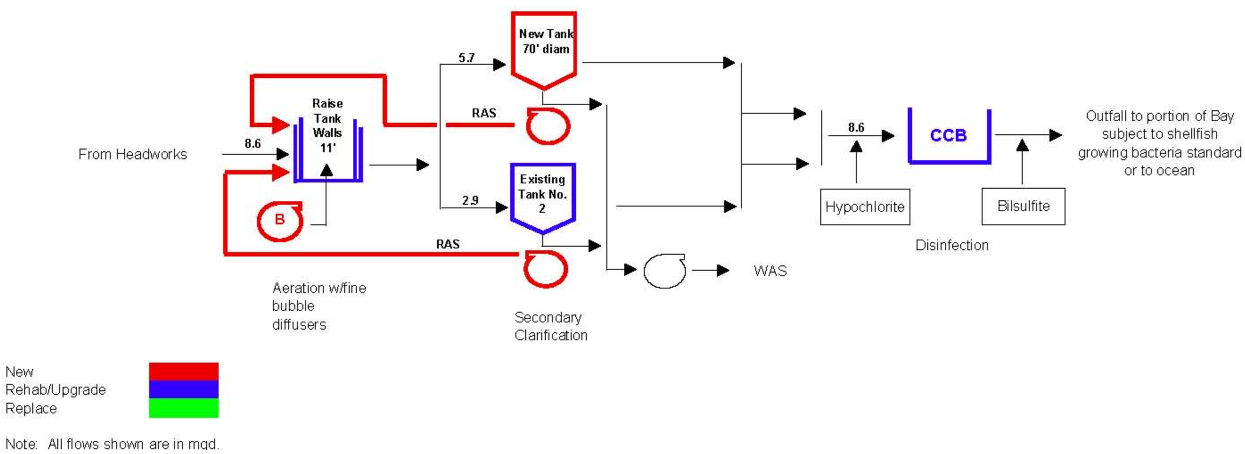
The plant's existing hydraulic grade line requires pumping of mixed liquor (ML) from the aeration basins to the secondary clarifiers. This arrangement could be detrimental to effluent quality as the turbulence imparted by the pumps could break up the floc, resulting in poorer solids settling characteristics.

Secondary clarification is provided by two clarifiers, a small, older clarifier (No. 1) and a larger, newer clarifier (No. 2). The combined capacity of both clarifiers is adequate for projected peak day flows. Clarifier No. 1 capacity exceeds maximum month dry weather flow however, operators report that due to performance limitations likely associated with its shallow depth, Clarifier No. 1 cannot operate alone for long periods, so Clarifier No. 2 cannot be taken out of service for extended maintenance. Clarifier No. 1 is also less efficient than No. 2 partly because of its peripheral feed configuration. Clarifier No. 2 has a conventional center feed arrangement. Clarifier No. 1 is integral with the chlorine contact basin.

The chlorine contact basin provides 37 minutes of detention time at current peak day flow. It will have 30 minutes of detention time at the projected future peak day flow. While 30 minutes is adequate to meet the conventional fresh water bacteria limits, a minimum of 60 minutes will be required to meet the shellfish growing bacteria standard. With the likely application of the more stringent bacteria standard, the existing chlorine contact basin volume will not be sufficient. The existing chlorine contact basin volume would be adequate for alternatives incorporating a new outfall which discharges effluent to waters subject to the fresh water bacteria standard. It should also be noted that chlorination can be more efficient if it follows filtration.

Treatment Process Alternative T1. Shown in Figure 7-5, this alternative eliminates primary sedimentation. Increasing the wall height of the aeration basins eliminates the need for the intermediate pump station and increases basin volume and treatment capacity. In addition, coupled with the addition of a fine bubble aeration system, increasing the basins' wall height improves oxygen transfer efficiency, reducing energy costs. Chlorine contact time is increased to 78 minutes at design peak day flow by converting Secondary Clarifier No. 1 to a contact basin. A new, larger, secondary clarifier would be constructed to take its place.

Figure 7-5. Treatment Process Alternative T1



The new secondary clarifier would be constructed in the space currently occupied by the existing primary sedimentation basin. Since the diameter of the new secondary is larger than the existing primary, some limited additional space is needed for new tankage with this alternative. Other currently unoccupied space is only needed for a new blower building. The existing Clarifier No. 2 would be modified to improve the overflow rate by the addition of equipment such as a Stamford Baffle.

Table 7-3 shows existing and future design data for treatment facilities for Alternative T1.

Table 7-3. Alternative T1 Design Data

Description	Existing Value	New Value
PRIMARY TREATMENT		
Primary Sedimentation Basin		Not used
Number	1	
Diameter, ft	50	
Sidewater Depth, ft	8.5	
Overflow rate, gpd/sf	—	
ADWF	433	
PWWF	3,566	
Capacity, mgd	4.9	
Primary Sludge/Scum Pumps		Not used
Number	2	
Type	Piston	
Capacity, each, gpm	75	
SECONDARY TREATMENT		
Aeration Basins		
Number	2	2
Width, ft	32	32
Length, ft	60	60
Sidewater Depth, ft	14	21
Volume, each, gal	202,000	301,600
MLSS, mg/l	1,300	2,500
Operational Mode	Complete Mix	Multiple
Aerators		
Number	4	
Type	Surface, low speed	
Horsepower, each	15	
Blowers		
Number	—	3
Type	—	Rotary lobe
Capacity, each, scfm	—	700

Table 7-3. Alternative T1 Design Data, cont'd...

Description	Existing Value	New Value
Diffusers		
Type	—	Fine bubble membrane disk
Number	—	840
Mixers		
Number	—	1
Motor horsepower	—	2
Intermediate Lift Station		Not used
Number of pumps	3	
Type	Submersible	
Capacity, each, gpm	2,000	
HP	20	
Drive type	Variable speed	
Secondary Clarifiers		
Clarifier No. 1		Converted to CCB
Diameter, ft	52	
Sidewater Depth, ft	11.5	
Overflow Rate, PWWF, gpd/sf	1,047	
Capacity, mgd	2.2	
Clarifier No. 2		
Diameter, ft	56	56
Sidewater Depth, ft	13.5	13.5
Overflow Rate, PWWF, gpd/sf	1,047	1,200
Capacity, mgd	2.6	2.9
New Clarifier		
Diameter, ft	—	70
Sidewater Depth, ft	—	18
Overflow Rate, PWWF, gpd/sf	—	1,500
Capacity, mgd	—	5.7
WAS Pumps		
Number of pumps	1	1

Table 7-3. Alternative T1 Design Data, cont'd...

Description	Existing Value	New Value
Type	Submersible	Submersible
Capacity, gpm	150	150
Drive	Variable Speed	Variable Speed
RAS pumps		
Clarifier No. 2		
Number of pumps	—	2
Type	—	Submersible
Capacity, each, gpm	—	500
Drive	—	Variable speed
New Clarifier		
Number of pumps	—	2
Type	—	Submersible
Capacity, each, gpm	—	1,000
Drive	—	Variable speed
CHLORINATION AND DECHLORINATION		
Chlorination Facilities		
Type	Sodium Hypochlorite	Sodium Hypochlorite
Contact Tank		
Number	1	2
Total volume, gal	116,000	299,000
Hydraulic detention time, minutes[1]	—	—
ADWF	197	431
PDF	37	78
PWWF	24	50
Capacity at 60 min. detention time, mgd	2.8	7.2
Length to Width Ratio	—	40:1
Sodium Hypochlorite Storage Tanks		
Number	3	3
Total Storage Volume, gal	2,550	2,550
Flash Mixer		
Horsepower	3	3

Table 7-3. Alternative T1 Design Data, cont'd...

Description	Existing Value	New Value
Velocity gradient, fps/ft	900	900
Feed pumps		
Number	2	2
Type	Diaphragm	Diaphragm
Capacity, each, gph	20	20
Dechlorination Facilities		
Type	Sodium bisulfite	Sodium bisulfite
Sodium Bisulfite Storage Tanks		
Number	2	2
Total Storage Volume, gal	2,900	2,900
Metering Pumps		
Number	2	2
Type	Diaphragm	Diaphragm
Capacity, each, gph	4	4

Treatment Process Alternative T2. Treatment Alternative T2 does not increase primary sedimentation capacity, but it does improve biological treatment, secondary clarification, intermediate pumping and disinfection. As shown in Figure 7-6, during peak flow events, up to 5.5 mgd flows through the primary clarifier, flow in excess of 5.5 mgd flows directly from the headworks to the aeration basins. Aeration basin volume would not be increased, but the existing aerators would be replaced with larger units. As with Treatment Alternative T1, Secondary Clarifier No. 1 would be converted to a chlorine contact basin and a new, larger, secondary clarifier would be constructed. Unlike Alternative T1, however, the new secondary clarifier would need to be located on previously unoccupied ground. The headworks, storage and control building will be relocated to an adjacent parcel also owned by the City. The existing Clarifier No. 2 would be modified to improve the overflow rate by the addition of equipment such as a Stamford Baffle. The intermediate pump station will be upgraded to accommodate peak flows.

Figure 7-6. Treatment Process Alternative T2

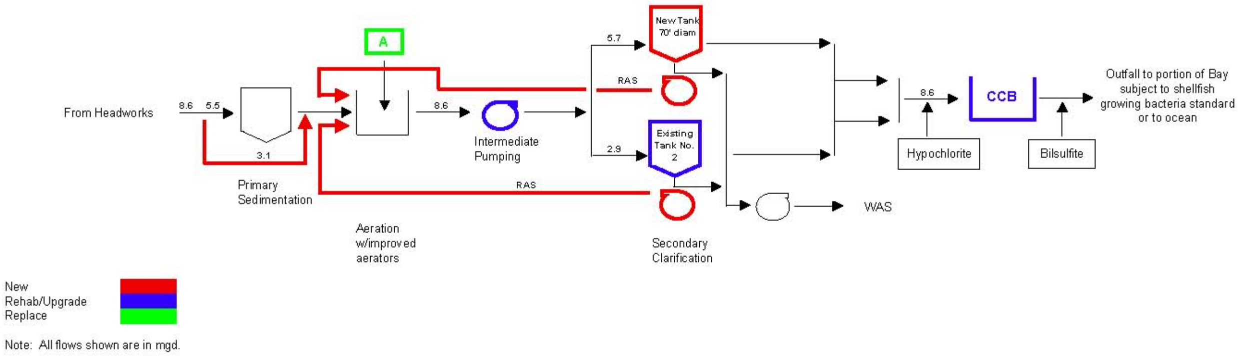


Table 7-4 shows existing and future design data for treatment facilities for Alternative T2.

Table 7-4. Alternative T2 Design Data

Description	Existing Value	New Value
PRIMARY TREATMENT		
Primary Sedimentation Basin		
Number	1	1
Diameter, ft	50	50
Sidewater Depth, ft	8.5	8.5
Overflow rate, PWWF, gpd/sf	2,445	2,800
Capacity, mgd	4.8	5.5
Primary Sludge/Scum Pumps		
Number	2	2
Type	Piston	Piston
Capacity, each, gpm	75	75
SECONDARY TREATMENT		
Aeration Basins		
Number	2	2
Width, ft	32	32
Length, ft	60	60
Sidewater Depth, ft	14	14
Volume, each, gal	202,000	202,000
MLSS, mg/l	1,300	2,500
Operational Mode	Complete Mix	Multiple

Table 7-4. Alternative T2 Design Data, cont'd...

Description	Existing Value	New Value
Aerators		
Number, total	4	6
Type	Surface, low speed	Surface
Horsepower, each	15	25
Intermediate Lift Station		
Number of pumps	3	3
Type	Submersible	Submersible
Capacity, each, gpm	2,000	3,000
HP	20	TBD
Drive type	Variable speed	Variable speed
Secondary Clarifiers		
Clarifier No. 1		Converted to CCB
Diameter, ft	52	
Sidewater Depth, ft	11.5	
Overflow Rate, PWWF, gpd/sf	1,047	
Capacity, mgd	2.2	
Clarifier No. 2		
Diameter, ft	56	56
Sidewater Depth, ft	13.5	13.5
Overflow Rate, PWWF, gpd/sf	1,047	1,200
Capacity, mgd	2.6	2.9
New Clarifier		
Diameter, ft		70
Sidewater Depth, ft		18
Overflow Rate, PWWF, gpd/sf		1,500
Capacity, mgd		5.7
WAS Pumps		
Number of pumps	1	1
Type	Submersible	Submersible
Capacity, gpm	150	150
Drive	Variable Speed	Variable Speed

Table 7-4. Alternative T2 Design Data, cont'd...

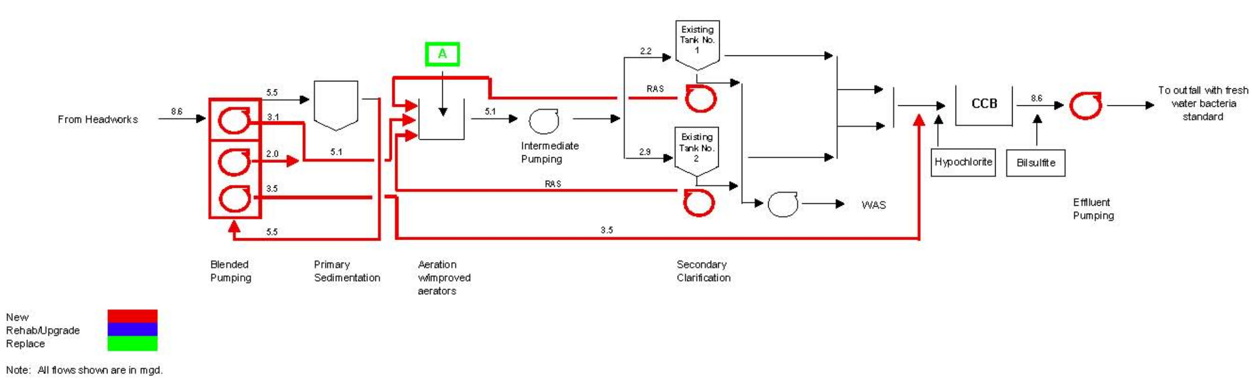
Description	Existing Value	New Value
RAS pumps		
Clarifier No. 2		
Number of pumps		2
Type		Submersible
Capacity, each, gpm		500
Drive		Variable speed
New Clarifier		
Number of pumps		2
Type		Submersible
Capacity, each, gpm		1,000
Drive		Variable speed
CHLORINATION AND DECHLORINATION		
Chlorination Facilities		
Type	Sodium Hypochlorite	
Contact Tank		
Number	1	2
Total volume, gal	116,000	299,000
Hydraulic detention time, minutes		
ADWF	197	430
PDF	37	78
PWWF	24	50
Capacity at 60 min detention time, mgd	2.8	7.2
Length to Width Ratio		40:1
Sodium Hypochlorite Storage Tanks		
Number	3	3
Total Storage Volume, gal	2,550	2,550
Flash Mixer		
Horsepower	3	3
Velocity gradient, fps/ft	900	900
Feed pumps		
Number	2	2

Table 7-4. Alternative T2 Design Data, cont'd...

Description	Existing Value	New Value
Type	Diaphragm	Diaphragm
Capacity, each, gph	20	20
Dechlorination Facilities		
Type	Sodium bisulfite	Sodium bisulfite
Sodium Bisulfite Storage Tanks		
Number	2	2
Total Storage Volume, gal	2900	2900
Metering Pumps		
Number	2	2
Type	Diaphragm	Diaphragm
Capacity, each, gph	4	4

Treatment Process Alternative T3. As shown in Figure 7-7, Treatment Alternative T3 does not increase the primary sedimentation or secondary clarification capacities, but adds additional pumping to allow for blended treatment. When influent flows exceed the capacity of the primary sedimentation basin, a portion of the wastewater would be pumped from the headworks directly to the aeration basins. This raw sewage would be combined with a portion of the primary effluent until the capacity of the secondary clarifiers is reached. At this point, excess primary effluent would be pumped from the primary sedimentation basin directly to the chlorine contact basin. The blended effluent discharged during high flow events likely would not comply with the bacteria standard for discharge to shellfish-growing waters. Therefore, this alternative must be paired with a potential outfall that would discharge to waters subject to the conventional fresh water bacteria limit. Furthermore, less stringent bacteria limits would eliminate the need for improvements to the chlorine contact basin. Depending on the location of the new outfall, effluent pumping would likely be required and is included in this alternative.

Figure 7-7. Treatment Process Alternative T3



This alternative does not add any additional tanks on previously unoccupied land. The only new facilities are the blending pump station and an effluent pump station. These facilities would all fit on existing available space at WWTP No. 2.

Table 7-5 shows existing and future design data for treatment facilities for Alternative T3.

Table 7-5. Alternative T3 Design Data

Description	Existing Value	New Value
PRIMARY TREATMENT		
Blended Pump Station		
Pump No. 1		
Destination		Aeration Basin
Number		2
Type		Submersible
Capacity, each, gpm		2,600
Pump No. 2		
Destination		Aeration Basin
Number		2
Type		Submersible
Capacity, each, gpm		1,000
Pump No. 3		
Destination		CCB
Number		2
Type		Submersible
Capacity, each, gpm		2,500
Primary Sedimentation Basin		
Number	1	1
Diameter, ft	50	50
Sidewater Depth, ft	8.5	8.5
Overflow rate, PWWF, gpd/sf	2,445	2,800
Capacity, mgd	4.8	5.5
SECONDARY TREATMENT		
Aeration Basins		
Number	2	2
Width, ft	32	32

Table 7-5. Alternative T3 Design Data, cont'd...

Description	Existing Value	New Value
Length, ft	60	60
Sidewater Depth, ft	14	14
Volume, each, gal	202,000	202,000
MLSS, mg/l	1,300	2,500
Operational Mode	Complete Mix	Multiple
Aerators		
Number, total	4	6
Type	Surface, low speed	Surface
Horsepower, each	15	25
Intermediate Lift Station		
Number of pumps	3	3
Type	Submersible	Submersible
Capacity, each, gpm	2,000	2,000
HP	20	20
Drive type	Variable speed	Variable speed
Secondary Clarifiers		
Clarifier No. 1		
Diameter, ft	52	52
Sidewater Depth, ft	11.5	11.5
Overflow Rate, PWWF, gpd/sf	1,047	1,047
Capacity, mgd	2.2	2.2
Clarifier No. 2		
Diameter, ft	56	56
Sidewater Depth, ft	13.5	13.5
Overflow Rate, PWWF, gpd/sf	1,047	1,200
Capacity, mgd	2.6	2.9
WAS Pumps		
Number of pumps	1	1
Type	Submersible	Submersible
Capacity, gpm	150	150
Drive	Variable Speed	Variable Speed

Table 7-5. Alternative T3 Design Data, cont'd...

Description	Existing Value	New Value
RAS pumps		
Clarifier No. 1		
Number of pumps		2
Type		Submersible
Capacity, each, gpm		400
Drive		Variable speed
Clarifier No. 2		
Number of pumps		2
Type		Submersible
Capacity, each, gpm		500
Drive		Variable speed
CHLORINATION AND DECHLORINATION		
Chlorination Facilities		
Type	Sodium Hypochlorite	
Contact Tank		
Number	1	1
Total volume, gal	116,000	116,000
Hydraulic detention time, minutes		
ADWF	197	167
PDF	37	30
PWWF	24	19
Capacity at 30 min detention time, mgd	5.6	5.6
Sodium Hypochlorite Storage Tanks		
Number	3	3
Total Storage Volume, gal	2,550	2,550
Flash Mixer		
Horsepower	3	3
Velocity gradient, fps/ft	900	900
Feed pumps		
Number	2	2
Type	Diaphragm	Diaphragm

Table 7-5. Alternative T3 Design Data, cont'd...

Description	Existing Value	New Value
Capacity, each, gph	20	20
Dechlorination Facilities		
Type	Sodium bisulfite	Sodium bisulfite
Sodium Bisulfite Storage Tanks		
Number	2	2
Total Storage Volume, gal	2900	2900
Metering Pumps		
Number	2	2
Type	Diaphragm	Diaphragm
Capacity, each, gph	4	4

Treatment Process Alternative T4. Like Alternative T3, T4 incorporates blended treatment to maximize the treatment capacity of existing facilities. As shown below in Figure 7-8, this alternative increases the primary treatment capacity by adding a new basin, but does not increase the capacity of the biological treatment system or secondary clarification. During peak flow conditions, part of the primary effluent is sent directly to the chlorine contact basin via a new primary effluent pump station. Chlorine contact basin volume is not expanded, but a final effluent pump station and new outfall are added. The new outfall would discharge at a location subject to the fresh water bacteria standard.

Figure 7-8. Treatment Process Alternative T4

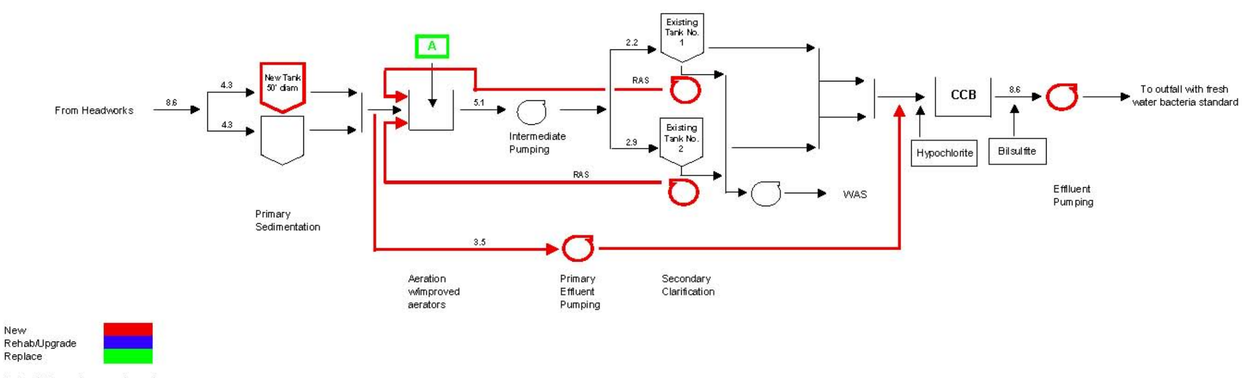


Table 7-6 shows existing and future design data for treatment facilities for Alternative T4.

Table 7-6. Alternative T4 Design Data

Description	Existing Value	New Value
PRIMARY TREATMENT		
Primary Sedimentation Basin		
Existing basins, number	1	1
Diameter, ft	50	50
Sidewater Depth, ft	8.5	8.5
Overflow Rate, PWWF, gpd/sf	2,445	2,200
Capacity, mgd	4.8	4.3
New basin, number		1
Diameter, ft		50
Sidewater Depth, ft		10
Overflow Rate, PWWF, gpd/sf		2,200
Capacity, mgd		4.3
Primary Effluent Pumping		
Number		2
Destination		CCB
Type		Submersible
Capacity, each, gpm		2,500
SECONDARY TREATMENT		
Aeration Basins		
Number	2	2
Width, ft	32	32
Length, ft	60	60
Sidewater Depth, ft	14	14
Volume, each, gal	202,000	202,000
MLSS, mg/l	1,300	2,500
Operational Mode	Complete Mix	Multiple
Aerators		
Number, total	4	6
Type	Surface, low speed	Surface
Horsepower, each	15	25

Table 7-6. Alternative T4 Design Data, cont'd...

Description	Existing Value	New Value
Intermediate Lift Station		
Number of pumps	3	3
Type	Submersible	Submersible
Capacity, each, gpm	2,000	2,000
HP	20	20
Drive type	Variable speed	Variable speed
Secondary Clarifiers		
Clarifier No. 1		
Diameter, ft	52	52
Sidewater Depth, ft	11.5	11.5
Overflow Rate, PWWF, gpd/sf	1,047	1,047
Capacity, mgd	2.2	2.2
Clarifier No. 2		
Diameter, ft	56	56
Sidewater Depth, ft	13.5	13.5
Overflow Rate, PWWF, gpd/sf	1,047	1,200
Capacity, mgd	2.6	2.9
WAS Pumps		
Number of pumps	1	1
Type	Submersible	Submersible
Capacity, gpm	150	150
Drive	Variable Speed	Variable Speed
RAS pumps		
Clarifier No. 1		
Number of pumps		2
Type		Submersible
Capacity, each, gpm		400
Drive		Variable speed
Clarifier No.2		
Number of pumps		2
Type		Submersible

Table 7-6. Alternative T4 Design Data, cont'd...

Description	Existing Value	New Value
Capacity, each, gpm		500
Drive		Variable speed
CHLORINATION AND DECHLORINATION		
Chlorination Facilities		
Type	Sodium Hypochlorite	
Contact Tank		
Number	1	1
Total volume, gal	116,000	116,000
Hydraulic detention time, minutes		
ADWF	197	167
PDF	37	30
PWWF	24	19
Capacity at 30 min detention time, mgd	5.6	5.6
Sodium Hypochlorite Storage Tanks		
Number	3	3
Total Storage Volume, gal	2,550	2,550
Flash Mixer		
Horsepower	3	3
Velocity gradient, fps/ft	900	900
Feed pumps		
Number	2	2
Type	Diaphragm	Diaphragm
Capacity, each, gph	20	20
Dechlorination Facilities		
Type	Sodium bisulfite	Sodium bisulfite
Sodium Bisulfite Storage Tanks		
Number	2	2
Total Storage Volume, gal	2900	2900
Metering Pumps		
Number	2	2
Type	Diaphragm	Diaphragm
Capacity, each, gph	4	4

Alternative T5. This alternative consists of abandoning WWTP No. 2 and pumping all flow to WWTP No. 1 for treatment. This alternative would include replacing the treatment capacity that exists at WWTP No. 2, a pump station, a probable intermediate pump station and piping.

Alternative T6. This alternative consists of replacing a portion the aeration basin with an membrane bioreactor (MBR) sized for maximum month dry weather flow and bypassing flow in excess of the MBR around the unit.

Discharge Options

The following section examines discharge options for WWTP No. 2.

Alternative D1, Existing Outfall. The existing outfall has a capacity of 9 mgd, which is adequate for current and future peak flows. The Bay in the vicinity of the existing outfall is subject to bacteria standards for shellfish growing waters.

Alternative D2, Ocean Outfall. There is the potential for WWTP No. 2 to pump to an alternate outfall that discharges to the Pacific Ocean off the North Spit. However, like the Bay in the vicinity of Plant No. 2, shellfish growing is a designated beneficial use of the Pacific Ocean. Therefore, ocean discharges are subject to the same stringent bacteria standard as the Bay. Consequently, there would be no benefit to using this new outfall off the North Spit, despite the considerable costs in pumping and transmission that would be required. In light of the additional costs and minimal benefits compared to continued use of the existing outfall, the alternative of using the new North Spit outfall is removed from further consideration.

Alternative D3, New Outfall. If effluent could be discharged to non-shellfish growing waters, there could be cost benefits that would outweigh the pumping and transmission costs to the new outfall. In non-shellfish growing waters, the less restrictive conventional bacteria limit would apply, allowing blended treatment during peak flows and reducing the required chlorine contact time. There are some areas of Coos Bay that currently fit this description. However, there is some uncertainty as to whether these areas will remain designated as non-shellfish growing since they are currently located upstream of shellfish growing waters. With these uncertainties, it is prudent to plan for the more stringent bacteria standard. In light of this, there is no compelling reason to explore alternate outfall locations since the existing outfall is in good condition and has adequate capacity for future flows.

Alternative D4, Zero Discharge. A zero discharge alternative should be included as part of a facilities plan treatment system evaluation. For the City of Coos Bay, a zero discharge alternative would include wastewater treatment system upgrades as presented previously; a pipeline and pump station to transport the effluent to an irrigation site; an effluent storage pond; an irrigation site; an irrigation pump station; and irrigation equipment. Due to the high annual rainfall and moderate temperatures in the area, it is estimated that the irrigation season would only be about 4 months each year. There are also essentially no areas suitable for irrigation within reasonable distance to the WWTP. Reasons for this include:

- Much of the nearby land is under federal or state ownership.
- Most of the flat areas are wetlands.

In addition to the drawbacks above, the effluent reuse would add considerably to the project cost. The costs associated with an effluent irrigation system would be added to the costs for a treatment system upgrade. The only potential savings would be the elimination of construction of a new outfall, as required by Alternative T3 and T4. Therefore, a zero discharge alternative would be significantly more expensive than outfall discharge, especially when paired with Alternative T1 or T2.

ALTERNATIVES SCREENING

The following section briefly examines the alternatives presented above to determine if significant shortcomings warrant their elimination from further consideration.

Headworks Alternatives

Both alternatives H1 and H2 are feasible alternatives that will be fully evaluated and compared in later sections.

Treatment Alternatives

Alternatives T3 and T4 both rely on blended treatment to maximize the use of existing facilities and minimize the need for new construction. Because of this, however, they also both require a new outfall to a location subject to the non-shellfish growing bacteria standard. Since the shellfish growing bacteria standard may someday be applied to all of Coos Bay, it is not prudent to base long-term planning on such an outfall. Therefore, Alternatives T3 and T4 will be eliminated from further consideration. Alternative T5 would include replacing a significant amount of existing treatment infrastructure in addition to pumping facilities and would be significantly more expensive than any rehabilitation alternative so was not considered further. The cost of the installed MBR alone is in excess of $12 million and preliminary calculations do not confirm that the effluent quality of blended effluent would meet discharge standards so this alternative was not considered further. Alternatives T1 and T2 will be fully evaluated and compared in later sections.

Discharge Alternatives

Since Treatment Alternatives T3 and T4 have been eliminated from further consideration, Discharge Alternatives D2, D3 and D4 have also been eliminated as they only pair feasibly with Treatment Alternatives T3 and T4.

Outfall Alternatives

As discussed previously, there are no compelling reasons to discontinue use of the existing outfall. Therefore, the existing outfall will be retained regardless of which headworks and treatment alternatives are ultimately selected.

COMPARISON OF ALTERNATIVES

Tables 7-7 and 7-8 present the capital costs for Alternatives H1 and H2, and T1 and T2, respectively. A complete present worth comparison between alternatives will be presented in

Chapter 10, Recommended Plan. Non-economic comparisons of alternatives are provided in Tables 7-9 and 7-10.

Alternatives H1 and T2 have the lowest capital costs. Alternative H1 provides for construction of above grade screening which is easier to construct, operate and maintain. Alternative T2 provides an upgrade of the aeration basins with relatively simple construction. Since the new secondary clarifier will be built adjacent to the new facilities, the disruption to existing operation will be minimized. Alternative T2 provides reliable secondary treatment by adding a secondary clarifier and expanding disinfection. Therefore alternatives H1 and T2 are recommended. Details of the alternatives will be developed fully in Chapter 9.

Table 7-7. Headworks Alternatives Capital Cost Comparisons, $1,000

	Alt. H1	Alt. H2
Contractor Profit and Overhead, 15%	$ 292	$ 327
Mobilization, 5%	$ 97	$ 104
Influent Pump Station	$ 697	$ 687
Influent Sewer Replacement	$ 134	$ 134
Screening	$ 383	$ 504
Grit	$ 307	$ 307
Building Improvements	$ 100	$ 100
Electrical/SCADA, 20%	$ 324	$ 346
SUBTOTAL	$ 2,334	$ 2,509
Contingencies, 25%	$ 584	$ 627
Engineering, 20%	$ 584	$ 630
Total	$ 3,502	$ 3,766

Table 7-8. Treatment Alternatives Capital Cost Comparisons, $1,000

	Alt. T1	Alt. T2
Contractor Profit and Overhead, 15%	$ 592	$ 448
Mobilization, 5%	$ 188	$ 149
New Primary Mechanism	—	$ 390
Aeration Basin Improvements	$ 1,589	$ 382
Intermediate Pump Station Improvements	—	$ 115
New Secondary Clarifier	$ 1,063	$ 1,063
Clarifier No. 2 Improvements	$ 135	$ 135
RAS Pumping for Clarifier No. 2	$ 130	$ 130
Chlorine Contact Basin Improvements	$ 67	$ 67
Relocate Storage Building	—	$ 58
Standby Power	$ 150	$ 150
Electrical/SCADA, 20%	$ 627	$ 498
SUBTOTAL	$ 4,541	$ 3,585
Contingencies, 25%	$ 1,125	$ 896
Engineering, 20%	$ 1,130	$ 896
Total	$ 6,796	$ 5,377

Table 7-9. Non-Economic Comparison of Headworks Alternatives

Evaluation Criteria	Headworks Alternative H1	Headworks Alternative H2
Capacity – design year for this plan is 2027	Influent pump station and headworks facilities would be sized for design year peak flows.	Influent pump station and headworks facilities would be sized for design year peak flows.
Performance – requirements are guided by DEQ NPDES permit	Screening and grit removal deficiencies would be corrected through proper equipment selection.	Screening and grit removal deficiencies would be corrected through proper equipment selection.
Implementation – feasibility of construction staging to maintain operations of the plant	Since all new facilities and structures are being constructed, they will be operational prior to decommissioning of existing facilities.	Since all new facilities and structures are being constructed, they will be operational prior to decommissioning of existing facilities.
Constructability – outlines any construction concerns or issues	Relatively few uncertainties likely during construction.	Below grade construction always caries more uncertainties, but few are expected.
Reliability – adequate redundancy provided for critical equipment	Complies with Class I reliability requirements	Complies with Class I reliability requirements
Future Capacity Expansion – space available and ease of expansion of new and existing facilities	Future expansion will be considered in the design and placement of new facilities.	Future expansion of below grade screening may be more difficult and costly than that of above grade screening.
Operational Issues – operational and maintenance ease and flexibility.	Influent pumps will be fitted with variable speed drives to accommodate varying flows. Screening structure will be located significantly above grade, as in current situation. Pumping unscreened wastewater can increase potential for clogging.	Influent pumps will be fitted with variable speed drives to accommodate varying flows. Installing screens upstream of pumps eliminates potential for clogging.
Other Issues	Complete replacement of all facilities with new reduces maintenance requirements in early years of operation.	Complete replacement of all facilities with new reduces maintenance requirements in early years of operation.

Table 7-10. Non-Economic Comparison of Treatment Alternatives

Evaluation Criteria	Treatment Alternative T1	Treatment Alternative T2
Capacity – design year for this plan is 2027	All treatment steps have adequate capacity for design year peak flows.	Some raw sewage flows from the headworks directly to the aeration basins during high flows.
Performance – requirements are guided by DEQ NPDES permit	New facilities will be able to meet the proposed bacteria standards in the new permit.	New facilities will be able to meet the proposed bacteria standards in the new permit.
Implementation – feasibility of construction staging to maintain operations of the plant	Construction staging is possible to keep all facilities in service.	Construction staging is possible to keep all facilities in service. Will need to be coordinated with construction of headworks facilities as the new secondary may be built where existing headworks facilities are located.
Constructability – outlines any construction concerns or issues	Raising the walls of the aeration basins may be a complicated structural design. Few uncertainties are likely during construction.	Few uncertainties are likely during construction.
Regulatory Issues – ease of permit compliance	Permit compliance responsibilities are similar to current situation.	Permit compliance responsibilities are similar to current situation.
Reliability – adequate redundancy provided for critical equipment	All processes have backup facilities.	Only one primary tank is included in this alternative. Maintenance on that tank would occur during periods of low loading.
Future Capacity Expansion – space available and ease of expansion of new and existing facilities	Limited additional land has been used for new facilities. Open area adjacent to existing aeration basins has been left clear for future expansion.	A new secondary is constructed on currently unoccupied. Open area adjacent to existing aeration basins has been left clear for future expansion.
Operational Issues – operational and maintenance ease and flexibility.	Intermediate pumping is eliminated. RAS pumping is added for more accurate sludge returning. Aeration basins will be modified to provide multiple modes of operation enhancing process flexibility.	RAS pumping is added for more accurate sludge returning. Aeration basins will be modified to provide multiple modes of operation enhancing process flexibility.
Other Issues	Elimination of primary results in higher loads to the secondary process and increased energy use.	

CHAPTER 8

SOLIDS MANAGEMENT ALTERNATIVES

Solids that are produced as part of the wastewater treatment process must be treated and reused or disposed of in an environmentally and economically acceptable manner. Solids treatment includes reduction of the water content, stabilization of volatile compounds, reduction of pathogens, and storage during wet weather. Following these steps, the biosolids are disposed of in a landfill, or are applied on agricultural land. Alternatives for solids management are evaluated in this chapter.

The Department of Environmental Quality (DEQ) encourages the beneficial reuse of biosolids through land application. While incineration has been practiced, air quality concerns and cost have eliminated most of these facilities. Some communities dispose of dewatered solids in landfills, but the beneficial attributes of the solids as a soil amendment are lost in this approach. In addition, landfill disposal is subject to the discretion of the landfill operator. Some successful solids management programs utilize landfill disposal as a wet-weather or emergency disposal strategy. The City of Coos Bay currently applies solids from Plant Nos. 1 and 2 to private agricultural and forest lands in a manner consistent with regulatory requirements for beneficial reuse.

The primary objectives of the solids management program include:

- Ensure adequate capacity is available to process current and projected sludge quantities.
- Comply with applicable state and federal (Code of Federal Regulations, Chapter 40, Part 503) regulations.
- Ensure that biosolids are reused in an environmentally sound and publicly acceptable manner.
- Prevent the creation of nuisance conditions, such as objectionable odors.
- Minimize costs by using existing facilities to the extent possible.

EXISTING SYSTEM

Solids collected at wastewater treatment plant (WWTP) No. 2 consists of waste activated sludge (WAS), primary sludge, primary scum, and secondary scum. Primary sludge and WAS are co-thickened in the primary sedimentation basin prior to anaerobic digestion. Digested solids are then trucked to the facultative sludge lagoons on the east side of town and combined with digested sludge from WWTP No. 1. The lagoons provide wet weather storage. Biosolids are removed from the lagoons and land applied between June and October each year.

Estimated solids production rates are necessary to evaluate process options. Under current average loading conditions, the plant generates approximately 2,000 pounds of dry solids per day. Solids production projections are summarized in Table 8-1.

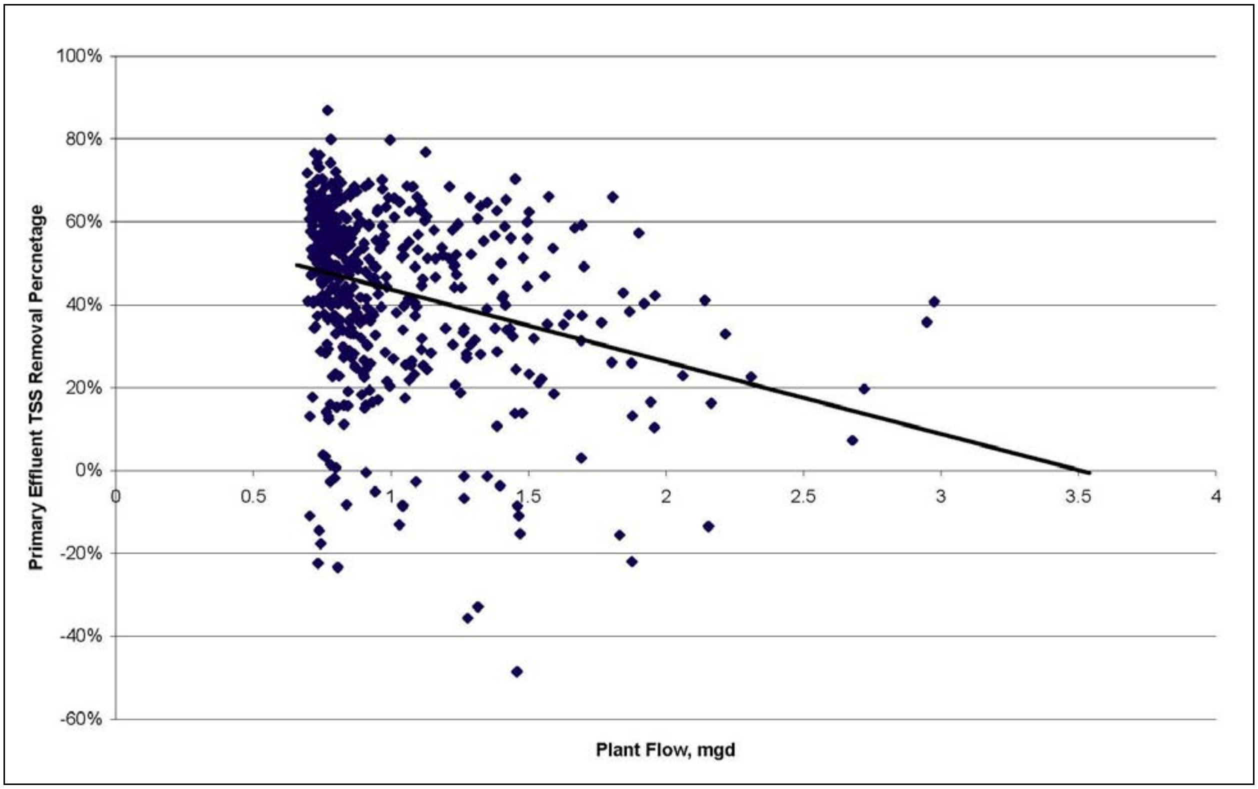
Table 8-1. WWTP No. 2 Sludge Production Projections

Year		Sludge Production, lbs/day	Sludge Production, gal/day[a]
2003	Primary Solids	965	3,900[a]
	WAS Solids	1,035	12,400[b]
	Total Solids	2,000	16,300
2027	Primary Solids	1,110	3,300[c]
	WAS Solids	1,190	3,600[c]
	Total Solids	2,300	6,900

[a]Based on average sludge pumped to digester at 3 percent solids.
[b]Based on average thickened sludge pumped to digester at 1 percent solids.
[c]Based on average thickened sludge pumped to digester at 4 percent solids.

Primary Sludge. Operations personnel currently maintain a sludge blanket in the primary clarifier in an effort to thicken primary sludge and WAS prior to digestion. While this technique is effective at reducing the volume of sludge produced, the solids are susceptible to wash out during periods of high flow due to hydraulic currents in the primary clarifier. Consequently, the effective capacity of the primary clarifier is reduced compared to an operational approach that does not include in-tank thickening. Figure 8-1 shows the relationship between primary clarifier solids removal efficiency and plant flow. There is a general trend of decreasing efficiency with increased plant flow.

Figure 8-1. Plant Flow vs. Primary Effluent TSS Removal Percentage



Primary clarifiers designed specifically for in-tank sludge thickening are typically equipped with large hoppers that isolate the sludge from hydraulic currents. The hopper in the existing primary clarifier is relatively small, complicating simultaneous optimization of thickening and peak flow treatment. Primary clarifier solids washouts could be reduced by continuously pumping solids to a separate thickening system.

Waste Activated Sludge. WAS solids concentration currently average approximately 1 percent. In an effort to reduce WAS volume; a rotary drum thickener was installed as part of the last plant upgrade. This thickener is no longer used and WAS is now sent to the primary clarifier for co-thickening prior to digestion. As stated above, this method is not ideal for a primary that is not specifically designed for in-tank thickening, and creates operational challenges in primary treatment. Reducing WAS volumes through an alternate thickening method would likely produce a thicker sludge, increase the capacity of the digesters, and reduce overall solids handling costs. In addition primary capacity and performance would improve.

Anaerobic Digestion. There are two digesters at the WWTP No. 2 site. Only Digester No. 1 is heated and mixed. Digester No. 2 provides storage. Considering only the volume of Digester No. 1 which is 102,000 gallons (assume a 10% unusable volume) and an existing average day loading of 8300 gallons/day of unthickened sludge, the existing capacity of 6100 gallons/day is not adequate for current sludge quantities.

Truck Hauling. Existing truck loading is done using the sludge recirculation pump and operators report that the existing sludge truck has reached its useful life. The truck loading station is in good condition and improvements there are not needed.

Facultative Lagoons. The City's lagoons have adequate capacity to store current and future loads from WWTP No. 1 and No. 2. Improvements to the lagoons are not needed.

BIOSOLIDS QUALITY

Biosolids produced in the City of Coos Bay meet the Environmental Protection Agency's (EPA) requirements for land application. Table 8-2 shows the general biosolids characteristics, while Table 8-3 summarizes the concentration of heavy metals detected in the biosolids. As shown, not a single sample has exceeded the allowable limit for any of the metals, even for exceptional quality biosolids.

Table 8-2. Biosolids Characteristics

Parameter	Average, mg/kg
Total Solids	40,550
Volatile Solids	20,165
VS/TS, %	0.497
Ammonia Nitrogen	12,700
Nitrate Nitrogen	100
Total Kj. Nitrogen	42,150
Phosphorus	31,050
Potassium	2,000

Table 8-3. Biosolids Quality – Metals

Parameter	Measured Average Concentration, mg/kg	Standard, mg/kg	
		Limit	Exceptional Quality
Arsenic	8.9	75	41
Cadmium	2.6	85	39
Chromium	34.2	3,000	1,200
Copper	401.0	4,300	1,500
Lead	105.6	840	300
Mercury	3.6	57	17
Molybdenum	11.4	75	18
Nickel	29.2	420	420
Selenium	5.0	100	36
Zinc	954.5	7,500	2,800

TREATMENT LEVEL

Land application of biosolids is subject to Federal Part 503 regulations. These regulations list two categories of treatment requirements: vector attraction (rodents, birds, and insects) and pathogen reduction. Vector attraction reduction requirements concentrate on reducing the volatile solids content of the sludge. With respect to pathogen reduction requirements, the Regulations recognize two categories of biosolids: Class A and Class B. Class A biosolids have low levels of pathogenic bacteria and are considered safe for public use. Class B biosolids have higher levels of pathogenic bacteria and are not considered appropriate for public use.

Because the processes required for the production of Class A biosolids have both a significant initial capital cost and ongoing operation and maintenance costs, the vast majority of Oregon communities produce Class B biosolids. Because of these high costs, the sludge management alternatives presented herein assume the City will continue to produce Class B biosolids.

The presence of metals in the sludge is also a concern with regard to land application. As mentioned previously, Table 8-3 lists the metals of concern and the concentrations present in the City's biosolids. Also listed in the table are the Pollutant Concentration Limits of the 503 regulations. The City's sludge easily meets the Pollutant Concentration Limits, even for exceptional quality biosolids.

SOLIDS MANAGEMENT ALTERNATIVES

There are numerous processes available for solids management that, in combination, is capable of providing effective solids treatment prior to disposal. Figure 8-2 illustrates the wide range of alternatives that incorporate anaerobic or aerobic digestion. In addition to digestion, lime stabilization could be used to meet the regulatory requirements for pathogen and vector attraction reduction; however, storage options would be reduced.

Prior to analyzing these various options, the three elements of a successful solids management program should be reviewed. A short description of each element as related to the Coos Bay WWTP No. 2 solids management program is presented below.

Disposal. Disposal consists of the final application of the treated solids product. The City currently disposes all of their solids in a beneficial manner on agricultural and forestlands during the summer months. This method is consistent with DEQ's promotion of beneficial use and is a program that should have no significant obstacles or limitations in the planning horizon. Other options, as listed in Figure 8-2, either adds cost or uncertainty.

Storage. Most successful solids management programs include some type of wet weather storage of biosolids, because agricultural land application is possible only during the summer months. The City's facultative lagoons provide this storage. These lagoons have adequate capacity to accommodate the current and future sludge quantities from both plants. Therefore, in the interest of maximizing the use of existing facilities, alternative storage methods need not be evaluated.

Treatment. Numerous sludge treatment technologies are available, designed to produce either a Class A or Class B biosolids. As discussed previously, the primary advantage to Class A biosolids is that they can be distributed with few restrictions because a high level of pathogen reduction has been achieved. However, compared to Class B processes, production of Class A biosolids has significantly higher capital and operation and maintenance (O&M) costs. If disposal methods are available that are compatible with Class B biosolids and there is no other compelling reason to convert to a Class A program, the additional expense to achieve a Class A product is not justifiable.

The City's anaerobic digestion process currently produces Class B biosolids, which is acceptable for application onto agricultural and forest land. In addition, with additional thickening facilities, the existing digesters have enough capacity to accommodate projected future sludge quantities. As illustrated in Figure 8-2 however, other treatment options are available. Lime stabilization is another common Class B process, but it is not generally compatible with lagoon storage. Converting to Class B lime stabilization would necessitate an alternate approach to storage, and would only be cost-effective if the existing lagoons were inadequate for the design year sludge quantities. A Class B lime stabilization program would require construction of new dewatering and dewatered biosolids storage facilities. Aerobic digestion is another acceptable Class B process. While simpler to operate than anaerobic digestion, aerobic digesters require a great deal more energy and space—additional tank volume would have to be constructed. In addition, there have been reported cases of odor problems where aerobic digesters are coupled with facultative sludge lagoons.

Figure 8-2. Solids Management Alternatives

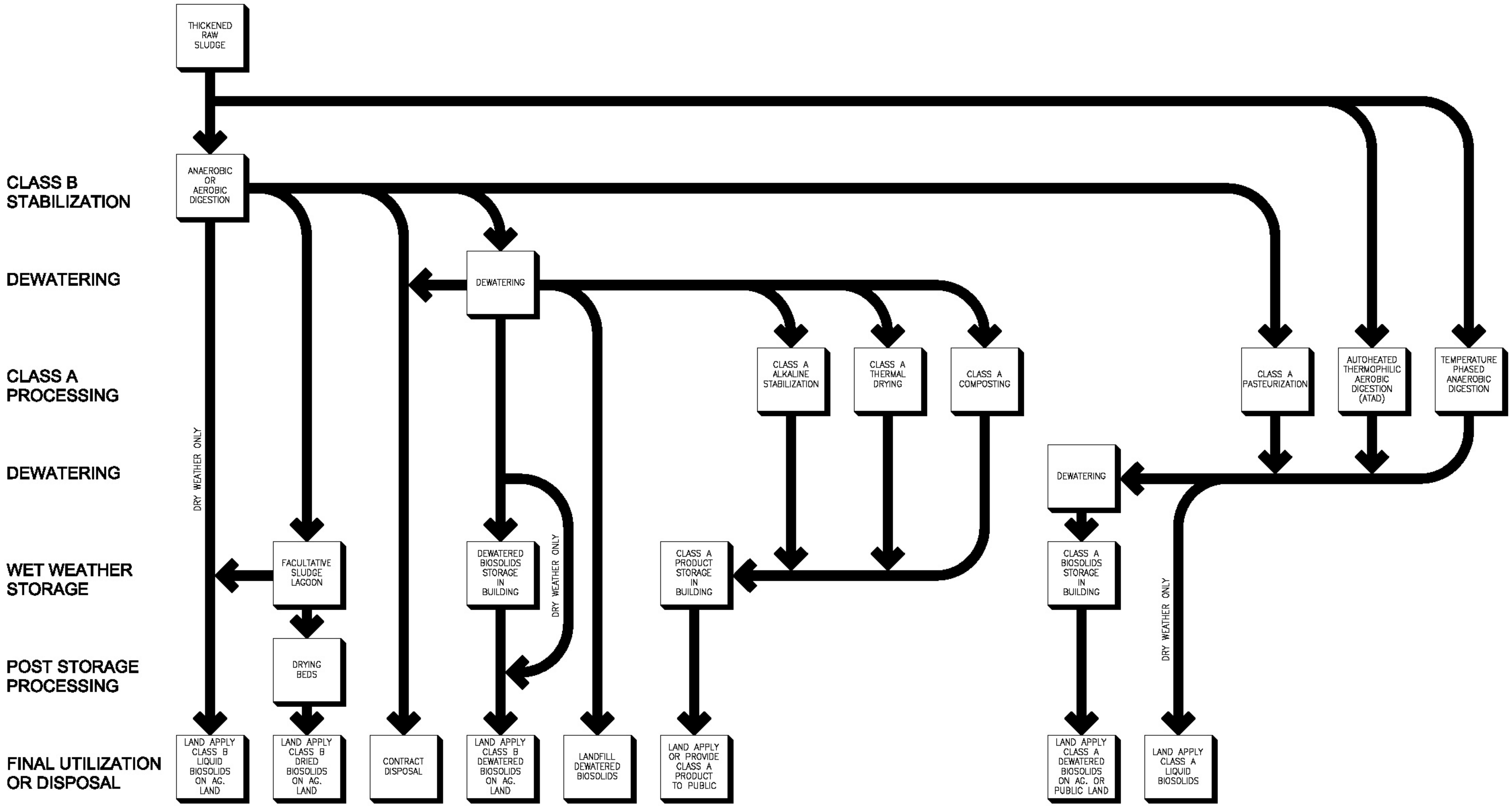


FIGURE 8-2

SOLIDS MANAGEMENT ALTERNATIVES

WEST YOST ASSOCIATES
Consulting Engineers

Elements Common to All Alternatives

The following elements are common to all solids management alternatives:

- Improvements to the digester control building. Improvements would include a new building roof, piping replacements and addition of an upstairs fire escape.
- Use of the existing anaerobic digester tanks. In an effort to minimize costs, these tanks will continue to be used either as anaerobic digesters or simply as storage tanks.
- Improved thickening. Sludge thickening will be enhanced to reduce sludge volumes and maximize the use of existing treatment capacity.
- Digester roof drain relocations. Operators report that the digester roof drains currently drain to the vault between the digesters and flood the room. Improvements or relocations would be made to the piping to prevent flooding and ensure safe drainage.
- Electrical and SCADA/process control improvements. The power distribution system would be upgraded as required to serve new equipment. Control system improvements would focus on reducing labor and energy costs.
- Replacing and relocating waste gas burner.

Solids Management Alternative S1

As shown schematically in Figure 8-3 this alternative consists of continuing to thicken primary sludge in the primary sedimentation basins and thicken WAS separately, on-site anaerobic digestion, hauling Class B biosolids to the City's facultative lagoons, and land application. This alternative provides single stage high rate digestion for all of the WWTP 2 sludge. Major improvements include:

- Adding a gravity belt thickener or centrifuge and related appurtenances for WAS thickening.
- Replacing mixing and heating equipment for Digester No. 1. Mechanical mixers are assumed for the purposes of this report.
- Adding mixing and heating equipment for Digester No. 2.
- Repairing and improving both digester roofs to ensure adequate support for mechanical mixers.
- Replacing the boiler and hot water system to provide adequate heating for both digesters.
- Replacing portions of the gas handling system that have reached their useful life.
- Replacing truck-loading pumps.

Figure 8-3. Alternative S1

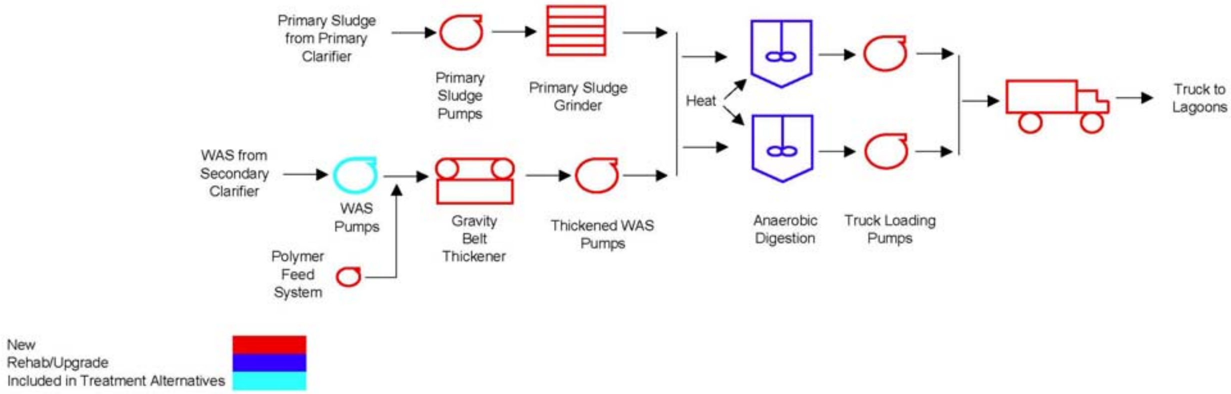


Table 8-4 shows existing and future design data for Alternative S1.

Table 8-4. Solids Management Alternative S1 Design Data

Description	Existing Value	New Value
Primary Sludge Processing		
Primary Sludge Pumps		
Number	2	2
Type	Piston	Centrifugal
Capacity, gpm	—	100
Drive	—	Constant Speed
Primary Sludge Grinder		
Number	—	1
Type	—	In-line
Secondary Sludge Thickening		
WAS Auxiliary Storage Tank		
Volume, gal	28,300	28,300
WAS Auxiliary Storage Tank		
Volume, gal	9,750	9,750
WAS Rotary Drum Screen Thickener		Not used
Number	1	—
Capacity, gpm	150	—
Polymer Feed System		
Number	—	1
Type	—	Liquid
WAS Gravity Belt Thickener		
Number	—	1

Table 8-4. Solids Management Alternative S1 Design Data, cont'd...

Description	Existing Value	New Value
Belt Width, meters	—	1
Loading Rate, lb/hr-m	—	500
Thickened WAS Pumps		
Number	—	2
Type	—	Positive Displacement
Capacity, gpm	—	50
Drive	—	Constant Speed
Anaerobic Digestion		
Digester No. 1		
Number	1	1
Diameter, ft	32	32
Depth, ft	17	17
Volume, gallons	102,300	102,300
Average Hydraulic Retention Time at 2% solids, days	8.5	—
Average Hydraulic Retention Time at 4% solids, days	17.1	14.8
Mixer		
Number	1	1
Type	Screw Impeller	Propeller
Size, Hp	5	5
Heat Exchanger		
Number	1	1
Type	—	Spiral
Recirculation Pump		
Number	1	1
Type	—	Recessed impeller
Capacity, gpm		200
Size, Hp	5	TBD
Digester No. 2		
Number	1	1
Diameter, ft	30	30
Depth, ft	16.5	16.5
Volume, gallons	87,250	87,250
Average Storage Capacity at 2% solids, days	7.3	—

Table 8-4. Solids Management Alternative S1 Design Data, cont'd...

Description	Existing Value	New Value
Average Hydraulic Retention Time at 4% solids, days	14.6	12.7
Mixer		
Number	—	1
Type	—	Propeller
Size, Hp	—	3
Heat Exchanger		
Number	—	1
Type	—	Spiral
Recirculation Pump		
Number	—	1
Capacity, gpm	—	200
Size, Hp	—	TBD
Boiler		
Number	1	1
Type	—	Hot Water
Size	—	TBD
Truck Loading Pumps		
Number	1	2
Type	—	Centrifugal
Size, gpm	—	300

A variation of this alternative is to provide two-stage high rate digestion. In two-stage, high rate digestion, the second tank is not heated or mixed so may not be considered in the calculation of HRT, requiring a third digester to provide adequate capacity. In addition, anaerobically digested solids may not settle well, resulting in a supernatant from the secondary digester containing a high concentration of suspended solids that could be detrimental to the liquid train. (WEF/ASCE Manual of Practice 8, 1998) Therefore two-stage, high rate digestion was not considered further.

Solids Management Alternative S2

As shown schematically in Figure 8-4 this alternative includes thickening continuing to thicken primary sludge in the primary sedimentation basins and separate WAS thickening. The existing digesters would be retained for solids storage only. Following storage, solids would be hauled to WWTP No. 1 for anaerobic digestion. With additional thickening, adequate capacity exists in the existing Plant No. 1 digesters to treat future solid loads from both plants. Major components of Alternative S2 include:

- Adding a gravity belt thickener or centrifuge and related appurtenances for WAS thickening.
- Removing mixing and heating equipment from Digester No. 1.
- Repairing both digester roofs.
- Replacing truck-loading pumps.

Figure 8-4. Alternative S2

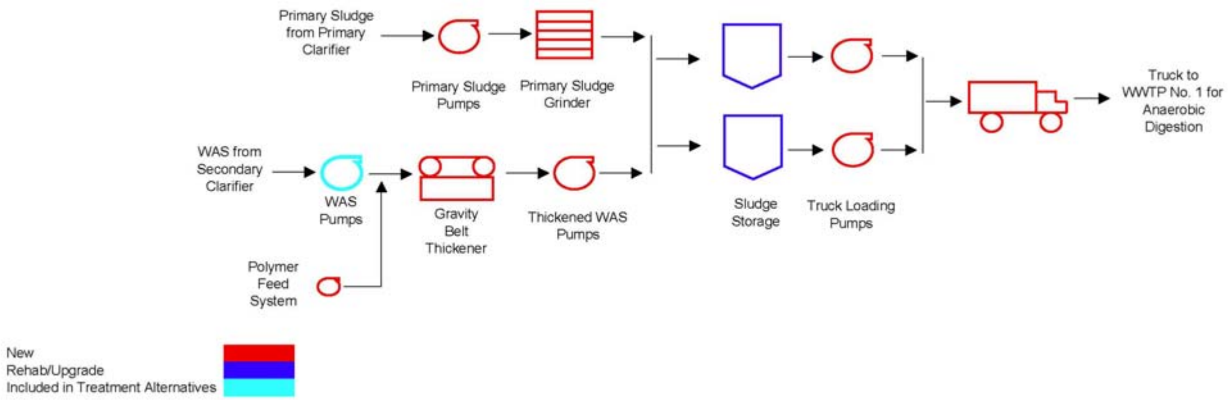


Table 8-5 shows existing and future design data for Alternative S2.

Table 8-5. Solids Management Alternative S2 Design Data

Description	Existing Value	New Value
Primary Sludge Processing		
Primary Sludge Pumps		
Number	2	2
Type	Piston	Centrifugal
Capacity, gpm	—	100
Drive	—	Constant Speed
Primary Sludge Grinder		
Number	—	1
Type	—	In-line
Secondary Sludge Thickening		
WAS Auxiliary Storage Tank		
Volume, gal	28,300	28,300
WAS Auxiliary Storage Tank		
Volume, gal	9,750	9,750
WAS Rotary Drum Screen Thickener		Not used
Number	1	
Capacity, gpm	150	

Table 8-5. Solids Management Alternative S2 Design Data, cont'd...

Description	Existing Value	New Value
Polymer Feed System		
Number	—	1
Type	—	Liquid
WAS Gravity Belt Thickener		
Number	—	1
Belt Width, meters	—	1
Loading Rate, lb/hr-m	—	500
Thickened WAS Pumps		
Number	—	2
Type	—	Positive Displacement
Capacity, gpm	—	50
Drive	—	Constant Speed
Sludge Storage		
Digester No. 1		
Number	1	1
Diameter, ft	32	32
Depth, ft	17	17
Volume, gallons	102,300	102,300
Average Hydraulic Retention Time at 2% solids, days	8.5	—
Average Hydraulic Retention Time at 4% solids, days	17.1	14.8
Mixer		
Number	1	Not Used
Type	Screw Impeller	
Size, Hp	5	
Heat Exchanger		Not Used
Number	1	
Recirculation Pump		Not Used
Number	1	
Size, Hp	5	
Digester No. 2		
Number	1	1
Diameter, ft	30	30
Depth, ft	16.5	16.5
Volume, gallons	87,250	87,250

Table 8-5. Solids Management Alternative S2 Design Data, cont'd...

Description	Existing Value	New Value
Volume, gallons	87,250	87,250
Average Hydraulic Retention Time at 2% solids, days	7.3	—
Average Hydraulic Retention Time at 4% solids, days	14.6	12.7
Truck Loading Pumps		
Number	1	2
Type	—	Centrifugal
Size, gpm	—	300

Solids Management Alternative S3

As shown schematically in Figure 8-5 this alternative stores primary sludge and WAS separately at WWTP No. 2 prior to transfer to WWTP No. 1 for thickening, anaerobic digestion, and transmission to storage facilities. Major improvements to WWTP No. 2 include:

- Removing mixing and heating equipment from Digester No. 1.
- Repairing both digester roofs.
- Adding a pump station and two pipelines for transmission of raw sludge to WWTP No. 1.
- Replacing and relocating the waste gas burner.

Figure 8-5. Alternative S3

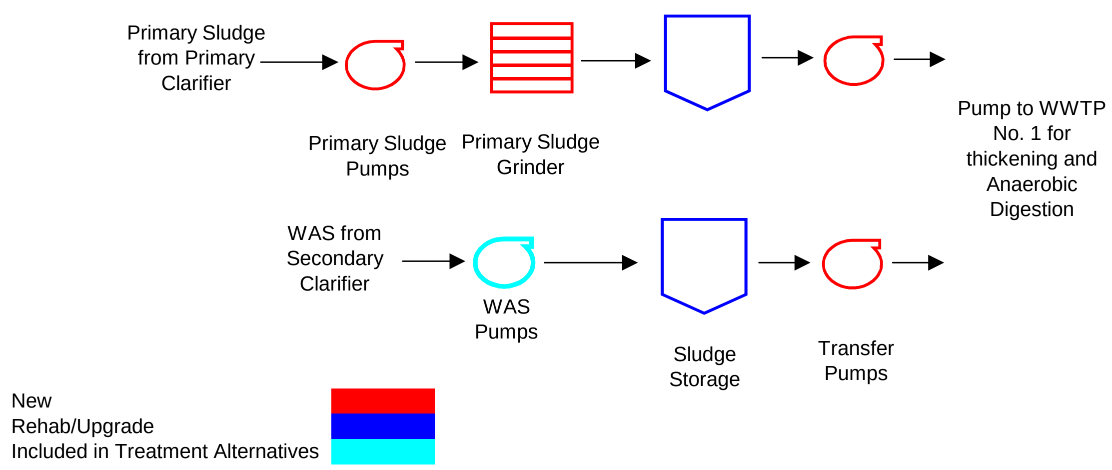


Table 8-6 shows existing and future design data for Alternative S3.

Table 8-6. Solids Management Alternative S3 Design Data

Description	Existing Value	New Value
Primary Sludge Processing		
Primary Sludge Pumps		
Number	2	2
Type	Piston	Centrifugal
Capacity, gpm	—	100
Drive	—	Constant Speed
Primary Sludge Grinder		
Number	—	1
Type	—	In-line
Secondary Sludge Processing		
WAS Auxiliary Storage Tank		
Volume, gal	28,730	28,300
WAS Auxiliary Storage Tank		
Volume, gal	9,750	9,750
WAS Rotary Drum Screen Thickener		Not used
Number	1	
Capacity, gpm	150	
Sludge Storage		
Digester No. 1		
Number	1	1
Diameter, ft	32	32
Depth, ft	17	17
Volume, gallons	102,300	102,300
Average Hydraulic Retention Time at 1% solids, days	4.3	3.7
Mixer		
Number	1	Not Used
Type	Screw Impeller	
Size, Hp	5	
Recirculation Pump		Not Used
Number	1	
Size, Hp	5	
Digester No. 2		
Number	1	1
Diameter, ft	30	30
Depth, ft	16.5	16.5

Table 8-6. Solids Management Alternative S3 Design Data, cont'd...

Description	Existing Value	New Value
Volume, gallons	87,250	87,250
Average Hydraulic Retention Time at 1% solids, days	3.6	3.2
Sludge Transfer to Plant 1		
Primary Sludge Transfer Pumps		
Number	—	2
Type	—	Positive Displacement
Capacity, gpm	—	200
Drive	—	Constant Speed
WAS Sludge Transfer Pumps		
Number	—	2
Type	—	Positive Displacement
Capacity, gpm	—	200
Drive	—	Constant Speed
Solids Transfer Pipelines		
Number	—	2
Diameter, each, inches	—	6
Length, each, feet	—	27,000

COMPARISON OF ALTERNATIVES

Table 8-7 present the capital costs for Alternatives S1, S2 and S3. A non-economic comparison of the solids management alternatives is provided in Table 8-8. Alternative S-2 is the lowest cost alternative for solids treatment. This alternative uses the additional digestion capacity at Treatment Plant No. 1 to stabilize Treatment Plant 2 sludge. Hauling costs are reduced by sludge thickening. Non-economic advantages to Alternative S2 include having the operation flexibility that nearly 30 days of storage at Plant No. 2 provides and the efficiency of having all solids digestion at one treatment plant.

A complete present worth comparison between alternatives will be presented in Chapter 10, Recommended Plan.

Table 8-7. Solids Management Alternatives Capital Cost Comparisons, $1,000

	Alt. S1	Alt. S2	Alt. S3
Contractor Profit and Overhead, 15%	$ 287	$ 211	$ 521
Mobilization, 5%	$ 91	$ 70	$ 165
Primary Sludge Handling	$ 61	$ 61	$ 61
WAS Gravity Belt Thickener	$ 590	$ 590	—
Thickened WAS Pumping	$ 47	$ 47	—
Thickening Building	$ 100	$ 100	—
Digester Roof Improvements	$ 74	$ 49	$ 49
Digester Control Building Improvements	$ 150	$ 150	$ 150
Digester Heating and Mixing Improvements	$ 216	—	—
Boiler	$ 110	—	—
Truck Loading Improvements	$ 43	$ 43	—
Waste Gas Burner Improvements	$ 30	$ 30	$ 30
Truck	$ 100	$ 100	—
Sludge Pipeline and Appurtenances	—	—	$ 2,466
Electrical/SCADA, 20%	$ 304	$ 234	$ 551
Subtotal	$ 2,203	$ 1,685	$ 3,993
Contingencies, 25%	$ 551	$ 421	$ 998
Engineering, 20%	$ 551	$ 421	$ 998
Total	$ 3,305	$ 2,527	$ 5,989

Table 8-8. Non-Economic Comparison of Solids Management Alternatives

Evaluation Criteria	Alternative S1	Alternative S2	Alternative S3
Capacity – design year for this plan is 2027	Adequate capacity for design year sludge production. Higher ultimate capacity as all four digesters (two at WWTP No. 1 and two at WWTP No. 2) would be used.	Adequate capacity for design year sludge production. Lower ultimate capacity as the two digesters at WWTP No. 2 would be used for storage.	Adequate capacity for design year sludge production. Lower ultimate capacity as the two digesters at WWTP No. 2 would be used for storage.
Performance – requirements are guided by DEQ NPDES permit and Part 503 regulations	Properly designed and operated anaerobic digesters consistently comply with Class B stabilization requirements.	Properly designed and operated anaerobic digesters (at WWTP No. 1) consistently comply with Class B stabilization requirements.	Properly designed and operated anaerobic digesters (at WWTP No. 1) consistently comply with Class B stabilization requirements.
Implementation – feasibility of construction staging to maintain operations of the plant	During construction of improvements to the digesters, some raw primary sludge and WAS will likely have to be hauled to WWTP No. 1 for treatment.	Construction staging is possible to keep all facilities in service.	Construction staging is possible to keep all facilities in service.
Constructability – outlines any construction concerns or issues	Few uncertainties are likely during construction.	Few uncertainties are likely during construction.	Few uncertainties are likely during construction.
Regulatory Issues – ease of permit compliance	Complies with Class B biosolids requirements	Complies with Class B biosolids requirements	Complies with Class B biosolids requirements
Reliability – adequate redundancy provided for critical equipment	The primary sludge gravity thickener could serve as back up for the gravity belt thickener. Hauling raw primary sludge and WAS to WWTP No. 1 could provide redundancy for the anaerobic digesters.	The primary sludge gravity thickener could serve as back-up for the gravity belt thickener. The sludge storage capacity at WWTP No. 2 could provide some relief to digesters at WWTP No. 1, but there is not full redundancy for the anaerobic digestion system.	The sludge storage capacity at WWTP No. 2 could provide some relief to digesters at WWTP No. 1, but there is not full redundancy for the anaerobic digestion system.

Table 8-8. Non-Economic Comparison of Solids Management Alternatives, cont'd...

Evaluation Criteria	Alternative S1	Alternative S2	Alternative S3
Future Capacity Expansion – space available and ease of expansion of new and existing facilities	Thickening facilities would be constructed on previously unoccupied land.	Thickening facilities would be constructed on previously unoccupied land. Digester capacity could be increased in the future by adding heating and mixing to digesters at WWTP No. 2.	No new facilities are being located on previously unoccupied land.
Operational Issues – operational and maintenance ease and flexibility.	Thickening facilities will add operations and maintenance activities to Plant No. 2.	Having nearly 30 days of storage at Plant No. 2 would provide operational flexibility in transfer to and anaerobic digestion at WWTP No. 1. Eliminating sludge treatment at Plant 2 consolidates process O&M functions.	Having nearly 30 days of storage at Plant No. 2 would provide operational flexibility in transfer to and anaerobic digestion at WWTP No. 1. Eliminating sludge treatment at Plant 2 consolidates process O&M functions.

CHAPTER 9

RECOMMENDED PLAN

This chapter presents the recommended plan for upgrading Coos Bay Wastewater Treatment Plant No. 2. Liquid treatment alternatives are described in Chapter 7 and solids alternatives are described in Chapter 8.

RECOMMENDED PROCESS IMPROVEMENTS

The recommended improvements are summarized in Table 9-1.

Table 9-1. Summary of Evaluated Alternatives

Alternative	Description
H1	New influent pumping, screening, metering and grit removal.
T2	Treat up to 5.5 mgd through primary treatment, upsize aerators, provide flexibility in aeration basin operation, add secondary clarifier with RAS/WAS pumping, convert Secondary Clarifier No.1 to chlorine contact basin.
D1	Continue using the existing outfall.
S2	Gravity thicken primary sludge. Thicken WAS with gravity belt thickener, convert digesters to sludge storage tanks, truck thickened sludge to WWTP No. 1 for digestion.

PRESENT WORTH ANALYSIS

As noted in Chapters 7 and 8, the headworks, treatment discharge and solids alternatives cannot be compared independently, as some cost savings may be achieved with certain combinations of alternatives. This fact is addressed in the cost summary presented in Table 9-2. Table 9-2 also compares and ranks the present worth of each alternative. In a present worth analysis, the ongoing operation and maintenance (O&M) costs are converted to an equivalent current value and added to an alternative's capital cost. In this way, alternatives with relatively low capital costs and high O&M costs can be compared to alternatives with high capital and low O&M costs. O&M costs include labor, power and chemicals.

Table 9-2. Present Worth (PW) Cost Comparison of Alternatives, $1000*

Item	H1-T1-S1	H1-T1-S2	H1-T1-S3	H1-T2-S1	H1-T2-S2	H1-T2-S3	H2-T1-S1	H2-T1-S2	H2-T1-S3	H2-T2-S1	H2-T2-S2	H2-T2-S3
Capital	13,558	12,784	16,258	12,179	11,405	14,879	13,810	13,036	16,510	12,431	11,657	15,131
Annual O&M	1,019	1,011	892	1,034	1,026	907	1,019	1,011	892	1,034	1,026	907
PW of O&M	11,813	11,715	10,332	11,987	11,890	10,507	11,812	11,715	10,332	11,987	11,890	10,507
Total PW	25,370	24,499	26,590	24,166	23,295	25,622	25,622	24,751	26,842	24,418	23,547	25,638
Rank	8	5	11	3	1	7	10	6	12	4	2	9

*Based on a 20 year planning period and a return rate of 5.875 as recommended by the Natural Resources Conservation Service

RECOMMENDED PLAN ELEMENTS

The recommended plan elements include the following:

Liquid Train

Influent Pumping. The influent pump station will be replaced with a larger capacity pump station that will be able to accommodate existing and future flows. The pump station will be submersible pump station and will be located so that it is accessible for operation and maintenance.

Headworks. Headworks improvements include replacing the mechanical bar screen to meet future flow requirements. A bypass channel with a manual bar screen will be provided to facilitate work on the mechanical screen. The grit system will also be replaced to with a larger system to meet future flow requirements. It will be replaced with a system that is better suited to accommodate the variation of incoming flow and will consist of a vortex chamber, recessed-impeller grit slurry pump, cyclone separator and screw classifier.

Primary Treatment. The existing primary sedimentation basin will treat flows up to 5.5 mgd. Flows exceeding this amount will flow directly to secondary treatment. The existing primary sedimentation basin mechanism will be replaced when it ends its useful life. Primary sludge pumps will be replaced and a sludge grinder will be added.

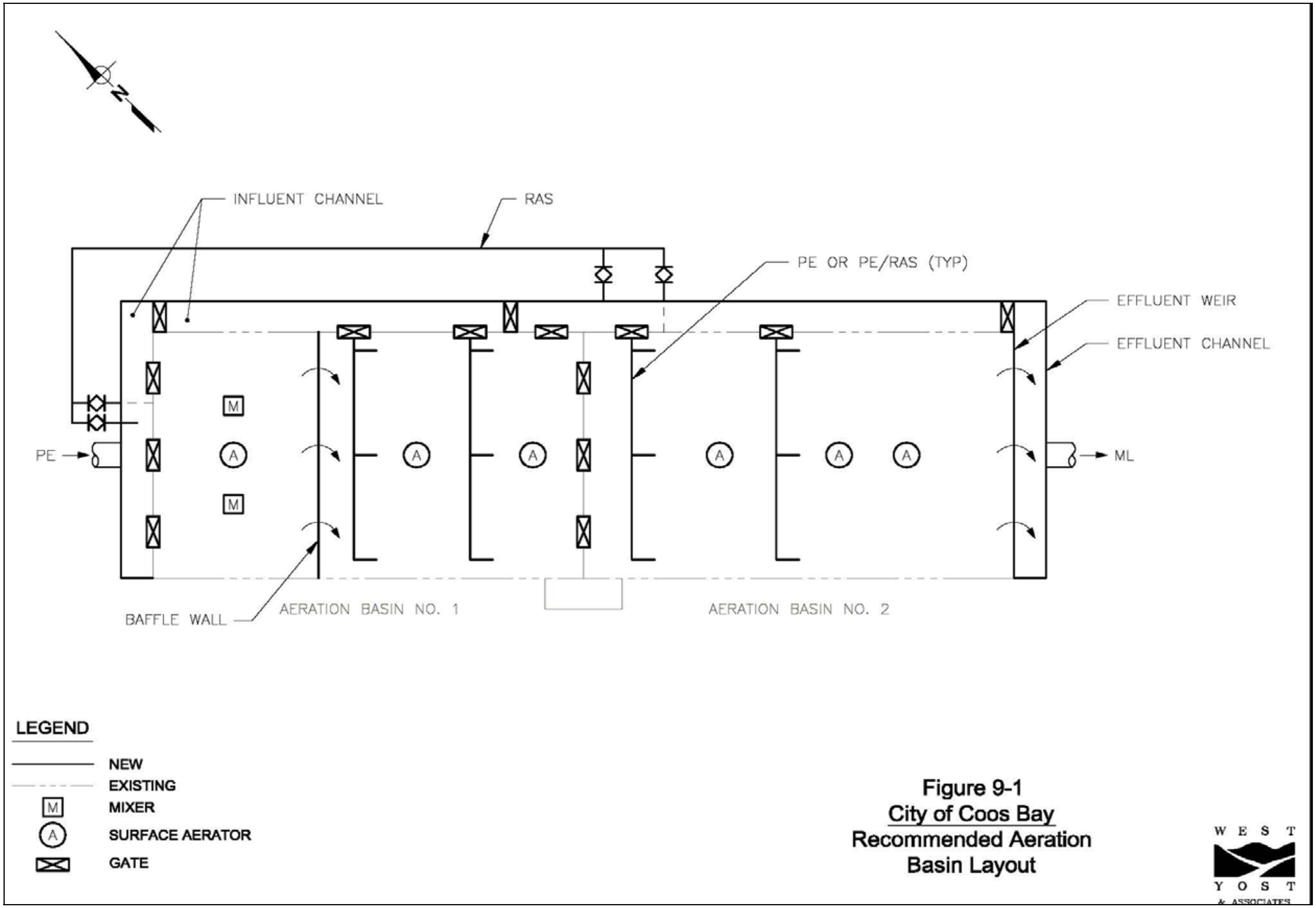
Aeration Basins. The existing aeration basins have adequate volume to provide secondary treatment and nitrification to meet new permit requirements. The basins will be modified to provide more flexible operation of the process. Channels, piping and gates will be added to allow plug flow, step feed and contact stabilization operational modes. A baffle wall and mixer will be added to provide an anoxic zone and the aeration capacity will be increased by replacing the surface aerators with six larger units. A schematic of the proposed aeration basin layout is shown in Figure 9-1.

Intermediate Pumping. Intermediate pumps will be replaced so that flow can be directed to both existing Secondary Clarifier No. 2 and the new secondary clarifier. Capacity will be increased to accommodate design flows.

Secondary Clarifiers and RAS/WAS Pumping. A new 70-foot diameter clarifier will be added to increase secondary clarification capacity. RAS pumping will be added so that the volume of RAS return to the aeration basins can be positively controlled and the capacity will provide the return RAS flow required to operate the secondary process at a higher mixed liquor concentration so that the process can meet new permit requirements. WAS pumping will be replaced. WAS will continue to be returned to the primary sedimentation basin for co-thickening with primary sludge.

Disinfection. Existing Secondary Clarifier No. 1 will be converted to a chlorine contact basin by adding baffling. The additional capacity will provide contact time to meet the bacterial limits required by the new permit.

Figure 9-1. Recommended Aeration Basin Layout



Solids Train

Primary Sludge and WAS Thickening. Ultimately, WAS will be thickened with a gravity belt thickener and primary sludge will continue to be thickened in the primary sedimentation basins.

Anaerobic Digestion. The digesters at WWTP No. 2 will be converted to storage tanks. Thickened primary sludge and WAS will be held in the tanks and trucked to WWTP No. 1 for digestion. The waste gas burner will be replaced so that methane produced in the digesters when they are still functioning either as digesters in the early years and or storage tanks in later years can be burned.

Biosolids Disposal. Digested sludge will be pumped from the digesters at WWTP No. 1 to the City's existing facultative lagoons and land applied.

Other Improvements

Other improvements needed at the site include the following:

- Relocate the Control Building.
- Relocate the Storage Building.
- Stand-by power system to provide EPA Class 1 reliability requirements.
- Replace the influent sewer creek crossing.
- Electrical and SCADA/process control improvements.
- Digester Control Building improvements including a new roof and roof drains and addition of an upstairs fire escape.

The recommended plan elements are summarized in Table 9-3. A process flow diagram of the recommended plan is shown in Figure 9-2.

Table 9-3. Recommended Plan Basic Data

Description	New Value
INFLUENT PUMPING	
Number of Pumps	4
Capacity, each gpm	2,000
Type	Submersible
Drive	Variable Speed
Horsepower	TBD
Flow Measurement	
Type	Magnetic Meter
PRELIMINARY TREATMENT	
Mechanical Bar Screen	
Number	1

Table 9-3. Recommended Plan Basic Data, cont'd...

Description	New Value
Type	TBD
Bar Spacing, in	TBD
Manual Bar Screen	
Number	1
Bar Spacing, in	1
Screenings washer/compactor	
Number	1
Type	Screw
Capacity, cy/hr	35
Grit Removal	
Number	1
Type	Paddle vortex
Tank Diameter, ft	12
Peak Capacity, mgd	10.6
Grit Slurry Pump	
Number	1
Type	Recessed Impeller
Capacity, gpm	200
Cyclone Grit Separator	
Number	1
Grit Classifier	
Number	1
PRIMARY TREATMENT	
Primary Sedimentation Basin	
Number	1
Diameter, ft	50
Sidewater depth, ft	8.5
Overflow rate, PWWF, gpd/sf	2,800
Capacity, mgd	5.5
SECONDARY TREATMENT	
Aeration Basins	
Number	2
Width, ea	32
Length, ea	60
Sidewater depth, ft	14
Volume, ea, gal	202,000

Table 9-3. Recommended Plan Basic Data, cont'd...

Description	New Value
MLSS, mg/l	2,500
Operational Mode	Multiple
Mixers	
Number	2
Type	TBD
Aerators	
Number	6
Type	Surface
Horsepower, ea	25
Intermediate Lift Station	
Number of pumps	3
Type	Submersible
Capacity, ea, gpm	3,000
Horsepower, ea	TBD
Drive	Variable speed
Secondary Clarifiers	
Clarifier No. 2	
Diameter, ft	56
Sidewater depth, ft	13.5
Overflow Rate, PWWF, gpd/sf	1,200
Capacity, mgd	2.9
New Clarifier	
Diameter, ft	70
Sidewater depth, ft	18
Overflow Rate, PWWF, gpd/sf	1,500
Capacity, mgd	5.7
RAS Pumps	
Clarifier No. 2	
Number	2
Type	Submersible
Capacity, ea, gpm	500
Drive	Variable speed
New Clarifier	
Number	2
Type	Submersible
Capacity, ea, gpm	1,000

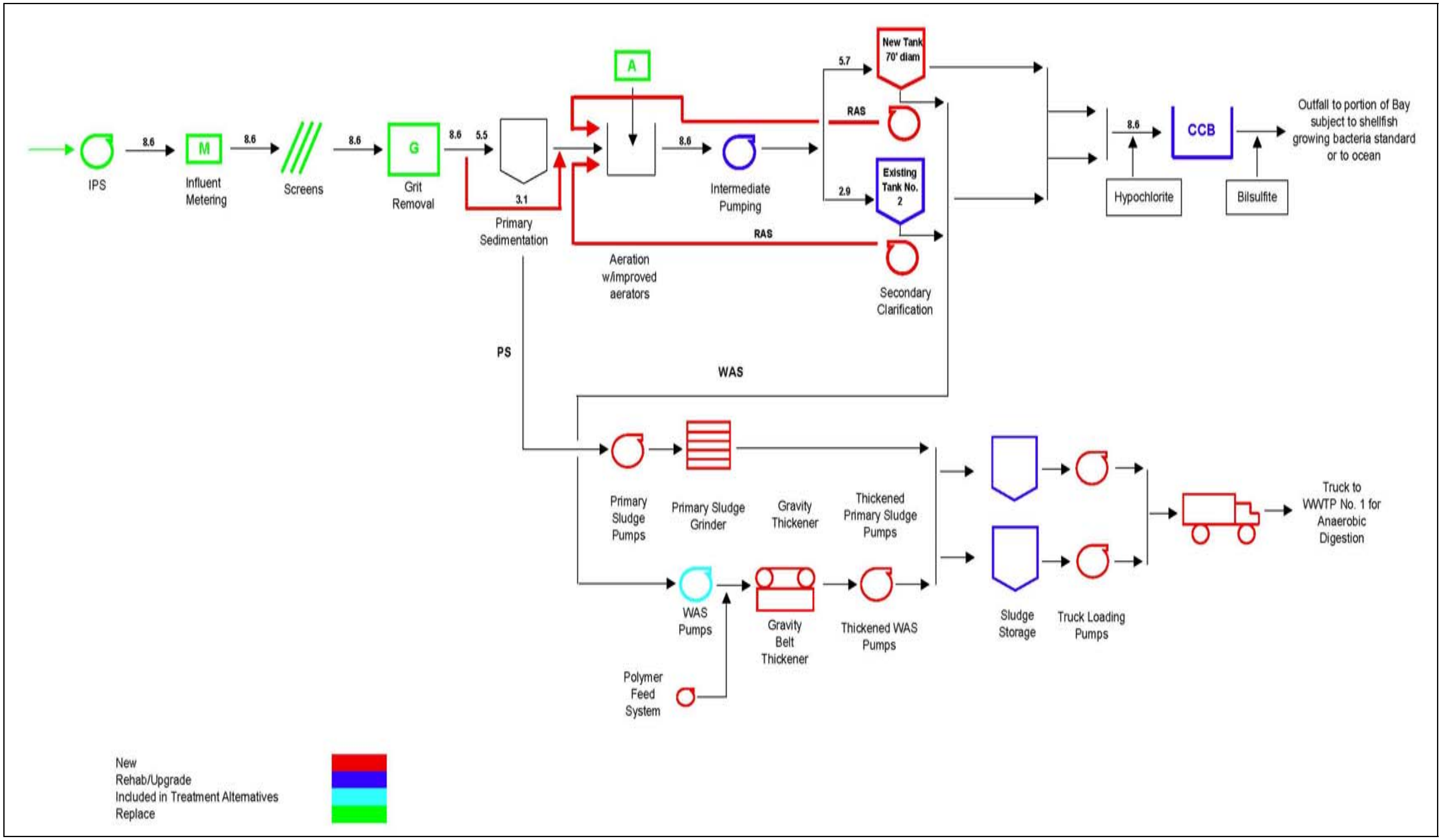
Table 9-3. Recommended Plan Basic Data, cont'd...

Description	New Value
Drive	Variable speed
WAS Pumps	
Number	1
Type	Submersible
Capacity, ea, gpm	150
Drive	Variable speed
CHLORINATION/DECHLORINATION	
Chlorination Facilities	
Type	NaOCl
Contact Basin	
Number	1
Volume, gal	299,000
Detention time, min	
ADWF	430
PDF	78
PWWF	50
Length/Width	40/1
NaOCl Storage Tanks	
Number	3
Total storage volume, gal	2,550
Feed Pumps	
Number	2
Type	Diaphragm
Capacity, ea, gph	20
Flash Mixer	
Horsepower	3
Velocity gradient, fps/ft	900
Dechlorination Facilities	
Type	Sodium Bisulfite
Bisulfite Storage Tanks	
Number	2
Total storage volume, gal	2,900
Metering Pumps	
Number	2
Type	Diaphragm
Capacity, ea, gph	4

Table 9-3. Recommended Plan Basic Data, cont'd...

Description	New Value
OUTFALL	
Length, ft	1,826
Diameter, ft	27
Number of Diffusers	5
SLUDGE PROCESSING	
Primary Sludge	
Primary Sludge Pumps	
Number	2
Type	Centrifugal
Capacity, gpm	100
Drive	Constant speed
Primary Sludge Grinder	
Number	1
Type	In-line
Waste Activated Sludge	
WAS Storage Tanks	
Volume, gal	38,050
Polymer Feed System	
Type	Liquid
Gravity Belt Thickener	
Number	1
Belt width, meters	1
Loading rate, lb/hr-m	500
Thickened WAS Pumps	
Number	2
Type	Positive displacement
Capacity, gpm	50
Drive	Constant speed
Sludge Storage	
Digester No. 1	
Volume, gal	102,300
Digester No. 2	
Volume, gal	87,250
Truck Loading Pumps	
Number	2
Type	Centrifugal
Capacity, gpm	300
Drive	Constant speed

Figure 9-2. Recommended Plan Process Flow Diagram



IMPLEMENTATION

Improvements will be phased in at the plant over the course of the planning period. These facility improvements are necessary to maintain acceptable performance and reliability at the treatment plant over the next twenty years. The site plan is given in Figure 9-3 and shows the anticipated phasing of improvements.

Collection System Improvements

The City will undertake significant I/I reduction program in the service area based on the Wastewater Collection system Master Plan, January 2006 (HBH Consulting Engineers). In order to accomplish this $350,000 per year have been allotted in the CIP for the planning period. Additionally the pump station and line repair improvements at $8.38M and $7.18M, respectively will be used to maintain the collection system during the planning period.

Phase 1 Facilities

Phase 1 facilities are required to meet ammonia and bacterial standards listed in the MAO issued in August 2003 and the new NPDES permit and include the following:

- Construct new influent pump station.
- Provide new surface aerators.
- Construct aeration basin modifications.
- Construct new secondary clarifier with RAS/WAS pumping.
- Expand intermediate pumping.
- Convert Secondary Clarifier No. 1 to chlorine contact basin.
- Relocate Control Building.
- Construct new waste gas burner.
- Relocate Storage Building.
- Construct standby power.

Phase 2 Facilities

Phase 2 facilities will be implemented after improvements to the WWTP No. 1 digesters are complete. Primary sludge pumps will be replaced and sludge grinders will be added. Co-thickening in the digesters will be provided to reduce hauling requirements and extend the capacity of the digesters. Other equipment will be replaced as it reaches the end of its useful life. Phase 2 facilities include the following:

- Replace headworks.
- Construct primary sludge handling improvements.
- Co-thicken in digesters.

- Construct Digester Control Building improvements.
- Replace primary clarifier mechanism.

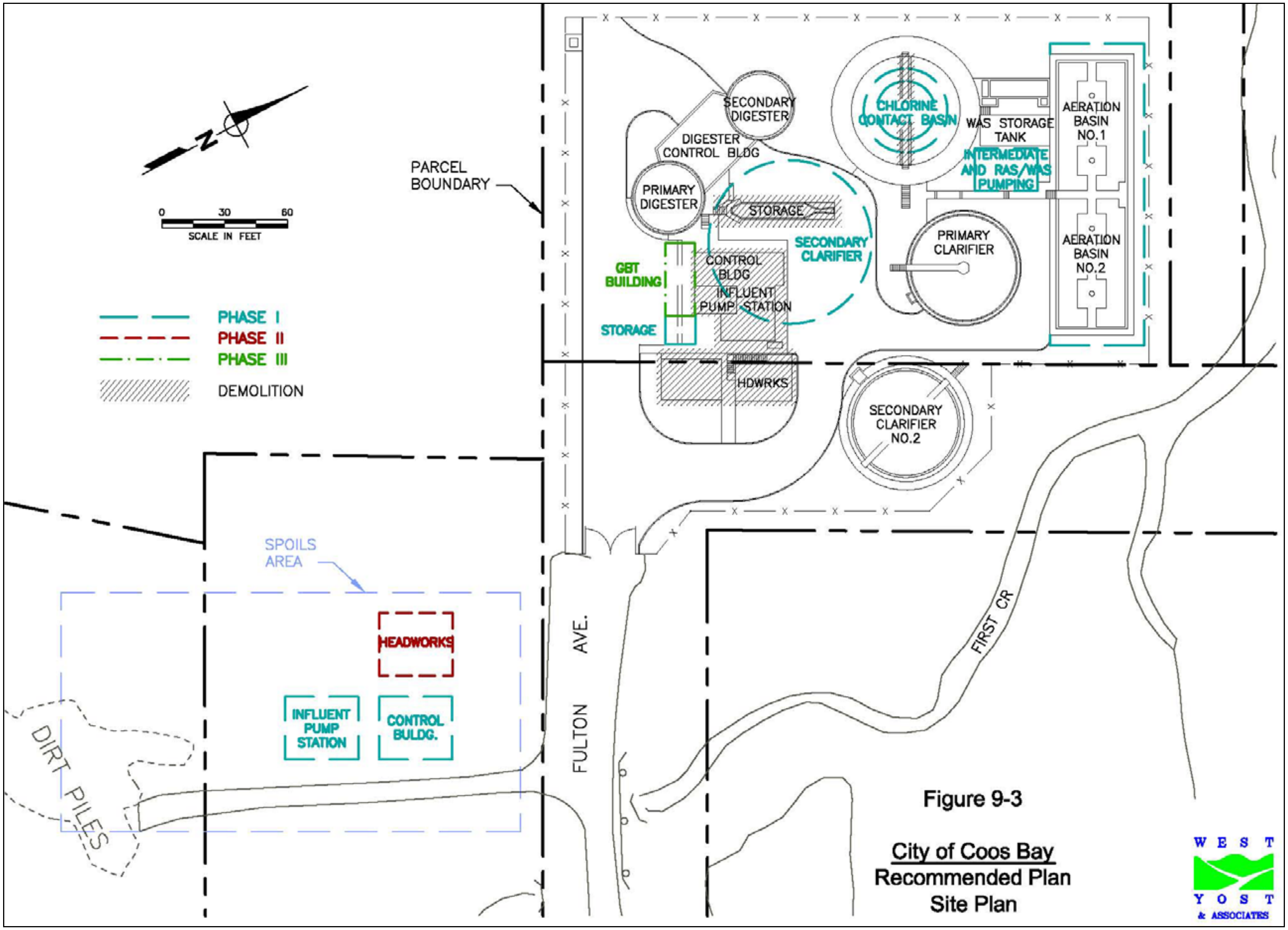
Phase 3 Facilities

Phase 3 facilities will be needed to extend the capacity of the digesters at WWTP No. 1. Improvements to the existing Secondary Clarifier No. 2 will improve its performance as peak flows increase. Improvements include replacing the mechanism and the addition of Stamford baffles. Phase 3 facilities include the following:

- Construct gravity belt thickener.
- Construct secondary clarifier improvements.

Expansion beyond the planning period will be constrained by the site. Processes that provide equivalent treatment on a small footprint, such as membrane bioreactors (MBRs) might be considered for capacity expansion beyond the planning horizon.

Figure 9-3. Recommended Plan Site Plan



CAPITAL IMPROVEMENT PLAN

The Capital Improvement Plan (CIP) provides a road map for the City that identifies the location, timing and estimated cost of the recommended improvement projects that are necessary to maintain reliable operation of the wastewater treatment plant. The CIP is based on the recommended plan. The following sections summarize the details of the recommended CIP.

Basis for Cost Estimates

The cost estimates presented in this report are planning level estimates. Such estimates are approximate and made without detailed engineering design data. Construction and operating costs for the recommended plan are based on preliminary layouts. Estimates were prepared using the construction costs of similar plants when possible. When these costs were not available, construction costs were obtained from available cost cures and EPA process design manuals. Since these cost estimates are base don conceptual design data, they may change as more detailed design information is developed.

Costs can be expected to undergo long-term changes in keeping with corresponding changes in the national economy. One of the best available barometers of these changes is the Engineering News-Record (ENR) construction cost index. It is computed from the prices for structural steel, Portland cement, lumber and common labor.

The costs developed in this report are based on the ENR 20-city index of 7314, which was the index in October 2004. The costs presented here may be related to those at any time in the past or future by applying the ration of the then-prevailing cost index to ENR CCI 7314.

Because of the limitations of cost estimates based on planning information, cost estimates must allow for unanticipated improvements, variation in final quantities, adverse construction conditions, and other unforeseeable difficulties that will increase the final construction cost. Therefore, the total construction cost includes a contingency allowance of 25 percent.

The cost of engineering services for major projects typically includes special investigations, a predesign report, surveying, foundation exploration, preparation of contract drawings and specifications, construction management, start-up services and the preparation of operation and maintenance manuals. Depending on the size and type of project, engineering costs may range from 12 to 20 percent of the construction cost. The lower percentage applies to large projects without complicated mechanical systems. The higher percentage applies to small, complicated projects and to projects that involve extensive remodeling of existing facilities. For Coos Bay WWTP No. 2, where new projects will involve both rehabilitation and expansion of the existing plant, it is anticipated that total engineering costs will average 15 percent of the construction cost.

The City of Coos Bay has its own administrative costs associated with any major construction project. These include internal planning and budgeting, the administration of engineering and construction contracts, legal services, and liaison with regulatory and funding agencies. For a typical project similar in size to the work described in this report, the city’s administrative costs are estimated at five percent of the construction cost.

The combination of engineering and administrative cost is 20 percent and is applied to the total construction cost.

Capital Cost Summary

Estimated costs for the recommended improvements are summarized in Table 9-4. These costs are all shown in 2004 dollars and need to be adjusted when planning for projects that will be implemented in the future. Projects are organized according the previously outlined phasing plan.

Based on the general implementation schedule outlined in Table 9-4, Table 9-5 provides a recommended implementation schedule for the capital improvement plan over the full planning period.

Table 9-4. Recommended Plan Cost Summary
(2004 Dollars at ENR CCI 7314)

Description	Cost, $1000			
	Const	Contin 25%	E&A 20%	Total
Phase 1 Improvement Projects (Present – 2008)				
Relocate influent sewer	193	48	48	289
Influent pump station	989	247	247	1,483
Construct aeration basin improvements	550	137	137	825
Construct new secondary clarifier with RAS/WAS pumping	1,718	429	429	2577
Expand intermediate pumping	170	42	42	255
Convert Secondary Clarifier No. 1 to chlorine contact basin	96	24	24	144
Relocate Control Building	144	36	36	216
Relocate Storage Building	58	14	14	87
Construct new waste gas burner	43	10	10	64.5
Construct standby power	216	54	54	324
Total Phase 1 Cost	4,177	1,044	1,044	6,266
Phase 2 Improvement Projects (2012-2017)				
Replace headworks	994	248	248	1491
Construct primary sludge handling improvements	88	22	22	132
Convert digesters to storage tanks	282	70	70	423
Digester building improvements	216	54	54	324
Replace primary clarifier mechanism	576	144	144	864
Total Phase 2 Cost	2,156	539	539	3,234
Phase 3 Improvement Projects (2018-2023)				
Construct gravity belt thickener	1,076	269	269	1614
Construct secondary clarifier improvements	194	48	48	291
Total Phase 3 Cost	1,270	318	318	1,905
TOTAL COST	**7,603**	**1,901**	**1,901**	**11,405**

Table 9-5. Recommended CIP Implementation Plan
(2004 Dollars at ENR CCI 7314)

Project Description	Fiscal Year, $1,000																				Total
	2006-2007	2007-2008	2008-2009	2009-2010	2010-2011	2011-2012	2012-2013	2013-2014	2014-2015	2015-2016	2016-2017	2017-2018	2018-2019	2019-2020	2020-2021	2021-2022	2022-2023	2023-2024	2024-2025	2025-2026	
PLANT 2																					
Relocate Influent Sewer		48	72	169																	289.5
Construct influent pump station		247	371	865																	1483.5
Construct aeration basin improvements		138	206	481																	825
Construct new secondary clarifier		430	644	1503																	2577
Expand intermediate pumping		43	64	149																	255
Convert SC No. 1 to chlorine contact basin		24	36	84																	144
Relocate Control Building		36	54	126																	216
Relocate Storage Building		15	22	51																	87
Construct new waste gas burner		11	16	38																	64.5
Construct standby power		54	81	189																	324
Replace headworks							249	311	311	311	311										1491
Construct primary sludge handling improvements							22	28	28	28	28										132
Convert digesters to storage tanks							71	88	88	88	88										423
Digester building improvements							54	68	68	68	68										324
Replace primary clarifier mechanism							144	180	180	180	180										864
Construct gravity belt thickener												269	336.25	336.25	336.25	336.25					1614
Construct secondary clarifier improvements												48.5	60.625	60.625	60.625	60.625					291
PLANT 1			85	85	317	633															1120
COLLECTION SYSTEM																					300
I/I	350	350	350	350	350	350	350	350	350	350	350	350	350	350	350	350	350	350	350	350	7000
Total	350	1,394	2,001	4,090	667	983	889	1,024	1,024	1,024	1,024	668	747	747	747	747	350	350	350	350	19,825

CHAPTER 10

FINANCING

Project financing is a key element for the successful implementation of the recommended capital improvement program (CIP) outlined in Chapter 9. The CIP is structured to provide the necessary improvements to the existing wastewater treatment facilities. The CIP presented in Chapter 9 is a 20-year plan that lays out a series of City projects and their associated costs. This chapter presents information that the City will need to make financing and implementation decisions. The impact of inflation is included in the following evaluation which has a significant impact on future cost levels.

This chapter first provides a summary of the numbers of ratepayers and the background information regarding the historical costs. These provide the base for the City's annual cost projections for wastewater services. Next, financing of the capital improvements is evaluated including an assessment of the projected cost increases to account for inflation, and an estimate of the sewer rate impacts. Finally, different financial options are analyzed and the recommended financing and revised rate plans are identified.

USER PROFILE

The existing user profile for the City, Bunker Hill and Charleston service areas consists of a mix of single family residential, multi family residential, commercial, industrial, high strength, and public use customers as presented in Table 10-1. Currently, a typical single family residential user in the City pays $22.00 per month. This is based on the revenue collected in the Fiscal Year 2004-2005 from the single family user category and the number of single family dwelling units that are in this category of use. The multi-use, commercial, high strength, and public user categories are converted to Equivalent Dwelling Units (EDUs) based on the revenue collected from each user group. For example, the number of EDUs for multi-use customers during the period July 2004 - June 2005 is calculated as the average revenue generated ($40,657) divided by $22.00. This generates a total of 1,848 EDUs of multi-use customers. The City collects revenue from a total of 11,592 equivalent dwelling units.

Table 10-1. Existing User Profile

Description	No. of EDUs
City of Coos Bay	
Residential	4,732
Multiple Use	1,848
Commercial	1,031
High Strength	812
Public	681
Subtotal	9,104
Charleston and Bunker Hill	2,488
Total EDUs	11,592

EXISTING COSTS

Wastewater services are provided by the City with the revenue collected from sewer user fees. Debt service costs associated with the general obligation bonds sold by the City is paid with tax revenue. Existing operation and maintenance costs include labor, materials and services, and minor recurring capital expenditure. The City also funds stormwater operation and maintenance costs with revenue generated by wastewater service charges. Historical costs for these are summarized in Table 10-2.

Table 10-2. Operation and Maintenance Costs

	Fiscal Year				
Description	2001-2002 Actual	2002-2003 Actual	2003-2004 Actual	2004-2005 Actual	2005-2006 Adopted
Administrative Department					
Personal Services	21,782	26,287	26,623	28,680	41,648
Materials and Services	49,031	47,031	47,381	47,381	49,350
Other	0	20,000	20,000	20,000	20,000
Subtotal	70,813	93,318	94,004	96,061	110,998
Plant 1					
Personal Services	29,651	24,007	19,289	20,321	48,380
Materials and Services	559,505	599,389	621,313	648,425	678,928
Recurring Capital Expenses	10,837	5,900	9,526	12,297	21,970
Subtotal	599,993	629,296	650,128	681,043	749,278
Plant 2					
Personal Services	29,651	24,007	19,289	20,321	64,104
Materials and Services	393,873	430,855	443,355	477,979	494,959
Recurring Capital Expenses	6,356	1,280	6,500	4,417	3,600
Subtotal	429,880	456,142	469,144	502,717	562,663
Collection System					
Personal Services	71,130	79,760	39,350	41,025	57,917
Materials and Services	561,111	549,544	400,781	493,059	592,066
Recurring Capital Expenses	23,472	8,770	44,407	23,626	55,310
Subtotal	655,713	638,074	484,538	557,710	705,293
Stormwater					
Personal Services	0	0	42,989	40,783	54,993
Materials and Services	0	1,700	158,559	159,646	227,498
Recurring Capital Expenses	0	0	29,299	4,577	11,210
Subtotal	0	1,700	230,847	205,006	293,701
Total Operation and Maintenance Cost	1,756,399	1,818,530	1,928,661	2,042,537	2,421,933

In addition to the operation and maintenance costs, capital costs are incurred due to the construction of wastewater and storm water improvements. Historical capital costs are summarized in Table 10-3. Total annual costs are summarized in Table 10-4.

Table 10-3. Capital Costs

Description	Fiscal Year				
	2001-2002	2002-2003	2003-2004	2004-2005	2005-2006
Administrative Department					
Transfer to G/O Bond Fund	28,908	35,377	36,487	36,713	36,523
Transfer to WW Reserve Fund	0	50,000	50,000	50,000	350,000
Subtotal	28,908	85,377	86,487	86,713	36,524
Plant 1					
Construction - DEQ Compliance	0	0	49,014	215,333	10,600
Plant 2					
Construction - DEQ Compliance	0	0	24,430	103,246	20,000
Collection System					
Construction - DEQ Compliance	0	0	0	63,318	70,000
Construction	54,998	4,796	2,554	4,836	1,276,000
Subtotal	54,998	4,796	2,554	68,154	1,346,000
Stormwater					
Construction	0	0	94,825	287,369	20,000
Total Capital Cost	83,906	90,173	257,310	760,815	1,783,124

Table 10-4. Annual Cost Summary

Description	Fiscal Year				
	2001-2002	2002-2003	2003-2004	2004-2005	2005-2006
Operation and Maintenance	1,756,399	1,818,530	1,928,661	2,042,537	2,421,933
Capital Costs	83,906	90,173	257,310	760,815	1,783,124
Existing General Obligation Bond Debt Service[a]	536,755	537,155	536,575	539,892	537,107
Total Annual Costs	1,840,305	1,908,703	2,185,971	2,803,352	4,205,057

[a]Existing bond debt service is paid by tax revenue

PROJECTED ANNUAL COSTS

Future operation and maintenance costs will increase as inflation occurs and the following projections include a provision for inflation. Inflation is included at a rate of 3.5 percent per year. Table 10-5 presents the projected annual costs for operation and maintenance. Projections are included in this table for the next five fiscal years. For estimating the long term impact of the improvements, the costs were projected for the full 20-year planning period and these projections are included in the appendices.

Capital costs presented in Table 10-3 were a one-time expense and do not recur in the subsequent years. The existing general obligation bond debt service was refinanced for a more favorable rate and is paid off as of September 1, 2007.

Table 10-5. Projected Operation and Maintenance Costs for Existing Treatment Systems[a]

Description	Fiscal Years 2004-2005	2005-2006	2006-2007	2007-2008	2008-2009	2009-2010	2010-2011	2011-2012	2012-2013	2013-2014
Administrative Department										
Personal Services	28,680	41,648	43,106	44,614	46,176	47,792	49,465	51,196	52,988	54,842
Materials and Services	47,381	49,350	51,077	52,865	54,715	56,630	58,612	60,664	62,787	64,985
Other	20,000	20,000	20,700	21,425	22,174	22,950	23,754	24,585	25,446	26,336
Plant 1										
Personal Services	20,321	48,380	50,073	51,826	53,640	55,517	57,460	59,471	61,553	63,707
Materials and Services	648,425	678,928	702,690	727,285	752,740	779,085	806,353	834,576	863,786	894,019
Recurring Capital Expenses	12,297	21,970	22,739	23,535	24,359	25,211	26,093	27,007	27,952	28,930
Plant 2										
Personal Services	20,321	64,104	66,348	68,670	71,073	73,561	76,135	78,800	81,558	84,413
Materials and Services	477,979	494,959	512,283	530,212	548,770	567,977	587,856	608,431	629,726	651,766
Recurring Capital Expenses	4,417	3,600	3,726	3,856	3,991	4,131	4,276	4,425	4,580	4,741
Collection System										
Personal Services	41,025	57,917	59,944	62,042	64,214	66,461	68,787	71,195	73,687	76,266
Materials and Services	493,059	592,066	612,788	634,236	656,434	679,409	703,189	727,800	753,273	779,638
Recurring Capital Expenses	23,626	55,310	57,246	59,249	61,323	63,469	65,691	67,990	70,370	72,833
Stormwater										
Personal Services	40,783	54,993	56,918	58,910	60,972	63,106	65,314	67,600	69,966	72,415
Materials and Services	159,646	227,498	235,460	243,702	252,231	261,059	270,196	279,653	289,441	299,571
Recurring Capital Expenses	4,577	11,210	11,602	12,008	12,429	12,864	13,314	13,780	14,262	14,761
Total Operation and Maintenance Cost	2,042,537	2,421,933	2,506,701	2,594,435	2,685,240	2,779,224	2,876,497	2,977,174	3,081,375	3,189,223

Table 10-5. Projected Operation and Maintenance Costs for Existing Treatment Systems, cont'd...

Description	Fiscal Years 2014-2015	2015-2016	2016-2017	2017-2018	2018-2019	2019-2020	2020-2021	2021-2022	2022-2023	2023-2024
Administrative Department										
Personal Services	56,762	58,749	60,805	62,933	65,136	67,415	69,775	72,217	74,745	77,361
Materials and Services	67,259	69,613	72,050	74,571	77,181	79,883	82,678	85,572	88,567	91,667
Other	27,258	28,212	29,199	30,221	31,279	32,374	33,507	34,680	35,894	37,150
Plant 1										
Personal Services	65,937	68,245	70,633	73,106	75,664	78,312	81,053	83,890	86,826	89,865
Materials and Services	925,309	957,695	991,214	1,025,907	1,061,814	1,098,977	1,137,441	1,177,252	1,218,455	1,261,101
Recurring Capital Expenses	29,943	30,991	32,076	33,198	34,360	35,563	36,807	38,096	39,429	40,809
Plant 2										
Personal Services	87,367	90,425	93,590	96,866	100,256	103,765	107,397	111,155	115,046	119,072
Materials and Services	674,578	698,189	722,625	747,917	774,094	801,187	829,229	858,252	888,291	919,381
Recurring Capital Expenses	4,906	5,078	5,256	5,440	5,630	5,827	6,031	6,242	6,461	6,687
Collection System										
Personal Services	78,935	81,698	84,557	87,517	90,580	93,750	97,031	100,427	103,942	107,580
Materials and Services	806,925	835,168	864,398	894,652	925,965	958,374	991,917	1,026,634	1,062,566	1,099,756
Recurring Capital Expenses	75,382	78,020	80,751	83,577	86,502	89,530	92,664	95,907	99,264	102,738
Stormwater										
Personal Services	74,950	77,573	80,288	83,098	86,007	89,017	92,132	95,357	98,695	102,149
Materials and Services	310,056	320,908	332,140	343,765	355,797	368,250	381,139	394,478	408,285	422,575
Recurring Capital Expenses	15,278	15,813	16,366	16,939	17,532	18,146	18,781	19,438	20,118	20,822
Total Operation and Maintenance Cost	3,300,846	3,416,376	3,535,949	3,659,707	3,787,797	3,920,370	4,057,583	4,199,598	4,346,584	4,498,714

[a]Costs for improving treatment facilities are not included.

FINANCING

The City does not have funds available to construct the projects outlined in the CIP. Thus, financing of the improvements can be accomplished through either pay-as-you-go, sale of bonds or through acquiring loans and grants.

Pay-As-You-Go

Pay-as-you-go financing is the least cost financing option since no interest costs are incurred. Communities with high growth rates and modest expenditures have successfully financed improvements with pay-as-you-go through a combination of system development charges and user fees.

For the capital requirements shown in the CIP, user fee increases to fund improvements on a pay-as-you-go basis are shown in Table 10-6. The table shows that the monthly rate for an average single-family dwelling fluctuates each year. The rates are higher when substantial improvements needed at the treatment facilities. Based on the rather severe fluctuations and very high rates required early in the planning period, pay-as-you-go financing is not recommended.

Table 10-6. Pay-As-You-Go Rates

Fiscal Year	Monthly Rate, $/EDU	Fiscal Year	Monthly Rate, $/EDU
2004-2005	21.30	2015-2016	54.20
2005-2006	24.20	2016-2017	55.90
2006-2007	33.90	2017-2018	52.80
2007-2008	45.50	2018-2019	59.10
2008-2009	59.10	2019-2020	63.30
2009-2010	86.50	2020-2021	65.40
2010-2011	63.20	2021-2022	67.60
2011-2012	50.00	2022-2023	56.90
2012-2013	55.20	2023-2024	66.10
2013-2014	58.70	2024-2025	79.70
2014-2015	60.60	2025-2026	82.40

Debt Financing

Several alternative debt financing options are available to the City including bonds and borrowing from the state revolving fund (SRF). The Coos Bay city charter requires voter approval for both general obligation and revenue bonds. Under current conditions, the interest rate offered by the SRF is very favorable (3.5 percent including service fees) which represents the lowest cost for borrowing money by the City.

With the CIP presented in Table 9-5, borrowing will be necessary during the planning period, which will increase annual costs to cover the debt service costs. One year of debt service cost must be maintained in reserve which is included in the financing evaluation. Table 10-7 shows the cash flow requirements and the corresponding debt service for financing the improvements with debt service. Annual debt service costs are based on an interest rate of 4.5 percent and a 20-year term.

Table 10-7. Financing Costs

Fiscal Year	Cost, $ 1000				
			Annual Debt Service		
	Capital Cost	Bond Sale	Interest	Principal	Total
2004-2005	761	0	0	0	0
2005-2006	311	0	0	0	0
2006-2007	1,209	0	0	0	0
2007-2008	2,409	5,300	239	169	407
2008-2009	3,818	10,000	681	495	1,176
2009-2010	6,761	0	659	518	1,176
2010-2011	4,106	0	635	541	1,176
2011-2012	2,564	11,200	1,115	922	2,037
2012-2013	3,051	0	1,073	964	2,037
2013-2014	3,341	0	1,030	1,007	2,037
2014-2015	3,458	0	985	1,052	2,037
2015-2016	2,631	0	937	1,100	2,037
2016-2017	2,723	0	888	1,149	2,037
2017-2018	2,261	5,300	1,075	1,370	2,445
2018-2019	2,848	0	1,013	1,432	2,445
2019-2020	3,209	0	949	1,496	2,445
2020-2021	3,322	0	881	1,563	2,445
2021-2022	3,438	0	811	1,634	2,445
2022-2023	2,096	0	737	1,707	2,445
2023-2024	3,006	0	661	1,784	2,445
2024-2025	4,411	0	580	1,864	2,445

Recommended Financing

Based on the analysis of pay-as-you-go financing, the fluctuations in rate that would be required are not desirable and debt financing is recommended. Low interest funds may be available through the SRF loan program and the City should pursue these funds. The Oregon Economic and Community Development Department has provided wastewater grants of up to $750,000 to communities for wastewater system improvements. The City should participate in a One-Stop meeting with the State to begin the financing process to ensure all options are being pursued.

USER FEES

The existing user fees for the City's wastewater utility are summarized in Table 10-8. Currently, (2006-2007) a typical single-family residential user pays a flat fee of $11.56 per month plus an additional fee of $4.15 per unit of water consumed. The average service fee is $26.50 (based on July through November 2006 data) per month for a single family dwelling but this does not include the taxes paid for the general obligation bonds. Given the existing mix of residential, commercial, industrial, and public use, the City collects revenue for the equivalent of 11,592 EDUs. The current rates are not adequate to cover the costs outlined in the CIP.

Revised rates would accommodate additional debt service costs incurred and the cost associated with inflation. Projected annual costs are shown in Table 10-9. User fees will need to be increased to meet the revenue requirements as estimated in Table 10-10. These rates include an annual allowance for inflation of 3.5 percent.

Table 10-8. User Fees for Wastewater Service
Fiscal Year 2006-2007

Description	Base Rate $/month	Volumetric $/100 cubic feet
Single-Family Residential	11.56	4.15
Multi-Family Residential	11.56	4.15
Public (schools, city, county, state, and federal)	11.56	4.15
High Strength Users (restaurants, markets with garbage disposal units, bakeries, etc.)	11.56	5.14
Commercial	11.56	4.15

Table 10-9. Projected Annual Cost Summary

Description	Fiscal Year									
	2005-2006	2006-2007	2007-2008	2008-2009	2009-2010	2010-2011	2011-2012	2012-2013	2013-2014	2014-2015
Operation and Maintenance	2,421,933	2,506,701	2,594,435	2,685,240	2,779,224	2,876,497	2,977,174	3,081,375	3,189,223	3,300,846
New Debt Service	0	0	407,444	1,176,205	1,176,205	1,176,205	2,037,218	2,037,218	2,037,218	2,037,218
Total Annual Costs	2,421,933	2,506,701	3,001,879	3,861,445	3,955,429	4,052,702	5,014,392	5,118,593	5,226,441	5,338,064
Description	Fiscal Year									
	2015-2016	2016-2017	2017-2018	2018-2019	2019-2020	2020-2021	2021-2022	2022-2023	2023-2024	2024-2025
Operation and Maintenance	3,416,376	3,535,949	3,659,707	3,787,797	3,920,370	4,057,583	4,199,598	4,346,584	4,498,714	4,656,169
New Debt Service	2,037,218	2,037,218	2,444,661	2,444,661	2,444,661	2,444,661	2,444,661	2,444,661	2,444,661	2,444,661
Total Annual Costs	5,453,594	5,573,167	6,104,368	6,232,458	6,365,031	6,502,244	6,644,259	6,791,245	6,943,376	7,100,831

Table 10-10. Recommended Rates

Fiscal Year	Base Rate	Consumption $/100 cubic feet	Monthly Rate, $/EDU	% Increase per year
2005-2006	7.90	2.84	24.00	12.0%
2006-2007	11.56	4.15	26.50	8.7%
2007-2008	12.20	4.40	28.00	5.4%
2008-2009	13.70	5.00	32.00	12.5%
2009-2010	14.50	5.30	34.00	5.9%
2010-2011	15.70	5.80	37.20	8.6%
2011-2012	17.50	6.50	42.00	11.4%
2012-2013	18.70	6.90	45.00	6.7%
2013-2014	20.00	7.40	48.50	7.2%
2014-2015	21.90	8.10	53.50	9.3%

Appendix A

City of Coos Bay Wastewater Treatment Plant No. 2

Environmental Assessment

February 2005

Prepared For:

West Yost & Associates
Consulting Engineers
1800 Blankenship Road, Suite 425
West Linn, OR 97068

Prepared by:
Adolfson Associates, Inc.
333 SW Fifth Avenue, Ste 600
Portland, Oregon 97204
503.226.8018

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1.0 PURPOSE AND NEED FOR THE PROJECT

The City of Coos Bay (City) proposes to upgrade Wastewater Treatment Plant (WWTP) No. 2 that has been in service since 1973. The purpose of this project is to improve wastewater treatment and to increase treatment capacity for the west side of the City and the Charleston Sanitary District in the City of Coos Bay. Wastewater facility improvements are needed to meet stricter treatment standards set forth by the Oregon Department of Environmental Quality (DEQ) and to accommodate planned growth in the service area.

The facility's National Pollutant Discharge Elimination System (NPDES) waste discharge permit was renewed on August 21, 2003, and expires December 31, 2007. The new NPDES permit establishes more stringent discharge limits for bacteria, chlorine, and ammonia due to shellfish growing areas in the vicinity of the effluent outfall. Because the current facility does not meet the NPDES discharge limits for bacteria, chlorine, and ammonia, the City of Coos Bay has entered into a Mutual Agreement and Order (MAO) with DEQ dated August 21, 2003. The MAO outlines measured steps necessary for WWTP No. 2 to be in compliance with the NPDES permit.

1.1 Project Location and Site Description

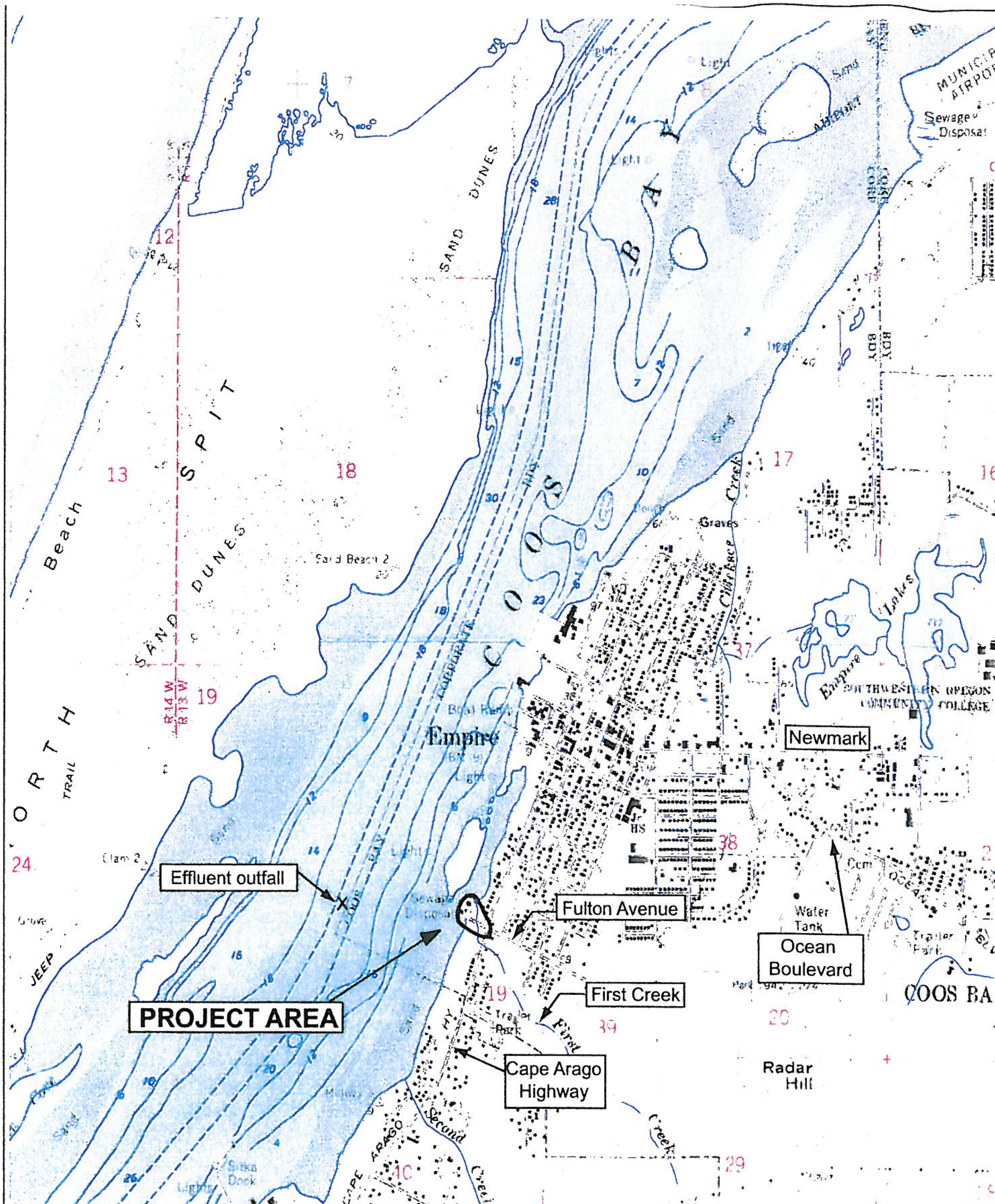
WWTP No. 2 is located in the southwest portion of the City of Coos Bay in the SE ¼ of Section 19, Township 25 South, Range 13 West, Willamette Meridian (Figures 1 and 2). The project site is bounded by Fulton Avenue and riparian vegetation to the east, Coos Bay to the west, and undeveloped estuarine habitat to the north and south (Figure 3). The surrounding area is a mixture of commercial and industrial uses with a few single-family residences near the WWTP. The existing WWTP is fenced and protected with riprap on the south, west, and northern sides (Photo 1, Exhibit A). The fenced area is developed and covers about 1.2 acres (Photos 2 and 3, Exhibit A). The City of Coos Bay owns an additional 3 acres adjacent to the WWTP site, including a debris stockpile area (Figure 3).

1.2 Proposed Action

1.2.1 Description of Existing Conditions

1.2.1.1 Existing Facilities

WWTP No. 2 is owned by the City of Coos Bay and managed and operated by Operations Management International, Inc. (OMI). A primary treatment plant was first constructed on the project site in 1964, and secondary treatment was added in 1973. The facility was upgraded in 1990 with new headworks and a second secondary unit to meet NPDES permit requirements. The existing facility treats primarily domestic wastewater and has a design peak flow of 4.5 million gallons per day (mgd). The facility consists of influent pumping, screening and grit removal, primary sedimentation, activated biosolids secondary treatment, secondary clarification,



NORTH
1" = 1,850'

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Date: 1/26/05

Source:
USGS Empire 7.5-minute quadrangle, 1970

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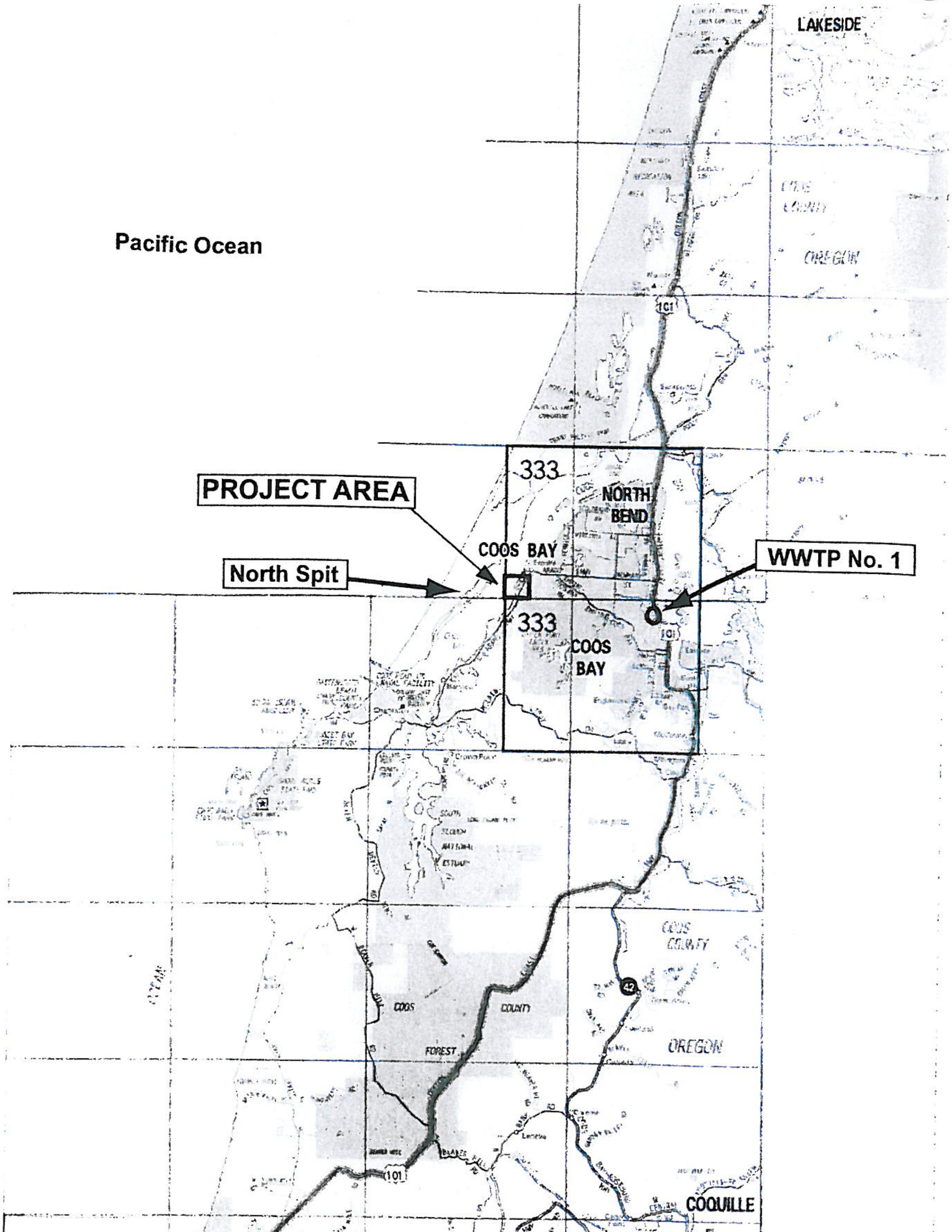
FIGURE 1
Site Map
Coos Bay WWTP No. 2 Improvement Project
Coos Bay, Oregon



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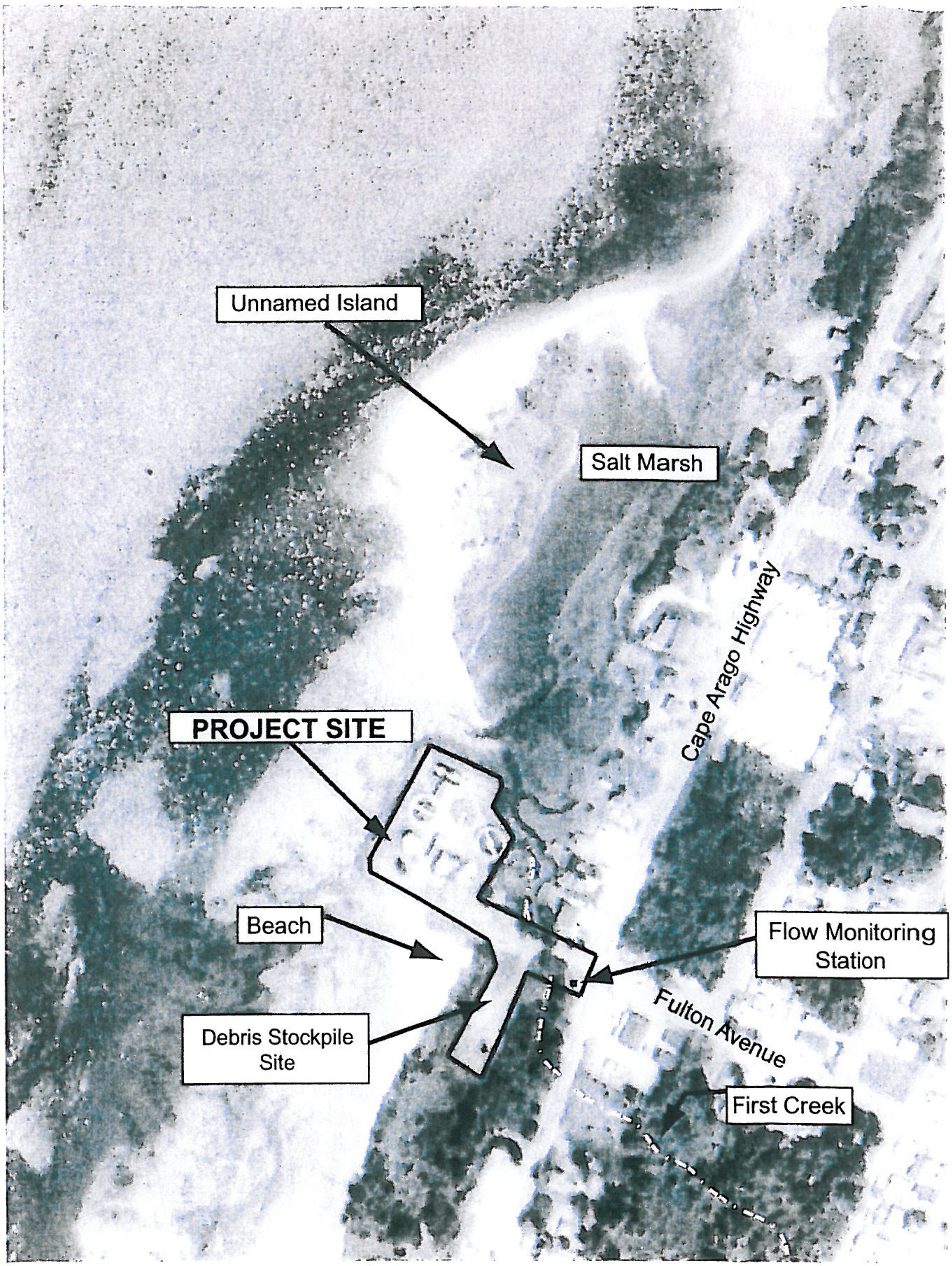
NORTH
1" = 2.3 miles

Edits by: AD
Date: 1/17/05

X
Project Location

FIGURE 2
Vicinity Map
Coos Bay WWTP No. 2
Improvement Project
Coos Bay, Oregon



NORTH
1" = 270'

Edits by: AD
Date: 2/04/05

Source:
U.S. Geological Survey. 1994

FIGURE 3
Aerial Map
Coos Bay WWTP No. 2 Improvement Project
Coos Bay, Oregon

disinfection, dechlorination, and anaerobic digestion of biosolids (Figure 4). Dechlorinated effluent is discharged through a 27-inch-diameter gravity outfall to Coos Bay at river mile (RM) 3.8.

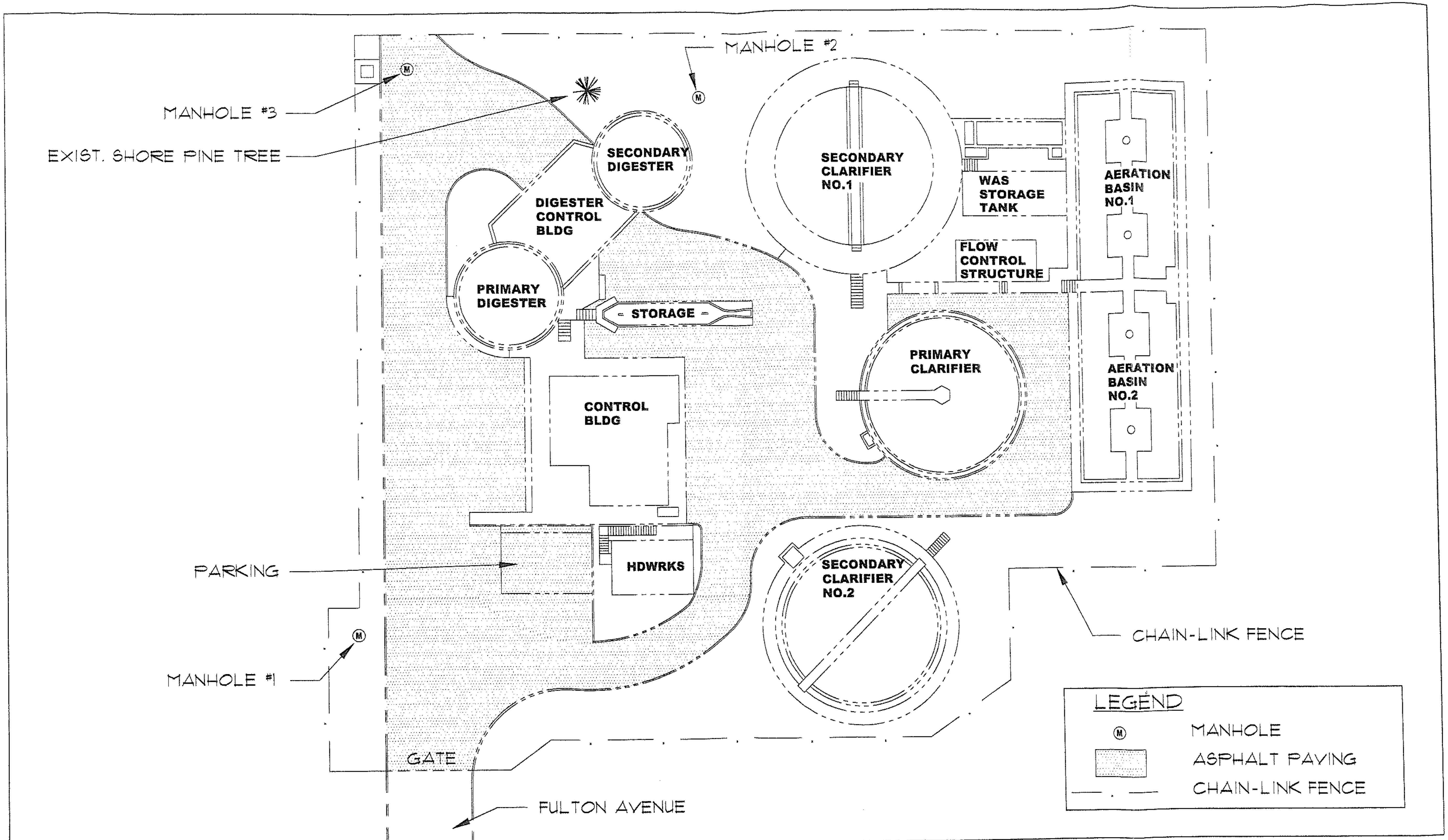
WWTP No. 2 was inspected by DEQ on September 10, 2002 and was found to be in compliance with the NPDES permit. Since 1994, the facility has been issued one Notice of Noncompliance for raw sewage overflows on February 19, 1999 (DEQ, 2003). The Notice of Noncompliance is an informal enforcement action and has been corrected. WWTP No. 2 does not have a record of complaints.

1.2.1.2 Current Treatment Process

Wastewater enters the facility through the influent pump station that is equipped with three non-clog, variable speed, and centrifugal pumps. The influent sewer pipe crosses First Creek just outside of the existing site (Photo 4, Exhibit A). The pump station has a capacity of 4.18 mgd, which is not adequate to convey current or future peak flows. As a temporary solution, a submersible pump was added to the wet well to assist with peak demands. A magnetic flow meter with a capacity of 3.79 mgd measures influent flow, although peak flows are not adequately measured. The pumps transport raw sewage to the headworks that consist of a mechanical bar screen and a vortex grit removal unit. Material collected in the screen is removed with a screening container and placed in a dumpster for landfill disposal. During high flows, material passes through the screen to the primary clarifier. Grit that is removed downstream of the screen is also disposed of in a dumpster and ultimately trucked across town to the headworks at WWTP No. 1. According to site operators, the grit removal unit performs poorly at low and high flows and is bypassed at flows above 4 mgd.

Primary treatment occurs in a circular primary sedimentation basin or clarifier with a design capacity of 2,500 gallons per day per square foot (gpd/sf) and an estimated capacity of 4.9 mgd. The primary clarifier is 50 feet in diameter with a side water depth of 8.5 feet. According to the *Draft Facilities Plan* (West Yost & Associates, 2005) the primary clarifier sweeps are corroded. From this sedimentation basin, primary biosolids are pumped to the digesters and primary effluent flows by gravity to two aeration basins for secondary treatment. The two aeration basins have variable speed drives and can each hold 202,000 gallons. The basins can only be operated in a complete mix mode. Primary effluent is mixed with low speed mechanical surface aerators (Photo 5, Exhibit A) and is then transported to two secondary clarifiers by an intermediate lift station and flow control structure. The aerators are reportedly inadequate due to the inability to maintain dissolved oxygen (DO) concentrations above 0.5 milligrams per liter (mg/L) in the basins during the summer.

The small secondary clarifier has insufficient capacity to operate alone; therefore, the large clarifier cannot be shut down for servicing. Chlorine (sodium hypocholorite) is added to the treated effluent in a contact basin (a covered exterior ring) around the small clarifier. The hydraulic detention time in the contact basin at peak wet weather flow is 34 minutes. Two storage tanks with spill containment were added to the WWTP No. 2 in 2004 to provide sodium bisulfite dechlorination. The dechlorination tanks are metered with feed and mixing equipment.



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Revised:

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SOURCE: *WEST YOST & ASSOCIATES, 2004*
CENTURY WEST ENGINEERING, 1990

FIGURE 4. EXISTING FACILITY LAYOUT
COOS BAY WASTEWATER TREATMENT PLANT NO.2 IMPROVEMENT PROJECT
COOS BAY, OREGON

Bisulfite is injected at the chlorine contact basin overflow weir. Prior to discharge into Coos Bay, the effluent is sampled for chlorine. The lined and coated concrete outfall is 1,826 feet in length and contains five diffuser ports that are 7.5 feet apart. The end of the outfall is marked with a timber pylon (Photo 6, Exhibit A).

Waste-activated sludge (WAS) is transported to the primary sedimentation basins and anaerobic digesters by the WAS pump station. The pump station is equipped with a timer that stops the loading of WAS when a preset daily limit is reached. Operators sample the WAS for total suspended solids (TSS) and modify operations accordingly. Return-activated sludge (RAS) flows by gravity back to the aeration basins. Throttling valves operated manually, control the flow rate. The RAS cannot be sampled, and during high flows, the volume of RAS returned is limited by the gravity flow hydraulics.

Anaerobic digestion of biosolids is achieved in a 32-foot-diameter primary digester and in a 30-foot-diameter secondary digester. The primary digester is mechanically mixed. No mixing or heating occurs in the secondary digester, which is used only for storage. Digested biosolids are hauled to a 4-acre facultative biosolids lagoon located south of WWTP No. 1 for storage. The storage lagoon is lined with bentonite clay and is 11 feet deep with two inlet ports. The liquid on the surface of the lagoon is aerated and returned to WWTP No. 1 after it is pumped into the City sewer system. Biosolids are annually removed from the lagoon with a floating dredge and applied to 250 acres of private farmlands and forests between June and October. The anaerobic digestion process produces Class B biosolids, which is acceptable for application onto agricultural and forest land.

1.2.2 Proposed Action

A number of facility upgrades are proposed to remedy existing inadequacies, to meet NPDES requirements, and to provide increased capacity for current and future peak flows. Most improvements would occur at the existing facility, but some would occur just outside the site boundaries. Plant improvement alternatives were developed with consideration of the following factors: (1) more stringent bacteria limits in future NPDES permits; (2) optimization of existing facilities to reduce cost; (3) simplification of plant hydraulics to reduce energy and maintenance costs; and (4) optimization of space at the existing facility.

Plant improvements are designed to accommodate current and projected future flows and loads. The population of the City of Coos Bay is expected to grow 0.4 percent per year from 15,650 in 2003 to 17,220 by the year 2027 (West Yost & Associates, 2005). The WWTP No. 2 service district (a portion of Coos Bay and Charleston) is projected to grow to a population of 11,160 by 2027. Current and future flow and load projections are summarized in Table 1.

Table 1. Current and Future Flow and Load Projections

Wastewater Characteristic Factor	2003	2027
Flows, mgd:		
Average Dry Weather Flow (ADWF)	0.85	1.0
Average Wet Weather Flow (AWWF)	1.3	1.5
Maximum Month Dry Weather Flow (MMDWF)	1.2	1.4
Maximum Month Wet Weather Flow (MMWWF)	2.3	2.7
Peak Day Flow (PDF)	4.5	5.5
Peak Wet Weather Flow (PWWF)	7.0	8.6
Loads:		
BOD, ppd		
Average	1,800	2,000
Maximum month	2,200	2,500
Peak day	3,600	4,100
TSS, ppd		
Average	2,000	2,300
Maximum month	3,100	3,500
Peak day	5,400	6,100

Notes: The *average dry weather flow* (ADWF) is the average flow at the plant during the dry weather season, typically May through October.

The *average wet weather flow* (AWWF) is the average flow at the plant during the wet weather season, typically November through April.

The *maximum month dry weather flow* (MMDWF) is defined as the flow recorded at the plant when total rainfall quantities are at the 1-in-10 year probability level for the month of May.

The *maximum month wet weather flow* (MMWWF) is defined as the plant flow when total rainfall quantities are at the 1-in-5 year probability level for the month of January.

The *peak day flow* (PDF) is the flow rate that corresponds to a 24-hour storm event with a 1-in-5 year recurrence interval that occurs during a period of high groundwater and saturated soils.

The *peak wet weather flow* (PWWF) is expected to occur during the peak day flow and is the highest flow at the plant sustained for one hour. The PWWF dictates the hydraulic capacity of the treatment system.

Proposed facility upgrades are described according to three categories: (1) headworks facilities, (2) effluent treatment, and (3) biosolids treatment. Headworks include the influent sewers and force mains, influent pumping, screening, and grit removal. Effluent treatment includes primary sedimentation (primary clarifier), biological treatment, intermediate pumping, secondary clarification, and disinfection. Biosolids treatment includes processing WAS, anaerobic digestion of biosolids, and removing biosolids from the site. Modifications to the existing outfall were considered but ultimately rejected and are briefly described in Section 2.3 of this assessment.

1.2.2.1 Headworks

Proposed upgrades include demolishing the existing headworks facilities and constructing new headworks (Alternative H1 in the 2005 *Draft Facilities Plan*). The proposed action also includes demolishing the existing control building and constructing on new control building. The new headworks would be designed to handle peak flows of 8.6 mgd in the following flow sequence: influent sewer → influent pump station → influent metering → screens → grit removal → treatment process. Specific improvements would include:

- Removing the existing headworks that was constructed in 1990,
- Demolishing the existing control building and constructing a new one,
- Constructing a new pump station, and
- Installing new screening and grit removal.

The new pump station, control building, and headworks are proposed for construction either where the current flow monitoring station is located (Photo 7, Exhibit A) or on the debris stockpile site just outside the WWTP No. 2 boundary (Photo 8, Exhibit A). The proposed pump station would be equipped with four submersible, variable speed pumps, each with a capacity of 2,000 gallons per minute (gpm). The footprint of the new pump station would be approximately 3,250 square feet (65 feet by 50 feet). The screenings facility and grit removal unit would be approximately 500 square feet each (20 feet by 25 feet). A mechanical bar screen and a 1-inch manual bar screen are proposed. A screenings washer/compactor with a capacity of 35 cubic yards would also be added to the headworks. The grit removal process would include a paddle vortex grit removal unit with a peak capacity of 10.7 mgd, a recessed impeller grit slurry pump with a capacity of 200 gpm, and a cyclonic grit separator.

1.2.2.2 Effluent Treatment

Proposed effluent treatment upgrades would involve improving biological treatment, secondary clarification, and intermediate pumping and disinfection (Alternative T2 in the 2005 *Draft Facilities Plan*). Specific upgrades would include the following:

- Replacing existing aerators in the aeration basins with larger units,
- Adding channels to the aeration basins for process flexibility
- Increasing capacity of the intermediate lift station from 2,000 gpm to 3,000 gpm,
- Converting small secondary clarifier to chlorine contact basin, and
- Constructing a new secondary clarifier.

The aerators in the existing aeration basins would be replaced with larger surface units, but the volume of the basins would not change. Two additional surface aerators would be added to each basin to increase effectiveness. The aeration basins would be modified so they could be operated in multiple modes. The small secondary clarifier would be converted to a chlorine contact basin to increase contact time from 34 minutes to 60 minutes. The capacity of the new chlorine contact basin would be 7.2 mgd at 60 minutes detention time. A proposed secondary clarifier would be constructed where the existing control building is located. This new clarifier would be

70 feet in diameter, with a sidewater depth of 18 feet and a capacity of 5.7 mgd. The footprint of the new clarifier would be approximately 3,850 square feet. The existing large clarifier would be modified to improve the overflow rate.

1.2.2.3 Biosolids Treatment

Upgrading the existing biosolids treatment would involve thickening both primary sludge and WAS (Alternative S2 in the *Draft Facilities Plan*). The existing digesters would be retained for solids storage only. Following storage, solids would be trucked to WWTP No. 1 for anaerobic digestion. With additional thickening at WWTP No. 2, the existing digesters at WWTP No. 1 would have adequate capacity to treat future solid loads from both plants. Proposed improvements would specifically include:

- Constructing a gravity thickener facility and related appurtenances for primary sludge thickening.
- Adding a gravity belt thickener or centrifuge and related appurtenances for WAS thickening.
- Removing mixing and heating equipment from Digester No. 1.
- Repairing both digester roofs.
- Replacing truck-loading pumps.
- Adding a waste gas burner to operate while digesters are in use.

Implementation of the solids improvements would be phased and would be located on City owned property. At the design year (2027), trucks would transport solids to WWTP No. 1 two to three times per day using the same route currently traveled – Ocean Boulevard to Highway 101. Currently, trucks haul biosolids to the WWTP No. 1 2.5 to 5 times per week.

1.2.2.4 General Improvements

General improvements common to all alternatives would include the following:

- Adding standby power system to comply with U. S. Environmental Protection Agency (EPA) Class I reliability requirements.
- Installing a new roof and walkway canopy on the existing operations building.
- Replacing the influent sewer pipe across First Creek.
- Upgrading the power distribution system to serve new equipment.
- Improving the digester control building by adding a new building roof, adding an upstairs fire escape, and replacing piping.
- Using the existing anaerobic digester tanks as their intended use or as storage.
- Enhancing sludge thickening to reduce sludge volumes and maximize the use of existing treatment capacity.
- Improving or relocating the digester roof drains to prevent flooding and to ensure safe drainage.

The existing 24-inch-diameter sewer pipe across First Creek sits on the creek bed surface and is reportedly in poor condition (Photo 4, Exhibit A). A new 30-inch-diameter sewer pipe is proposed for installation about five feet under the streambed via directional boring. The proposed sewer pipe would be either high-density polyethylene (HDPE) or ductile. A pit approximately 10 feet x 10 feet x 6 feet would be excavated just east of the top of the stream bank to initiate directional boring. The excavated pit material would be stockpiled at an upland location on-site for backfilling when drilling is complete. After the new segment of sewer pipe is connected, the portion of the old sewer pipe that sits on the streambed would be removed. Buried portions of the old sewer pipe would likely be plugged on either side of the stream and left in place to minimize disturbance to the banks. The new sewer pipe from the flow monitoring station to the bore initiation pit would be trenched, resulting in a temporary disturbance to approximately 250 square feet.

2.0 ALTERNATIVES TO THE PROPOSED ACTION

This section describes alternative headworks and treatment technologies considered in the 2005 *Draft Facilities Plan*.

2.1 No Build Alternative

For the purpose of this assessment, the No Build Alternative would maintain the existing WWTP No. 2 as it is and no upgrades would be implemented. Under this alternative, the existing facility would be in violation of ammonia and bacteria discharge limits imposed by the DEQ and would not be able to accommodate current or future peak flows.

2.2 Project Alternative

2.2.1 Headworks

As under the Proposed Action, the Project Alternative would also replace the existing headworks with new structures and equipment, but the elements would be in a different flow sequence (H2 in the 2005 *Draft Facilities Plan*). Under this alternative, screening would be located upstream of influent pumping to eliminate possible pump clogging. The flow sequence would be as follows: influent sewer → screens → influent pump station → influent metering → grit removal → treatment process.

Under this alternative, the screening unit would be constructed adjacent to the new pump station – possibly where the flow monitoring station is or on the City-owned debris stockpile site. About two-thirds or 12 feet of the screening unit would be underground, with the remaining third aboveground. Screened material would be directly discarded from the screening unit to an adjacent dumpster. The grit removal unit would likely be located near the existing headworks on the WWTP site. The types of equipment and capacities are the same as described under the Proposed Action.

2.2.2 Effluent Treatment

Effluent treatment upgrades proposed under the Project Alternative (T1 in the 2005 *Draft Facilities Plan*) would consist of the following:

- Increasing capacity and efficiency of the existing aeration basins
- Eliminating primary sedimentation
- Converting small secondary clarifier to chlorine contact basin (same as proposed action)
- Constructing a new secondary clarifier (same as proposed action but in different location)

This alternative proposes to increase the volume in each of the aeration basins from 202,000 gallons to 301,600 gallons by increasing the height of the basin walls. Adding height to the basin walls would eliminate the need for the intermediate pump station and increase treatment capacity. A fine bubble aeration system powered by multi-stage centrifugal blowers would also be added to the aeration basins. A new blower building would be required to house the blowers. With the proposed improvements to the aeration basins, primary sedimentation would no longer be needed. The new secondary clarifier would be constructed where the existing primary sedimentation basin is located.

2.2.3 Biosolids

Two alternative biosolids treatment methods under the Project Alternative are analyzed below:

2.2.3.1 Biosolids Treatment Alternative 1

Biosolids treatment Alternative 1 of the Project Alternative would consist of thickening both primary sludge and WAS, on-site anaerobic digestion, hauling Class B biosolids to the City's facultative lagoons, and land application of treated biosolids (Alternative S1 in the *Draft Facilities Plan*). Specific improvements would include:

- Constructing a gravity thickener facility and related appurtenances for primary sludge thickening
- Adding a gravity belt thickener or centrifuge and related appurtenances for WAS thickening
- Replacing mixing and heating equipment for Digester No. 1. Mechanical mixers are assumed for the purposes of this report
- Adding mixing and heating equipment for Digester No. 2
- Repairing and improving both digester roofs to ensure adequate support for mechanical mixers
- Replacing the boiler and hot water system to provide adequate heating for both digesters
- Replacing portions of the gas handling system that have reached their useful life
- Replacing and relocating the waste gas burner
- Replacing truck-loading pumps

The size and location of the proposed thickening facility is the same as described in Section 1 for the Proposed Action. This alternative would require repairing and upgrading the existing digesters on-site to provide adequate capacity.

2.2.3.2 Biosolids Treatment Alternative 2

The biosolids treatment Alternative 2 of the Project Alternative would involve storing primary sludge and WAS separately at WWTP No. 2 prior to transfer to WWTP No. 1 for thickening, anaerobic digestion, and transmission to storage facilities (Alternative S3 in the *Draft Facilities Plan*). Specific improvements to WWTP No. 2 would include:

- Removing mixing and heating equipment from Digester No. 1

- Repairing both digester roofs
- Adding a pump station and two pipelines for transmission of raw sludge to WWTP No. 1
- Replacing and relocating the waste gas burner

Two pipelines would require construction in the public right-of-way to transfer biosolids from WWTP No. 2 to WWTP No. 1. Each pipeline would be 6 inches in diameter and approximately 27,000 feet (5.1 miles) in length. The pipelines would most likely be installed via trenching because they would be located in the public right-of-way. The alignment for the pipelines would be decided during the pre-design phase.

2.3 Alternatives Considered but Eliminated

Two other treatment alternatives involving blended treatment were considered in the *Draft Facilities Plan.* Blended treatment would maximize the use of the existing facilities by combining raw sewage or primary effluent with secondary effluent during peak flows. The effluent discharged from the blended treatment alternatives would not meet the bacteria limits for shellfish growing waters and would require the construction of a new outfall. Because all of Coos Bay may be subject to bacteria limits for shellfish-growing waters in the future, the blended treatment and new outfall alternatives are not practical to pursue and were eliminated from further consideration.

3.0 AFFECTED ENVIRONMENT AND ENVIRONMENTAL CONSEQUENCES

The following sections describe the affected environment and potential impacts from the project alternatives on the environmental factors listed below.

- Earth resources
- Land use
- Floodplains
- Wetlands
- Cultural and historical resources
- Threatened and endangered species
- Fish, wildlife and vegetation
- Water resources
- Coastal resources
- Socio-economic/environmental justice issues
- Noise
- Air quality
- Transportation
- Aesthetics

3.1 Earth Resources

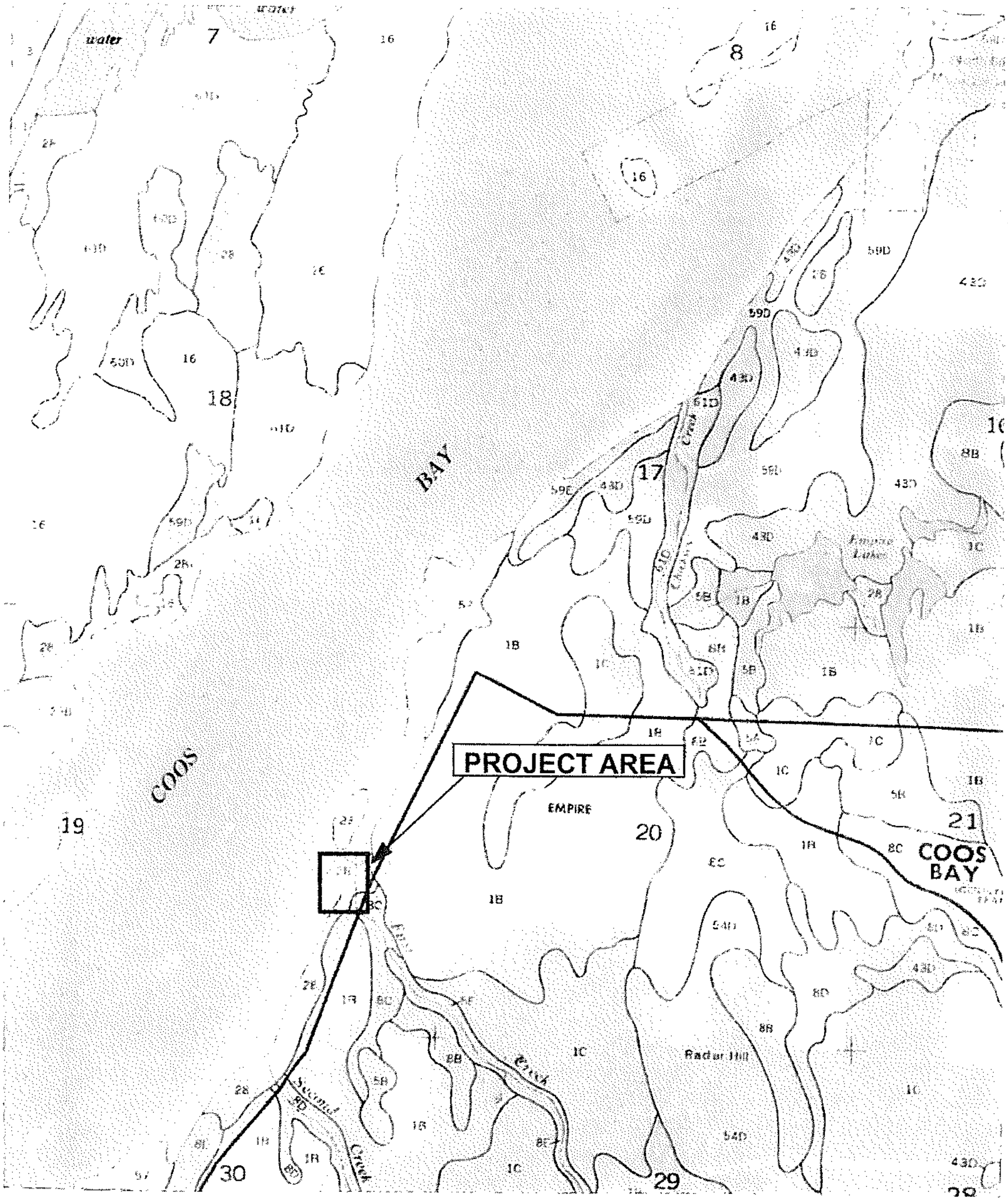
This section addresses potential impacts related to slope, erosion, and soil suitability. This section also discusses general construction impacts and proposed mitigation.

3.1.1 Affected Environment

The site is flat except for the riprap slopes around the perimeter of the existing facility (Photo 1, Exhibit A). The affected environment also includes the banks of First Creek where the sewer pipe currently crosses. Soils on-site and in the project vicinity are mapped as Heceta fine sand, 0 to 3 percent slopes (Figure 5). This soil is a deep, poorly drained soil in deflation basins and depressional areas between dunes. The hazard of water erosion for Heceta fine sand is slight (Haagen, 1989). Geotechnical information has not been collected for the site.

3.1.2 Regulatory Environment

Projects affecting slopes, erosion, and soils are regulated at the local level. Development proposals are reviewed and approved by the City.



8C = Bullards sandy loam, 7-12 percent slopes, non-hydirc with hydric inclusions
1B = Bandon sandy loam, 0-7 percent slopes, non-hydric with hydric inclusions
Soil Map Unit: 28 - Heceta fine sand, 0-3 percent slopes, hydric

ADOLFSON	↑ NORTH 1" = 1,850' — Edits by: AD Date: 1/18/05 — Source: Soil Survey of Coos County, Oregon 1989	**FIGURE 5** Soils Map Coos Bay WWTP No. 2 Improvement Project Coos Bay, Oregon

3.1.3 Environmental Consequences

3.1.3.1 No Build Alternative

Under the No Build Alternative, earthwork would not be conducted and no potential impacts related to soils and erosion would occur. Consequently, no mitigation would be required.

3.1.3.2 Proposed Action

Construction methods for the Proposed Action would include grading, excavating, directional boring, and backfilling. Earthwork from the Proposed Action is estimated to affect 8,750 square feet or 0.2 acres. Ground-disturbing activities have the potential to result in sedimentation of adjacent waterbodies from wind and water erosion. Approximately 4,193 cubic yards (cy) would be excavated for the installation of the new headworks, control building, pump station, new secondary clarifier, and thickening facility. Excavated material would be stockpiled on-site and just outside the WWTP No. 2 boundaries. Approximately 1,080 cy of material would be backfilled. Excess soil and gravel would be hauled off-site to an approved upland location. Approximately 90 cy would be excavated to trench the new sewer pipe to First Creek and then to bore it under the stream.

3.1.3.3 Project Alternative

The Project Alternative for headworks, effluent treatment, and biosolids treatment Alternative 1 would also include grading, excavating, filling, directional boring, and backfilling. In addition to demolishing the existing headworks and control building, this alternative would also involve dismantling the existing primary sedimentation basin and constructing a new secondary clarifier in its place. Because this alternative would include constructing the new secondary clarifier where the primary sedimentation basin is located, an approximate total of 4,900 square feet of area (0.1 acres) would be impacted by this alternative. Although the screening unit would require more excavation under this alternative, the overall excavation is less (2,939 cy) than the Proposed Action. Approximately 1,129 cy would be backfilled. Earthwork related to replacing the influent sewer pipe would be the same as described under the Proposed Action.

Under biosolids treatment Alternative 2, two pipelines would be constructed to transfer primary solids and WAS to WWTP No. 1. This would require excavating a series of trenches totaling 27,000 feet, or 5.1 miles in the public right-of-way from WWTP No. 1 to WWTP No. 2. The pipeline alignment would be determined during the pre-design phase of this project.

3.1.4 Mitigation

The following mitigation measures would apply to all alternatives that involve ground-disturbing activities. To avoid and/or minimize adverse impacts to the environment during construction, a number of conservation and mitigation measures would be in place. Mitigation would include developing comprehensive erosion prevention and sediment control plans prior to construction for each phase of construction. The plans would include elements for site documentation, pre-construction meetings, timing, staging, clearing, excavation, grading, and minimization.

Additionally, site stabilization, slope and drainageway protection, sediment retention, wet-weather measures, and emergency supplies would be included.

Mitigation would also include installing and maintaining all appropriate erosion prevention and sediment control best management practices (BMPs), including but not limited to:

- Establish access and staging areas with a stabilized ground surface to reduce tracking of soils onto roadways; wash vehicle wheels; and collect washwater for proper disposal.
- Maintain vegetative growth and provide adequate surface water runoff treatment and control systems.
- Minimize the area that is to be cleared and graded at one time; mark the area clearly; and schedule construction soon after clearing.
- Apply sediment control measures such as straw-bale and brush barriers, straw wattles, vegetated strips, and/or silt fences to control and filter sheet-flow and shallow runoff.
- Revegetate disturbed areas as soon as possible after completion of construction.
- Stabilize soil stockpiles with seed, sod, mulch, plastic covers, erosion control blankets, mats, and chemical binders. Between October 1 and April 30, implement wet-weather measures and stabilize exposed soils that have not been worked for more than two days. Between May 1 and September 30, stabilize exposed soils that have not been worked on for more than seven days.
- Suppress windborne movement of soils off-site by spraying the soils with water or using other dust control materials.
- Sweep the streets or use other means to remove vehicle-tracked soil near the entrances to major construction sites. Schedule project activities to minimize erosion potential; inspect and maintain structural BMPs; monitor weather and install extra measures in anticipation of severe storms; monitor compliance with the site erosion prevention and sediment control plan and local regulatory requirements; and remove gear and restore the site.

The Proposed Action and Project Alternative would comply with conditions of all required permits including the NPDES permit issued by DEQ as well as grading and building permits from the City of Coos Bay.

3.2 Land Use

3.2.1 Affected Environment

The affected environment includes the existing wastewater treatment plant, the City-owned debris stockpile site just outside the plant boundaries, and the existing outfall in Coos Bay at RM 3.8. The existing plant site is fully developed. The site is on the shoreline of Coos Bay, with water and sandy shoreline to the west, north, and south. To the east, the area is developed with small commercial businesses along Empire Boulevard and residences beyond. The WWTP No. 2 site is zoned Waterfront Industrial (W-I). Adjacent land to the east is zoned Commercial (C-2) along Empire Boulevard, with Residential (R-2) zoning two blocks farther east beyond Marple Street. Coos Bay downstream of the effluent outfall is designated shellfish-growing habitat (DEQ, 2003).

3.2.2 Regulatory Environment

The City of Coos Bay administers the building and mechanical inspection program. City codes are designed to ensure the safety and structural integrity of buildings and other structures. The building permit process includes a review by the planning division to ensure consistency with zoning requirements, a review by city code officials, and a review by the engineering division to ensure that adequate storm drainage and sewer service is provided.

3.2.3 Environmental Consequences

3.2.3.1 No Build Alternative

The No Build Alternative would maintain existing conditions. No land use actions would be required to maintain existing conditions.

3.2.3.2 Proposed Action

Under the Proposed Action, upgrades to the wastewater system would require a building permit and grading permit from the City of Coos Bay, but would not require any significant land use actions. No land conversion or zoning changes would be required to upgrade the wastewater system.

3.2.3.3 Project Alternative

Under the Project Alternative, proposed upgrades and expansion to the wastewater system would require a building permit and a grading permit from the City of Coos Bay, but would not require any significant land use actions. No land conversion or zoning changes would be required to upgrade the wastewater system.

3.2.4 Mitigation

None of the alternatives (including the No Build Alternative) would adversely affect existing land use or shoreland management. Therefore, no mitigation would be required.

3.3 Floodplains

3.3.1 Affected Environment

The existing WWTP No. 2 site is located in an area between the limits of the 100-year floodplain and the 500-year floodplain of Coos Bay (FEMA, 1984). This area, referred to as Zone B on the flood insurance rate map, may also be subject to 100-year flooding with average depths less than one foot. Additionally, Zone B includes areas protected by levees from the base flood and areas where the contributing drainage area is less than one square mile (FEMA, 1984). The existing outfall and the debris stockpile site just south of Fulton Avenue (adjacent to WWTP No. 2) occur in an area mapped as Zone A2 or the 100-year floodplain of Coos Bay (FEMA, 1984). The existing flow monitoring station is located on the northeast corner of Fulton Avenue and Empire Boulevard in an area mapped as Zone C – an area of minimal flooding.

3.3.2 Regulatory Environment

The Federal Emergency Management Agency (FEMA) administers the National Flood Insurance Program and reviews and approves changes to Flood Rate maps. The State of Oregon administers floodplain regulations through its review of local government regulations in compliance with the Statewide Planning Goals. Specifically, floodplain regulation is accomplished through State Goal 7, Areas Subject to Natural Disaster and Hazards. All local jurisdictions must adopt regulations that comply with Goal 7 and its policies and have their regulations acknowledged by the State Land Conservation and Development Commission.

The City of Coos Bay has a Flood Damage Prevention ordinance (Chapter 3.14) that applies to any development in the 100-year floodplain of Coos Bay. Grading, paving, excavation, and construction of structures in the 100-year floodplain of Coos Bay would be required to comply with the development standards of Chapter 3.14.

3.3.3 Environmental Consequences

3.3.3.1 No Build Alternative

The No Build Alternative would maintain existing conditions. Treated effluent that occasionally exceeds NPDES limits would continue to be discharged to the 100-year floodplain of Coos Bay. No construction would occur within the 100-year floodplain as part of the No Build Alternative.

3.3.3.2 Proposed Action

The Proposed Action would involve constructing new equipment outside of the site boundaries either on the debris stockpile site (within the 100-year floodplain) or where the existing flow monitoring station is located (above the 100-year floodplain). If equipment is located on the debris stockpile site, the estimated total impact on the floodplain would be 4,250 square feet, which includes 3,250 square feet for the pump station and 1,000 square feet for the headworks (screening and grit removal). Construction would involve minor grading and construction of a concrete pad for the facilities. If the pump station and headworks are located where the flow monitoring station is, then no impacts to the floodplain are anticipated. The new secondary clarifier and thickening facility would most likely be constructed on the existing WWTP site that is above the 100-year floodplain of Coos Bay.

3.3.3.3 Project Alternative

The Project Alternative would also involve constructing new equipment outside of the site boundaries, either on the debris stockpile site or where the flow monitoring station is located. With this alternative, the screening unit would be constructed adjacent to the pump station. If the screening unit and pump station were constructed on the debris stockpile site, approximately

3,750 square feet of the floodplain would be impacted (3,250 sf for the pump station and 500 sf for the screening unit). Construction of the screening unit would require excavation to at least 12 feet below grade.

Under biosolids treatment Alternative 1, the proposed thickening facility would be located on the existing WWTP site. The boiler and hot water system of the existing digesters would be replaced to provide on-site anaerobic digestion of solids. No impacts to the 100-year floodplain would result from this alternative.

Under Biosolids treatment Alternative 2, two pipelines would be constructed in the public right-of-way to transfer primary solids and WAS to WWTP No. 2. Impacts to floodplains are not anticipated from this alternative, although the pipeline route has not yet been determined.

3.3.4 Mitigation

Proposed equipment constructed in areas of special flood hazard (100-year floodplain of Coos Bay) would be required to comply with the development standards of the City's Flood Damage Prevention Chapter. Development standards require that non-residential structures:

- Be floodproofed so that below the base flood level, the structure is watertight with walls substantially impermeable to the passage of water;
- Have structural components capable of resisting hydrostatic and hydrodynamic loads and effects of buoyancy;
- Have a registered engineer or architect certify that the design and methods of construction are in accordance with accepted standards of practice for meeting provisions of this subsection based upon their development and/or review of the structural design, specifications and plans. Such certifications shall be provided to the City as set forth in Section 1(2)B of this Chapter; and
- If elevated and not floodproofed, meet the same standards for space below the lowest floor as described in Section 7((2)(A)(2)).

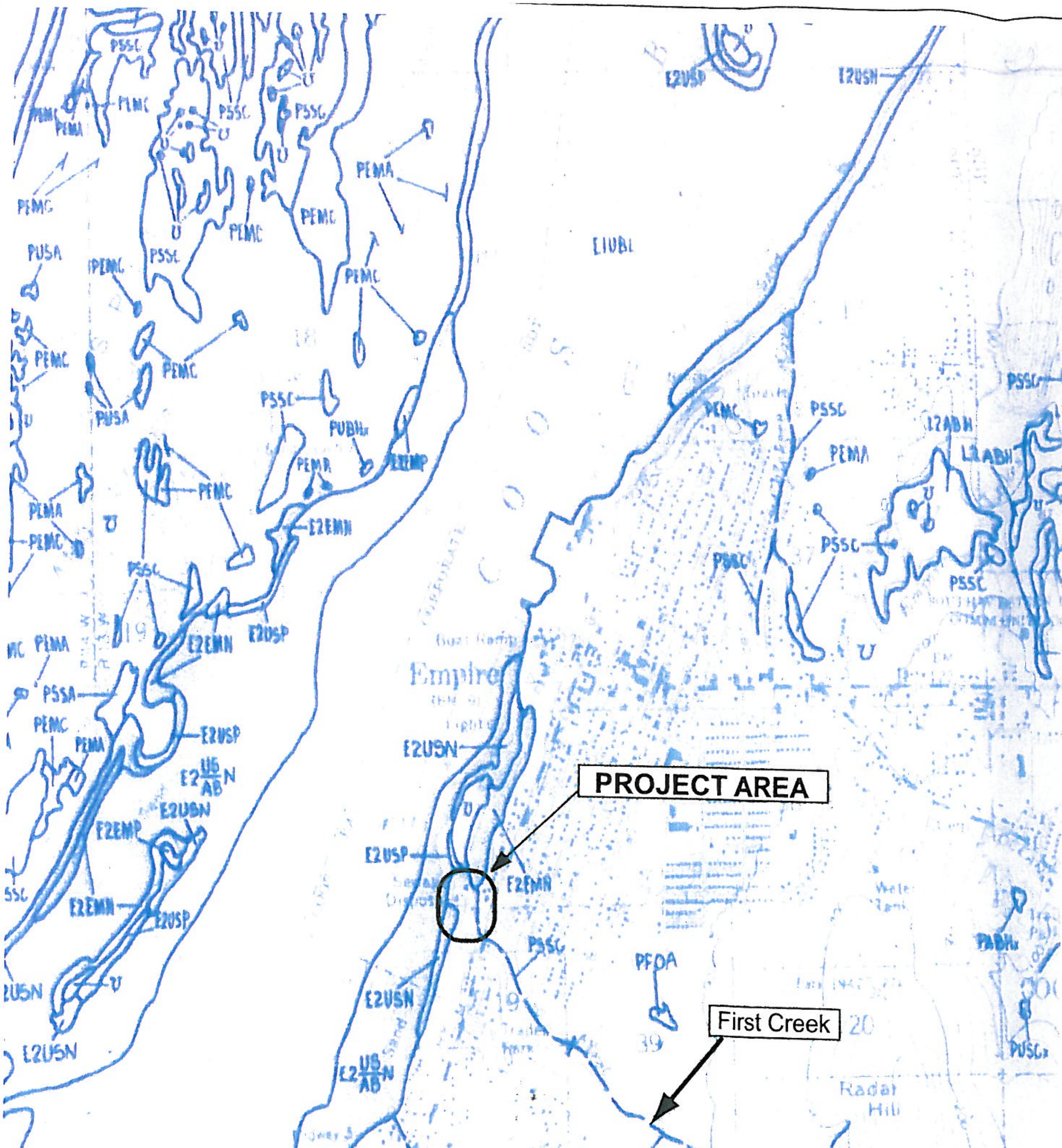
The development standards also require that applicants floodproofing non-residential buildings shall be notified that flood insurance premiums will be based on rates that are one foot below the floodproofed level, i.e., a building constructed to the base flood level will be rated as one foot below that level.

If structures are located within the 100-year floodplain of Coos Bay, the facilities would be protected with a concrete wall. The height of the concrete wall would be above base floodplain levels.

3.4 Wetlands

3.4.1 Affected Environment

Wetlands are formally defined by the U.S. Army Corps of Engineers (the Corps) (Federal Register, 1982) and the Environmental Protection Agency (Federal Register, 1988) as " … those areas that are inundated or saturated by surface or groundwater at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions." Wetlands generally include swamps, marshes, bogs, and similar areas (Federal Register, 1982). The three essential characteristics of wetlands are (1) hydrophytic vegetation; (2) hydric soils; and (3) wetland hydrology (Environmental Laboratory, 1987).



Key of common wetland categories mapped in project vicinity:
E2EMN = Estuarine, intertidal, emergent, regularly flooded
E2USN = Estuarine, intertidal, unconsolidated shore, regularly flooded
E2USP = Estuarine, intertidal, unconsolidated shore, irregularly flooded
PSSC = Palustrine, scrub-shrub, seasonally flooded
U = Upland

ADOLFSON

NORTH
No Scale

Edits by: AD
Date: 1/18/05

Source:
U.S. Department of the Interior, Fish and Wildlife Service 1989
Empire quadrangle

FIGURE 6
National Wetlands Inventory Map
Coos Bay WWTP No. 2 Improvement Project
Coos Bay, Oregon

The affected environment includes the existing WWTP No. 2 site, a cleared area just south of Fulton Avenue between the WWTP site and Empire Boulevard, and First Creek. According to the National Wetlands Inventory (NWI), tidally influenced wetlands are mapped in the project vicinity and palustrine, scrub-shrub wetlands are mapped along First Creek near the existing WWTP site (Figure 6) (USFWS, 1989). The mapped soil unit on the project site and site vicinity, Heceta fine sand, 0-3 percent slopes, is considered a hydric soil (NRCS, 1999).

The existing WWTP is built on historic fill and is protected by riprap on all sides except where accessed by Fulton Avenue. No wetlands are mapped on the existing WWTP site and no wetlands were observed at the facility during a January 2005 visit. The debris stockpile site just south of Fulton Avenue also did not contain wetland characteristics. The banks of First Creek, however, contained hydrophytic vegetation (sedges, reed canarygrass) and are possible jurisdictional wetlands.

3.4.2 Regulatory Environment

In general, proposed activities within jurisdictional wetlands typically require permits from the Oregon Division of State Lands (DSL) and the U.S. Army Corps of Engineers (Corps). The Corps and DSL regulate wetlands and other waters in different ways. Under Oregon's Removal-Fill Law (ORS 196.795-990), removal or fill of more than 50 cubic yards in a wetland or other Water of the State requires a permit. Any amount of fill or removal in Essential Salmon Habitat (ESH) requires a permit from DSL; however, First Creek is not considered ESH (DSL, 2005).

The Corps regulates wetlands under Section 404 of the Clean Water Act. The Corps regulates fill or disposal of dredged material in wetlands in terms of linear feet or acreage. Depending on the area of impact (if less than 0.25 or 0.5 acres), the project may qualify for a Nationwide Permit, a programmatic permit pre-issued by the Corps. A Nationwide Permit is a categorical permit designed to streamline permitting and is often processed in about thirty days. The area of wetland impact would be determined by delineating wetland boundaries in the field according to methodology approved by the Corps, surveying the boundary, and calculating the area impacted by the proposed trail construction. The City of Coos Bay does not have its own wetland ordinance, but the City coordinates with DSL regarding proposed fill and removal in wetlands.

3.4.3 Environmental Consequences

3.4.3.1 No Build Alternative

The No Build Alternative would maintain existing conditions. The sewer pipe across First Creek is in poor condition and could potentially leak into the stream and adjacent wetlands.

3.4.3.2 Proposed Action

The Proposed Action would include replacing the sewer pipe across First Creek with a new pipe. The new sewer pipe is proposed to be directionally bored approximately five feet under the streambed to avoid adverse impacts to wetlands and waterways. Removing the old sewer pipe and plugging the ends is not anticipated to result in adverse wetland impacts. The proposed action would not involve any other potential impacts to wetland resources.

3.4.3.3 Project Alternative

The Project Alternative would also include replacing the sewer pipe across First Creek with a new pipe. The environmental consequences would be the same as described under the Proposed Action.

3.4.4 Mitigation

Measures to avoid wetland impacts are incorporated into the construction methods by proposing to install the new sewer pipe via directional boring. Measures to avoid wetland impacts include avoiding clearing and grading near or on the banks of First Creek. Adverse impacts to wetland resources are not anticipated from the Proposed Action or Project Alternative; however, removal of old sewer pipe would be subject to in-water work periods recommended by the Oregon Department of Fish and Wildlife (ODFW). Refer the section on Water Resources for more details.

3.5 Cultural and Historical Resources

3.5.1 Affected Environment

Cultural resources are defined as recorded archaeological sites, traditional use areas, and areas with a high probability for containing archaeological resources. Historical resources include structures designated or eligible for listing on the National Register of Historic Places (National Register). Structures that may qualify for designation as a historical resource are typically older than 50 years. The possible presence of cultural and historical resources was assessed through coordination with the State Historic Preservation Office (SHPO), a review of the National Register, and a review of existing reports related to on-site structures.

According to SHPO, the project site has a high probability for possessing archaeological sites and/or buried human remains (Exhibit B). This is most likely due to the location of the site on the shoreline of Coos Bay. Specific cultural resources have not been identified because cultural resource surveys have not been previously conducted for the project site or the vicinity.

Based on a review of the National Register, no historical resources are listed for the project site or immediate vicinity (National Park Service, 2005). Additionally, no structures proposed for demolition are fifty years or older. The primary sedimentation basin was constructed in 1964 (41 years ago) (DEQ, 2003) and all other existing structures at the WWTP site were constructed circa 1973 (32 years ago) (West Yost & Associates, 2005).

3.5.2 Regulatory Environment

Federal laws, regulations, agency-specific directives, and Executive Orders require a consideration of cultural resources in federal undertakings. Section 106 of the National Historic Preservation Act (NHPA) of 1966, its subsequent amendments, and Executive Order 11593 require that federal agencies consider the effects of a federal undertaking on any district, site, building, structure, or object that is included in or eligible for inclusion in the National Register. Section 106 requires federal agency coordination with the SHPO and appropriate tribes. Archaeological sites, objects, and human remains are protected under Oregon Revised Statutes (ORS) 358.905 and ORS 97.740.

3.5.3 Environmental Consequences

3.5.3.1 No Build Alternative

The No Build Alternative would maintain existing conditions. No ground-disturbing construction would likely occur under this alternative.

3.5.3.2 Proposed Action

The Proposed Action would involve demolition of the existing headworks and control buildling as well as earthwork to install new equipment. The headworks facility was constructed in 1990 and the control building was constructed in 1973. Both structures are less than 50 years old and do not meet the eligibility criteria for a historic structure. Except for the proposed sewer pipe, earthwork is proposed in areas that have been previously cleared and graded. The new pump station is proposed either where the flow monitoring station is located or on the adjacent debris stockpile site. The new control building is proposed for construction on the debris stockpile site. Installing the new sewer pipe will require construction in previously undisturbed soils. The proposed secondary clarifier and thickening facility would be constructed on-site.

3.5.3.3 Project Alternative

The Project Alternative would involve demolition of the existing headworks, control buildling, and the primary sedimentation basin as well as earthwork to construct new equipment. The primary sedimentation basin was built in 1964 and does not meet the eligibility criteria for a historic structure. This alternative would involve excavating a pit to accommodate the screening facility that is proposed to extend 12 feet below ground. Minor excavation is proposed to install the pump station, thickening facility, and new secondary clarifier and would occur in previously disturbed areas.

Under biosolids treatment Alternative 1 – the proposed thickening facility would be located on the existing WWTP site. The boiler and hot water system of the existing digesters would be replaced to provide on-site anaerobic digestion of solids. No adverse impacts to cultural or historical resources are anticipated.

Under biosolids treatment Alternative 2 – two pipelines would be constructed in the public right-of-way to transfer primary solids and WAS to WWTP No. 2. Because this alternative would be located in an existing public right-of-way where previous ground disturbance is likely, no adverse impacts to cultural or historical resources are anticipated.

3.5.4 Mitigation

No adverse impacts to historical resources are expected and no mitigation is proposed. Mitigation related to cultural resources would be the same for the Proposed Action and the

Project Alternative. SHPO recommends extreme caution during ground-disturbing activities at the existing WWTP site and immediate vicinity (Exhibit B). If archaeological material were found during construction, all work would cease immediately until a professional archaeologist could assess the discovery. A data recovery plan would be developed by a professional archaeologist, with input from applicable Tribes regarding treatment of archaeological deposits.

3.6 Threatened and Endangered Species

3.6.1 Affected Environment

The presence of threatened, endangered, and candidate species in the study area was assessed from correspondence with the U.S. Fish and Wildlife Service (USFWS) (Exhibit C), a review of the National Marine Fisheries Service (NOAA Fisheries) website, a review of the Oregon Natural Heritage Information Center database (ONHIC, 2005), and a site visit on January 26, 2005. Threatened, endangered, and candidate species that may occur in the project vicinity are listed in Table 2. The distribution, habitat requirements, and likely presence in the project area of each of these species are described below.

Table 2. Threatened and Candidate Species that May Occur in the Project Vicinity

Common Name	Scientific Name	Federal Status	Agency with Jurisdiction
FISH			
Coho salmon (Oregon Coast ESU)	*Oncorhynchus kisutch*	Threatened	NOAA Fisheries
Steelhead (Oregon Coast)	*O. mykiss*	Candidate	NOAA Fisheries
WILDLIFE			
Brown pelican	*Pelecanus occidentalis*	Endangered	USFWS
Bald eagle	*Haliaeetus leucocephalus*	Threatened	USFWS
Marbled murrelet	*Brachyramphus marmoratus*	Threatened	USFWS
Northern spotted owl	*Strix occidentalis caurina*	Threatened	USFWS
Western snowy plover	*Charadrius alexandrinus nivosus*	Threatened	USFWS
Stellar sea lion	*Eumetopias jubatus*	Threatened	NOAA Fisheries
Pacific fisher	*Martes pennanti pacifica*	Candidate	USFWS
PLANTS			
Western lily	*Lilium occidentale*	Endangered	USFWS

Notes: ESU = Evolutionarily Significant Unit; USFWS = U.S. Fish and Wildlife Service; NOAA Fisheries = National Marine Fisheries Service

3.6.1.1 Salmonids

Coos Bay provides migration and rearing habitat for coho salmon and steelhead (ONHIC, 2005). Coho salmon (Oregon Coast ESU) is federally listed as threatened and considered a state sensitive-critical species. Critical habitat has not been designated for Oregon Coast coho salmon. Steelhead (Oregon Coast) is a candidate for listing on the Endangered Species Act (ESA) and is considered a state sensitive-vulnerable species.

Coho spawning and rearing habitat typically consists of small, low gradient tributary streams (Nickelson, 2001). Oregon coast adult coho are typically two years old when they return to their natal streams in the fall to spawn and die. Coho require clean gravel and cool temperatures for spawning and rearing (preferably 50 to 57° F). Juvenile coho typically spend one summer and one winter in freshwater, then migrate to the ocean. Although little is known about the residence time of juveniles in estuaries during out-migration, recent research indicates that juveniles may rear for extended periods in the upper ends of tidal reaches (Nickelson, 2001). During the summer, coho are found in pools in small streams. During the winter, juvenile coho may be found in off-channel alcoves (Nickelson, 2001).

Oregon coast steelhead has the most complex life history of the Pacific salmonids (Busby et al., 1996). Spawning and rearing habitat requirements of steelhead are similar to those described above for Oregon coast coho. Oregon coast steelhead are typically four years old when they return to their natal streams. Adult migration ranges from December to April with peak spawning in January and February (Busby et al., 1996).

3.6.1.2 Brown Pelican

The brown pelican was listed as endangered throughout its range on October 13, 1970 (35 FR 16047). Critical habitat is not designated for this species. Brown pelicans breed from November to March on small islands off the coast of California. During the non-breeding season, brown pelicans forage along the coast of Oregon and Washington. Typical foraging habitat includes near-shore waters and shallow estuaries. Pelicans plunge bill first into the water to catch surface-schooling fish.

Brown pelican foraging habitat occurs throughout Coos Bay and along the coast in the vicinity of the project. Specific feeding and roosting habitat for this species is noted on the north side of the bay near a sunken jetty, on North Spit, and south of the WWTP No. 2 at RM 3.4 (OHNIC, 2005).

3.6.1.3 Bald Eagle

On February 14, 1978, the bald eagle was federally listed as endangered in the conterminous United States, except for Oregon, Washington, Michigan, Minnesota, and Wisconsin, where it was listed as threatened. The bald eagle was proposed for delisting on July 6, 1999, but remains listed while the decision to delist the bald eagle is pending (64 FR 36453). Critical habitat has not been designated or proposed for bald eagles.

Bald eagles generally perch, roost, and build nests in mature trees near water bodies and available prey, usually away from intense human activity. They typically forage on open bodies of water and prey on a variety of foods, including fish, birds, mammals, carrion, and invertebrates (Stinson et al., 2001). Bald eagle winter foraging areas are usually located near open water on rivers, lakes, reservoirs, and bays with abundant fish and waterfowl (ODFW, 2003).

No bald eagle nest sites are known to occur within one mile of the project site (Stuart Love, personal communication, 2005). No bald eagles or their nests were observed during the January 26, 2005, site visit to the existing WWTP No. 2 facility. The shoreline in the project vicinity contains patches of mature forest and may provide suitable roosting and perching habitat for bald eagles (Photo 10, Exhibit A). However, the project vicinity does not provide unique bald eagle habitat, and no large trees are proposed for removal. The proposed activities would take place on or adjacent to the existing WWTP site, where human activity is common. The proposed construction would be limited in duration and occur within a small area; therefore, it would not likely have any effect on bald eagle breeding or foraging behavior.

3.6.1.4 Marbled Murrelet

The marbled murrelet was listed as threatened on October 1, 1992. Critical habitat was designated for this species on June 24, 1996 and typically consists of mature forests on state or federally owned lands (61 FR 26256). The marbled murrelet is a small seabird that breeds in large blocks of late successional or old growth coniferous forests (61 FR 26256). Marbled murrelets forage on small fish and invertebrates in near-shore marine environments, including estuaries. No marbled murrelet nests are recorded for the project vicinity (ONHIC, 2005), and no potential marbled murrelet habitat occurs on-site or in the vicinity due to a lack of mature forest habitat.

3.6.1.5 Northern Spotted Owl

The northern spotted owl was listed as threatened on June 26, 1990, due to widespread habitat loss. Critical habitat was designated for this species on February 14, 1992. The northern spotted owl requires large tracts of mature coniferous or coniferous/mixed-hardwood forests (57 FR 1796). No spotted owl nests are recorded for the project vicinity (ONHIC, 2005) and no potential spotted owl habitat occurs on the project site or immediate vicinity. The project vicinity lacks large blocks of mature forest and does not provide suitable perching or nesting habitat for the northern spotted owl.

3.6.1.6 Western Snowy Plover

The Pacific coast vertebrate population segment of the western snowy plover was listed as threatened on March 5, 1993. On January 6, 2000, the USFWS designated 28 areas along the coast of California, Oregon, and Washington as critical habitat for this small shorebird (64 FR 68507). The Pacific coast population of the western snowy plover is defined as those individuals that nest adjacent to tidal waters, and includes all nesting birds on the mainland coast, peninsulas, offshore islands, adjacent bays, estuaries, and coastal rivers (64 FR 68507). Preferred nesting habitat includes sand spits, dune-backed beaches, beaches at creek and river mouths, and salt pans at lagoons and estuaries. The nearest documented western snowy plover habitat is located on the North Spit across the bay and about one mile from the WWTP No. 2 (ONHIC, 2005). No suitable nesting habitat is located on the WWTP site, or on the adjacent stockpiling area, or in First Creek just south of Fulton Avenue.

3.6.1.7 Stellar Sea Lion

The stellar sea lion was listed as threatened in 1990. Critical habitat was designated August 27, 1993, and includes major rookeries and associated air and aquatic zones in Oregon and California. The aquatic zone includes an area extending 3,000 feet seaward from the rookery into state and federally managed waters. The nearest stellar sea lion rookery is located at Orford Reef, 40 miles south of the project site (NOAA Fisheries, 2005). Stellar sea lions are gregarious animals that congregate at rookeries and haul-outs. They have a varied diet that includes salmon, sand lance, Pacific herring, Pacific cod, mackerel, squid, and occasionally seals. According to information from ODFW, Stellar sea lions are a pelagic species and are not likely to occur in Coos Bay (Stuart Love, personal communication, 2005).

3.6.1.8 Pacific Fisher

The Pacific fisher is a nocturnal carnivore that dens in hollow trees and rocky crevices. This shy mammal is associated with large, undisturbed tracts of forest (Ingles, 1965). As of 2001, only six fisher sightings have been confirmed in Oregon (Pacific Biodiversity Network, 2001). The project site and vicinity lack undisturbed forests and do not provide suitable habitat for the Pacific fisher.

3.6.1.9 Western Lily

The western lily is an endangered, herbaceous plant with an extremely limited distribution. Critical habitat is not designated for the western lily. This species is known to occur at 31 sites within about two miles of the coast between Hauser in Coos County, Oregon; and Loleta in Humboldt County, California (USFWS, 1994). The western lily may reach up to 5 feet in height and have red or sometimes orange flowers that are in bloom from late June through July (Eastman, 1990). This perennial bulb occurs on the margins of sphagnum bogs and in forest or thicket openings along the periphery of seasonal ponds and small channels. The western lily also may be found in coastal prairie and scrub near the ocean where fog is common. Associated plants include *Calamagrostis nutkaensis* (Pacific reedgrass), *Carex* spp. (sedges), *Sphagnum* sp. (sphagnum moss), *Gentiana sceptrum*, and *Darlingtonia californica* (California pitcher-plant), *Myrica californica* (wax-myrtle), *Ledum glandulosum* (Labrador tea), *Spiraea douglasii* (Douglas' spiraea), *Gaultheria shallon* (salal), *Rhododendron macrophyllum* (western rhododendron), *Vaccinium ovatum* (evergreen huckleberry), and *Rubus* sp. (blackberry). Associated trees include *Pinus contorta* (coast pine), *Picea sitchensis* (sitka spruce), *Chamaecyparis lawsonia* (Port Orford cedar), and *Salix* sp. (willow).

3.6.2 Regulatory Environment

Threatened and endangered species are protected under the federal ESA of 1970 (16 USC 1531). The ESA prohibits the "take" of listed species without a special permit. Take is defined as to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, collect, or attempt any of these actions. Consultation with the USFWS or NOAA Fisheries is required for proposed actions with a federal nexus that may affect threatened or endangered species or their habitats. Any proposed in-water work in First Creek would be subject to the Oregon Department of Fish and Wildlife (ODFW) preferred in-water work period to protect fish resources. The in-water work period for Coos Bay (including First Creek) is July 1 to September 15 (ODFW, 2002).

Fish habitat is protected under the Magnuson-Stevens Act (16 USC 1801). The purpose of this federal law is to promote protection, conservation, and enhancement of EFH. EFH includes those waters and substrates necessary to fish for spawning, breeding, feeding, or growth to maturity. The MSA requires all federal agencies to consult with NOAA Fisheries on all actions or proposed actions that are permitted, funded, or undertaken by the federal agency that may adversely affect designated EFH.

3.6.3 Environmental Consequences

3.6.3.1 No Build Alternative

The No Build Alternative would maintain existing conditions that include the discharge of treated effluent to waters containing threatened and proposed for listing fish species.

3.6.3.2 Proposed Action

The Proposed Action would consist of improving the existing WWTP site to meet more restrictive water quality standards for the discharge of treated effluent. With proposed facility upgrades, the fecal coliform, chlorine, and ammonia concentrations would be substantially reduced. Construction would occur at a site that is currently developed and no vegetation is proposed for removal. No changes are proposed to the existing outfall in Coos Bay except for higher volumes of effluent (during projected future peak flows) and lower concentrations of toxic chemicals and pathogens.

The Proposed Action is not expected to adversely affect the northern spotted owl, pacific fisher, Stellar sea lion, and western snowy plover due to a lack of suitable habitat for these species on the project site and immediate vicinity. No large tracts of forest or upper beach habitat would be impacted by the proposed upgrades. The project would improve effluent quality and therefore may indirectly benefit species that forage on aquatic organisms in Coos Bay including the marbled murrelet, bald eagle, and brown pelican. No direct impacts to the marbled murrelet, bald eagle, and brown pelican are anticipated.

The NPDES water quality standards are designed to protect beneficial uses of Coos Bay that include shellfish production and salmonid habitat. Effluent discharge limits for fecal coliform, ammonia, chlorine, and temperature were developed with consideration of salmonid habitat requirements. Consequently, the Proposed Action is not anticipated to adversely impact coho salmon and steelhead.

First Creek is not mapped as salmonid habitat (OHNIC, 2005), but it may provide refugia for juvenile salmonids. Construction-related impacts to First Creek are anticipated to be minimal. The new sewer pipe would be bored under the streambed and the old sewer pipe would be removed during the recommended in-water work period. Removal of the old sewer pipe would improve fish habitat conditions in the stream by eliminating a partial barrier and pipe that could potentially leak.

Based on the current known distribution and habitat requirements, the banks of First Creek may be considered potential habitat for the western lily. However, no clearing or grading of the banks is proposed as part of the Proposed Action or Project Alternative and no adverse impacts to this endangered species is anticipated.

3.6.3.3 *Project Alternative*

The Project Alternative would result in the same environmental consequences as described for the Proposed Action.

3.6.4 Mitigation

Measures to minimize impacts to threatened and endangered species have been incorporated into the design of both alternatives: improving an existing facility, locating new equipment on previously disturbed land, and directionally boring the new sewer pipe under First Creek. Mitigation to reduce potential adverse impacts to First Creek include removing the old sewer pipe during the ODFW recommended in-water work period of July 1 to September 15. Compliance with the renewed NPDES permit that incorporates more restrictive water quality standards will minimize adverse impacts to listed and proposed for listing fish species in Coos Bay.

3.7 Fish, Wildlife and Vegetation

3.7.1 Affected Environment

The presence of fish, wildlife, and vegetation types in the study area were determined from a review of the Oregon Natural Heritage Information Center database (ONHIC, 2005), and a site visit on January 26, 2005. The affected environment includes the existing WWTP site, the debris stockpile site, First Creek in the vicinity of the existing influent sewer pipe, and Coos Bay in the vicinity of the existing effluent outfall. The existing WWTP site is developed and provides limited wildlife habitat. Gulls and crows commonly congregate at the facility and their scat is considered a nuisance by facility operators who hose-off the equipment on a daily basis (Robert Watts, personal communication, 2005). Wildlife species anticipated to occur adjacent to the WWTP include terns, osprey, thrushes, chickadees, wrens, woodpeckers, squirrel, and small rodents.

The little amount of vegetation present on the WWTP No. 2 site includes mowed grass, weedy herbaceous plants, and one or two shore pines (*Pinus contorta*) near the operations building. Vegetation on the outside of the fenced facility is also mowed grass and weedy herbaceous plants. Vegetation on the banks of First Creek includes Lyngby sedge (*Carex lyngbyei*), reed canarygrass (*Phalaris arundincea*), red-osier dogwood (*Cornus sericea*), red alder (*Alnus rubra*), and rush species (*Juncus sp.*). Vegetation along the perimeter of the cleared stockpiling area includes Scot's broom (*Cytisus scoparius*), Himalayan blackberry (*Rubus discolor*), and a few mature conifers (Photo 9, Exhibit A). Salt marsh habitat is located just north of the WWTP site and includes such species as the western marsh-rosemary (*Limonium californicum*), *Jaumea carnosa*, *Salicornia* virginica, and *Distichlis spicata*.

The effluent outfall is located at RM 3.8 in Coos Bay. In general, estuaries are highly productive systems that provide habitat for a multitude of resident and migratory species, including fish, marine mammals, terrestrial mammals, and birds (Johnson and O'Neil, 2002). The intertidal mudflats in Coos Bay provide habitat for oysters and clams while the salt marshes support shorebirds, juvenile fish, and other aquatic organisms. Fish and aquatic species present in Coos Bay near the outfall include: rock fish, Dungeness crab, Pacific lamprey, sturgeon, anchovy, herring, chum salmon, coho salmon, steelhead, surf perch, and lingcod (Alan Ritchey, personal communication, 2005). While salmonid habitat is not mapped for First Creek (DSL, 2005), the stream is likely to support other native fish species including coastal cutthroat trout and three-spine stickleback.

3.7.2 Regulatory Environment

Fish and wildlife species that are not listed under the federal ESA are protected in a few different ways. The federal Fish and Wildlife Coordination Act (16 USC 661) requires consultation with the USFWS for water-resource development projects that may result in the loss of or damage to wildlife resources. Water-resource development projects include actions where the "waters of any stream or other body of water are proposed or authorized, permitted or licensed to be impounded, diverted . . . or otherwise controlled or modified" by any agency under a federal permit or license.

The Migratory Bird Treaty Act (16 USC 703) prohibits the unauthorized "take" of all birds, including their nests, eggs, and young, with the exception of the European starling (*Sturnus vulgaris*), English sparrow (*Passer domesticus*), and domestic pigeon (*Columba* ssp.) (non-native species).

At the state level, ODFW provides guidance to federal permitting agencies regarding the potential for projects to adversely impact fish and wildlife resources. Through the application of statewide planning goals and policies, the state also requires local governments to plan for and protect natural resources. Fish, wildlife, and vegetation resources are addressed as part of State Planning Goal 5. All local jurisdictions must adopt regulations that comply with Goal 5 and its Policies and have their regulations acknowledged by the State Land Conservation and Development Commission.

3.7.3 Environmental Consequences

3.7.3.1 No Build Alternative

The No Build Alternative would maintain existing conditions, including discharge of effluent that exceeds the bacterial limit required in the NPDES permit for shellfish growing waters. Partially treated waste from overflows can impair the health of fish and other aquatic organisms and reduce economic and recreational opportunities in the Coos Bay.

3.7.3.2 Proposed Action

Construction of the Proposed Action would occur on previously disturbed or developed ground and is not anticipated to negatively affect fish and wildlife species or vegetation. No mature trees or native vegetation is proposed for removal. Aquatic habitat in Coos Bay may be positively affected by the proposed upgrades that are designed to meet more restrictive water quality standards for discharged effluent. Removing the old sewer pipe that is in poor condition is expected to improve habitat conditions in First Creek by reducing the possibility of raw sewage leaking into the stream and by eliminating a partial fish-barrier.

3.7.3.3 Project Alternative

The Project Alternative would have similar consequences to fish, wildlife, and vegetation as described for the Proposed Action.

3.7.4 Mitigation

Measures to minimize impacts to fish, wildlife, and vegetation have been incorporated into the design of both alternatives and include the following: improving an existing facility, locating new equipment on previously disturbed land, and directionally boring the new sewer pipe under First Creek. Mitigation to reduce potential adverse impacts to First Creek include removing the old sewer pipe during the ODFW recommended in-water work period of July 1 to September 15. Compliance with the renewed NPDES permit that incorporates more restrictive water quality standards will minimize adverse impacts to listed and proposed for listing fish species in Coos Bay.

3.8 Water Resources

3.8.1 Affected Environment

The affected environment includes the WWTP site and the effluent outfall located 0.3 miles offshore in Coos Bay at RM 3.8. The affected environment also includes First Creek in the vicinity of the project site.

The Coos Bay estuary, a sub-basin of the South Coast Watershed, covers approximately 13,348 acres and is fed by a number of creeks and rivers including Coos River, Coquille River, Willanch Creek, Kentuck Creek, Larson Creek, and Palouse Creek. The town of North Bend and the City of Coos Bay are situated on a peninsula that roughly divides Coos Bay into a western and an eastern portion. The western portion of Coos Bay is protected by North Spit - a narrow landmass with sand dunes. The tidally influenced mud flats along the shores of Coos Bay are ideal for shellfish production. Land use surrounding the bay includes agriculture, private and public timberlands, the Oregon Dunes National Recreation Area, wildlife reserves, urban centers (North Bend and the City of Coos Bay).

First Creek is a perennial tributary stream of Coos Bay that originates in the hills of the North Bend – Coos Bay peninsula. It flows northwest and is culverted under the Cape Arago Highway and Fulton Avenue before draining into a salt marsh behind the unnamed island just north of the

WWTP site. The culvert at Fulton Avenue has an approximate diameter of 2.5 feet and a length of 15 feet. The culvert at Cape Arago Highway was not observed during Adolfson's January, 2005 field visit. The influent sewer pipe crosses First Creek just south of Fulton Avenue (Photo 4, Exhibit A).

The DEQ administers and monitors water quality standards for Oregon rivers and streams per Section 303(d) of the federal Clean Water Act. Coos Bay from RM 7.8 to 12.3 exceeds water quality standards for fecal coliform (DEQ, 2002). Coos Bay is not listed for any other water quality parameters. Based on field data collected between 1991 and 2001 at DEQ's monitoring station in the vicinity of WWTP No. 2, the water temperature averages 58.8° F (14.9° C) from June to September and averages 51.9° F (11.1° C) from December to March (DEQ, 2005). Based on DEQ data collected in 1982 near Cape Arago Highway, the average winter temperature for First Creek is 46.6°F (8° C).

3.8.2 Regulatory Environment

The project alternatives are subject to a variety of federal, state, and local laws related to water resources and water quality. Proposed activities affecting Waters of the United States are regulated under Sections 404, 401, and 402 of the federal Clean Water Act (CWA). Section 404 applies to the discharge of dredged or fill material into navigable waters of the United States, including jurisdictional wetlands.

The NPDES permit (Section 402 of the CWA) is a joint state and federal permit for wastewater discharges to surface waters. The NPDES program requires a plan to prevent stormwater pollution and to control erosion. Section 401 Water Quality Certification is required to ensure that a federally permitted activity resulting in discharge to a water of the State meets water quality standards. NPDES permit parameters include biochemical oxygen demand (BOD), total suspended solids (TSS), fecal coliform, pH, chlorine, ammonia, and thermal loading. Expected parameter limits are listed in Table 3. Both Sections 402 and 401 are administered by the DEQ.

DEQ establishes mixing zone requirements for the discharge of effluent into receiving waters as part of the NPDES permit. Two types of mixing zones are regulated – the acute mixing zone and the chronic mixing zone. The acute mixing zone is designed to prevent lethal impacts to aquatic organisms that are in the zone of initial contact and the chronic mixing zone is designed to protect the integrity of the entire receiving waterbody. The NPDES permit writer uses best professional judgment in establishing mixing zone requirements. The previous NPDES permit for WWTP No. 2 lacked an acute mixing zone but provided for a 50-foot chronic mixing zone. The renewed permit allows for the same size chronic mixing zone with the addition of a 5-foot acute mixing zone requirement.

The water quality standards for the South Coast Basin (OAR 340-041-0325) apply to the project area. Under the temperature standards for Coos Bay, no measurable increase outside the mixing zone is allowed in stream segments containing federally listed threatened and endangered species if the increase would impair the biological integrity of the population. A measurable increase is defined as greater than a 0.25° F increase at the edge of the mixing zone (OAR 340-041-0006(55)). A temperature evaluation conducted for the NPDES permit renewal concluded that discharge to Coos Bay would not result in a measurable increase in temperature at the edge of the mixing zone (DEQ, 2003).

At the state level, removal or fill of more than 50 cy of material in a water of the state requires a permit from the Oregon DSL (ORS 196.795-990). Waters of the state include wetlands, intermittent streams, lakes, rivers, and tidal and non-tidal bays. First Creek meets the definition of a water of the state. Activity below the ordinary high water (OHW) level of streams and rivers is subject to review by the ODFW in association with removal/fill permits issued by DSL. ODFW imposes in-water work periods to minimize adverse impacts to aquatic organisms. The recommended in-water work period for Coos Bay (including First Creek) is July 1 through September 15 (ODFW, 2002).

Table 3. Wastewater Discharge Limitations Not to be Exceeded

Parameter	Average Effluent Concentrations		Monthly* Average lb/day	Weekly* Average lb/day	Daily* Maximum lbs
	Monthly	Weekly			
May 1 – October 31:					
BOD_5	20 mg/L	30 mg/L	340	510	670
TSS	20 mg/L	30 mg/L	340	510	670
November 1 – April 30:					
BOD_5	30 mg/L	45 mg/L	700	1100	1400
TSS	30 mg/L	45 mg/L	700	1100	1400

Other parameters (year-round except as noted)	Limitations
Fecal Coliform Bacteria	Shall not exceed a monthly median of 14 organisms per 100 mL. Not more than 10 percent of the samples shall exceed 43 organisms per 100 mL. (See Note 2)
pH	Shall be within the range of 6.0 – 9.0
BOD_5 and TSS Removal Efficiency	Shall not be less than 85% monthly average for BOD_5 and TSS.
Total Residual Chlorine	Shall not exceed a monthly average concentration of 0.02 mg/l and a daily maximum concentration of 30 mg/l.
Ammonia-N (May 1 – October 31)	Shall not exceed a monthly average concentration of 20 mg/L and a maximum concentration of 30 mg/L. (See Note 3)
Excess Thermal Load (May 1 – October 31)	Shall not exceed 37 Million kcals/day as a weekly average. (See Note 1)

* Average dry weather design flow to the facility equals 2.02 MGD. Summer mass load limits based upon average dry weather design flow to the facility. Winter mass load limits based upon average wet weather design flow to the facility equaling 2.8 MGD. The daily mass load limit is suspended on any day in which the flow to the treatment facility exceeds 4.04 MGD (twice the design average dry weather flow).

Note 1. The thermal load limit was calculated using the average dry weather design flow and an estimated maximum weekly effluent temperature. This permit may be reopened, and the maximum allowable thermal load modified (up or down), when more accurate effluent temperature data becomes available. In addition, if the Total Maximum Daily Load (TMDL) for temperature for this sub-basin assigns a Waste Load Allocation (WLA) to this source, this permit may be re-opened to establish new thermal load limits and/or new temperature conditions or requirements.

Note 2. This permit may be reopened and modified as necessary to incorporate any Waste Load Allocation (WLA) or Best Management Practice established by the TMDL for bacteria for this sub-basin.

Note 3. The Department is currently in the process of revising the ammonia criteria. These limits are based upon the existing criteria and is considered "interim". Once the ammonia criteria is revised, the Department intends to reopen this permit and add to, modify or delete the limitations and requirements relating to ammonia.

3.8.3 Environmental Consequences

3.8.3.1 No Build Alternative

The No Build Alternative would result in continued discharge of effluent into Coos Bay that does not meet the bacteria standards for shellfish growing waters.

3.8.3.2 Proposed Action

The Proposed Action would include upgrading the existing system to accommodate projected future loads and flows and to meet more restrictive NPDES water quality standards while balancing the cost of improvements. Current peak flow is estimated at 4.5 mgd and the projected peak flow for 2027 is 6.0 mgd. While the volume of effluent discharged into Coos Bay will increase as the population grows, the concentrations of toxic chemicals and pathogens will decrease. A comparison of previous and current NPDES effluent discharge requirements is presented in Table 4.

Table 4. NPDES Effluent Discharge Limits: Previous and Renewed Permit Requirements

Selected Parameters	Effluent Discharge Limits (end of pipe)	
	Previous NPDES Permit	**Current NPDES Permit (renewed 2003)**
Fecal Coliform Bacteria	Monthly average effluent concentration of **200 organisms per 100 milliliters**, and weekly average effluent concentration of 400 organisms per 100 milliliters	A median concentration of **14 organisms per 100 milliliters**, with not more than 10 percent of the samples exceeding 43 organisms per 100 milliliters.
pH	6.0 – 9.0	6.0 – 9.0
BOD and TSS Removal Efficiency	Not less than 85% monthly average	Not less than 85% monthly average
Total residual chlorine	Shall not exceed a **daily median value of 0.5 mg/l** and no single sample shall exceed 1.0 mg/l	Shall not exceed a monthly average concentration of 0.02 mg/l and a **daily maximum concentration of 0.05 mg/l.**
Ammonia-N (May 1 – October 31)	--	Shall not exceed a monthly average concentration of 20 mg/L and a daily maximum

		concentration of 30 mg/L.
Excess Thermal Load (May 1 – October 31)	--	Shall not exceed 37 Million kcals/day as a weekly average.

The Proposed Action would also include installing a new influent sewer pipe under First Creek and removing the existing pipe. The new 30-inch-diameter sewer pipe would be installed five feet under the streambed via directional boring to minimize impacts to First Creek. The visible portion of the existing sewer pipe would be removed and the remaining pipe sections plugged and left in place. Minimal disturbance to the streambanks is anticipated.

3.8.3.3 *Project Alternative*

The environmental consequences to water resources from the Project Alternative are the same as described for the Proposed Action.

3.8.4 Mitigation

Both the Proposed Action and Project Alternative would satisfy DEQ's effluent disposal requirements. Compliance with DEQ's NPDES permit is recommended to minimize adverse water quality impacts. The renewed permit required the permittee to monitor eleven metals and cyanide in Coos Bay semi-annually for one year. No adverse impacts to water quality are anticipated as long as compliance with DEQ's NPDES permit is achieved.

Measures to minimize impacts to First Creek are incorporated into the proposed construction methods. Removing the existing sewer pipe from First Creek is recommended between July 1 and September 15 to comply with ODFW's in-water work guidelines for the protection of aquatic resources.

3.9 Coastal Management Zone

3.9.1 Affected Environment

The project area is within the Coastal Zone Management area of Oregon that extends from the Washington border to the California border, seaward to the extent of state jurisdiction (3 nautical miles offshore), and inland to the crest of the coastal mountain range.

3.9.2 Regulatory Environment

The federal consistency provisions of the Coastal Zone Management Act (CZMA) require that any federal action occurring in or outside of Oregon's coastal zone that affects coastal land or water uses or natural resources must be consistent with the Oregon Ocean-Coastal Management Program (OCMP). Federal consistency potentially applies to any project having effects on land and water uses or natural resources of the Oregon coastal zone. Federal financial assistance to state and local governments or related public entities, such as Rural Economic & Community Development, Housing and Urban Development, and U.S. Forest Service grants will trigger the consistency provisions of the CZMA.

The Department of Land Conservation and Development (DLCD) is the state of Oregon's designated coastal management agency and is responsible for reviewing projects for consistency with the OCMP and issuing coastal management decisions. A project must be shown to be consistent with the various applicable components of the OCMP, with the statewide planning goals, and with coastal city and county comprehensive plans and land use regulations. The City of Coos Bay and Coos County adopted the *Coos Bay Estuary Management Plan* to provide implementation of the OCMP and statewide planning goals.

Under the *Coos Bay Estuary Management Plan*, the WWTP No. 2 site is within Shoreland Segment 55. The Management Classification within Shoreland Segment 55 for the WWTP No. 2 site is Urban Development (UD). The Management Objective for Shoreland Segment 55 states:

> *This segment shall be managed to allow continuation of the existing mix of residential and commercial uses to the west of Cape Arago Highway (Empire Blvd.), since this segment is not especially suited to commercial and industrial water-dependent/related uses. This segment also contains designated mitigation Site M-1b (medium priority) which must be protected from pre-emptive uses, consistent with Policy #22.*

The WWTP use is allowed outright within this Shoreland Segment.

3.9.3 Environmental Consequences

3.9.3.1 No Build Alternative

The existing WWTP is consistent with the base zoning and the *Coos Bay Estuary Management Plan*. No mitigation would be required to maintain existing conditions.

3.9.3.2 Proposed Action

The Proposed Action would consist of upgrading an existing wastewater facility located in Shoreland Segment 55 of the *Coos Bay Estuary Management Plan*. The WWTP is a permitted use within the Shoreland Segment and proposed upgrades are consistent with the Oregon Ocean-Coastal Management Program.

3.9.3.3 Project Alternative

The Project Alternative would have the same consequences to the Coastal Management Zone as described under the Proposed Action.

3.9.4 Mitigation

No adverse impacts to the Coastal Management Zone are anticipated from either the Proposed Action or the Project Alternative and no mitigation is proposed.

3.10 Socio-Economic / Environmental Justice Issues

3.10.1 Affected Environment

The WWTP No. 2 is on the shoreline on the west side of the City of Coos Bay. An area of small commercial businesses along Empire Boulevard lies to the east of the treatment plant. Farther east, beyond Marple Street, the area is residential. Construction of proposed improvements at the facility may potentially affect the residential area on the west side of Coos Bay.

The median family income for the City of Coos Bay residents in the year 1999 was $38,721 (Census 2000 Summary File 3, Series P-77, Median Family Income, U.S. Census Bureau, 2003). Approximately 90 percent of the residents of the City of Coos Bay are white, with 5 percent a mix of two or more races and the rest of the ethnic groups in the population representing 2 percent or less. In comparison, Coos County residents are 92 percent white, 4 percent a mix of other races, 3 percent American Indian, and the remaining ethnic groups in the population representing 1 percent or less (Census 2000 Summary File 3, Series P-6 Race, U.S. Census Bureau, 2003).

Low-income populations were identified using statistical poverty thresholds from the Census 2000 Summary File 3, Series P-87 Poverty Status in 1999 by Age (U.S. Census Bureau, 2003). These thresholds were derived from information collected in the Census 2000. Poverty status is defined by a set of income thresholds that vary by family size and composition. Families or individuals with income below their appropriate poverty thresholds are classified as poor. In 1999, 17 percent of City of Coos Bay residents were at or below poverty level standards compared to 15 percent of Coos County residents (Table 5). The percentage of residents at or below poverty level at the national and state level is approximately 12 percent. No readily identifiable groups of low-income persons living in geographic proximity to the project area were identified from the income data.

Table 5. Population Comparison for the City of Coos Bay and Coos County

	United States	Oregon	Coos County	Coos Bay
Total population	273,882,232	3,347,667	61,534	15,026
Income in 1999 below poverty level	33,899,812	388,740	9,257	2,483
Percentage below poverty level	12%	12%	15%	17%

3.10.2 Regulatory Environment

In February 1994, President Clinton issued Executive Order 12898, which requires each federal agency to "...make achieving environmental justice part of its mission by identifying and addressing, as appropriate, disproportionately high and adverse human health or environmental effects of its programs, policies, and activities on minority populations and low-income populations in the United States..." (Executive Order 12898).

3.10.3 Environmental Consequences

3.10.3.1 No Build Alternative

The No Build Alternative would maintain existing conditions. Sewer rates would periodically increase to account for inflation. Socio-economic impacts could occur from this alternative due to the occasional discharge of effluent above the bacteria limits for shellfish growing waters.

3.10.3.2 Proposed Action

Under the Proposed Action, wastewater treatment upgrades would occur at an existing facility and would equally affect all the residents of Coos Bay. The project would not result in disproportionately high or adverse effects to minority or low-income populations. Information on sewer rate increases from this alternative is not available.

3.10.3.3 Project Alternative

Similar to the Proposed Action, the Project Alternative would affect all the residents of Coos Bay in a similar manner, regardless of race or income, and would not result in adverse impacts to socioeconomic resources. Information on sewer rate increases from this alternative is not available.

3.10.4 Mitigation

Neither the Proposed Action nor the Project Alternative would result in disproportionately high or adverse effects to minority or low-income populations and no mitigation would be required.

3.11 Noise

3.11.1 Affected Environment

The affected environment includes the existing WWTP site and immediate vicinity. Three residences are located between 100 and 150 feet away from the WWTP No. 2 site and are separated from the site by trees, shrubs, and First Creek. Adolfson staff noted during the January 2005 field visit that the operating equipment at the existing facility was barely audible from perimeter of the site on Fulton Road.

The human ear responds to a wide range of sound intensities. The decibel scale used to describe sound is a logarithmic rating system that accounts for the large differences in audible sound intensities. This scale accounts for the human perception of a doubling of loudness as an increase of 10 decibels (dBA). Hence, a 70 dBA sound level will sound twice as loud as a 60 dBA sound level. People generally cannot detect differences of 1 dBA, but a 5 dBA change would likely be perceived under normal conditions.

Table 6 presents representative noise sources and corresponding noise levels produced in decibels. Factors affecting the impact that a given noise will have on a person include the frequency and duration of the noise, the absorbency of the ground and surroundings, and the distance of the receptor from the noise source. The receptor and the usual background noise levels also determine the degree of impact.

Table 6. Sound Levels Produced by Common Noise Sources

Thresholds/Noise Sources	Sound Level (dBA)	Subjective Evaluations	Possible Effects on Humans
Carrier jet takeoff (50 ft)	140	Deafening	Continuous exposure can cause hearing damage
Siren (100 ft) Loud rock band	130		
Jet takeoff (200 ft) Auto horn (3 ft)	120		
Chain saw Noisy snowmobile	110		
Lawn mower (3 ft) Noisy motorcycle (50 ft)	100	Very Loud	
Heavy truck (50 ft); bulldozer or backhoe (100 ft)	90		
Pneumatic drill (50 ft); loader (100 ft) Busy urban street, daytime	80	Loud	
Normal automobile at 50 mph; Vacuum cleaner (3 ft)	70		Speech Interference
Large air conditioning unit (20 ft) Conversation (3 ft)	60	Moderate	
Quiet residential area; Light auto traffic (100 ft)	50		Sleep Interference
Library; Quiet home	40	Faint	
Soft whisper (15 ft)	30		Minimal Effects
Slight Rustling of Leaves	20	Very Faint	
Broadcasting Studio	10		
Threshold of Human Hearing	0		

Source: U.S. Environmental Protection Agency, 1971.

A noise level analysis has not been conducted for the project area. Local governments have primary responsibility for controlling noise sources and regulating outdoor noise levels in the environment.

3.11.2 Regulatory Environment

Local governments have primary responsibility for controlling noise sources and regulating outdoor noise levels in the environment. The City of Coos Bay regulates "unreasonable noise" under Ordinance No. 100. Restrictions on construction noise apply only to residential districts – the nearest residential district is approximately 400 feet east of the WWTP site.

The State of Oregon establishes noise standards for existing industrial and commercial facilities (OAR 340-035-0035) and exemptions for construction noise (OAR 340-035-035(5)(g)). These standards are administered by the Oregon DEQ but are no longer enforced by DEQ due to elimination of the noise program (Rachel Sakarta, personal communication, 2004). Nevertheless, Commercial Noise Source Standards (OAR 340-35-035) are as follows:

- 7am-10pm: L_{50} = 55 dBA, L_{10} = 60 dBA, L_1 = 75 dBA
- 10pm-7am: L_{50} = 50 dBA, L_{10} = 55 dBA, L_1 = 60 dBA.

The L_{50} represents the allowable mean noise level that may occur in one hour. The L_{10} and L_1 represent the allowable noise level for 10% and 1% of one hour, respectively.

3.11.3 Environmental Consequences

3.11.3.1 No Build Alternative

The No Build Alternative would maintain existing conditions. No noise complaints have been made regarding operation of the existing wastewater system.

3.11.3.2 Proposed Action

Proposed wastewater facility upgrades would occur at an already developed site that is approximately 100 to 150 feet away from nearby residences. Noise from heavy trucks, bulldozers, or backhoes may be audible to the nearest residences during construction, but construction noise would likely be limited to daylight hours (7 a.m. to 6 p.m. Monday through Friday). Construction noise would also be attenuated by distance (100 to 150 feet) and vegetation. Additionally, construction would occur in an area with existing background noise from the Cape Arago Highway, a two-lane major thoroughfare, and existing commercial and industrial uses. No adverse noise impacts are anticipated.

3.11.3.3 Project Alternative

The Project Alternative for headworks, effluent treatment, and Biosolids treatment Alternative 1 would result in construction noise impacts similar to those described for the Proposed Action. This alternative would also involve constructing a second aeration process unit and associated blowers. The blowers would be housed in a small building and would not result in a significant noise increase.

Biosolids treatment Alternative 2 would require construction in the public right-of-way along an undetermined route. Construction noise along this route may be audible to residents in the vicinity.

3.11.4 Mitigation

Temporary construction noise resulting from either the Proposed Action or the Project Alternative may be audible to nearby residences. Although not required by the City of Coos Bay, construction would likely occur during daylight hours (generally between 7 a.m. and 6 p.m.) Monday through Friday. No adverse noise impacts are anticipated from operation of the upgraded WWTP, and no additional mitigation would be required.

3.12 Air Quality

3.12.1 Affected Environment

The affected environment includes the existing WWTP and immediate vicinity. The climate of Coos Bay is characterized by mild summers and wet, cool winters. Temperatures range from 46 to 67° F between May and October and 39 to 57° F from November to April. The average annual precipitation is 62 inches with most of the rainfall occurring October to April (National Weather Services, 2003).

The average wind velocity for North Bend is approximately 8 miles per hour with gusting up to 29 and 38 mph (National Weather Service, 2005). Wind direction is variable. Sufficient wind is present in the project area the year to disperse air pollutants released into the atmosphere.

Existing odor and air pollutant-producing activities on the site include the primary sedimentation, aeration, and the digester. The waste gas burner is not working and digester gas (methane) is being discharged to the atmosphere. Nearby sources of odor include exhaust from vehicles on the Cape Arago Highway and exposed mud and sand at low tide.

No significant sources of air pollution are designated by the Environmental Protection Agency (EPA) for the project site or vicinity (EPA, 2004). The nearest area that exceeds ambient air quality standards is the Eugene-Springfield area (EPA, 2004). A few odor complaints have been made in the past (during the summer months), but none have been made recently (Robert Watts, personal communication, 2005).

3.12.2 Regulatory Environment

Air quality is regulated under the federal Clean Air Act (CAA) and its amendments. At the federal level, the CAA is administered by the EPA. In Oregon, EPA has delegated its regulatory authority for air quality to the DEQ and to regional clean air agencies.

Several different types of air pollutants are subject to regulation. Under the CAA, EPA has set air quality standards for six principal pollutants: carbon monoxide, sulfur dioxide, lead, ozone, and two categories of particulate matter. The standards for these "criteria" pollutants are known as the National Ambient Air Quality Standards, or NAAQS. Areas of the country that persistently exceed the national ambient air quality standards for these pollutants are designated "nonattainment" areas.

EPA also has set standards for 188 hazardous air pollutants (HAPs), which are known or believed to cause human health effects when they exceed levels specified by EPA. HAP emissions in excess of certain levels are subject to National Emissions Standards for Hazardous Air Pollutants (NESHAPS). While the CAA and state and local regulations set standards for criteria pollutants and HAPs, they do not set standards for odors.

3.12.3 Environmental Consequences

3.12.3.1 No Build Alternative

The No Build Alternative would maintain existing conditions. Offensive odors are occasionally detected at nearby residences due to inadequate treatment facilities.

3.12.3.2 Proposed Action

Approximately 8,750 square feet or 0.2 acres of earthwork (excavating and grading) would be required to implement the proposed upgrades at the existing WWTP No. 2 site. Construction might result in periodic, short-term increases of airborne particles on-site and in the vicinity of the project. Dust and engine exhaust generated by construction equipment (such as front-end loaders or excavators) at the existing WWTP site would be the main source of impacts to air quality. These impacts are expected to occur intermittently during construction between 7 a.m. and 6 p.m. at the existing WWTP site.

Operation of this alternative would result in trucking biosolids to WWTP No. 1 two to three times a day for anaerobic treatment. Currently, trucks haul solids off-site 2.5 to 5 times per week. Sources of exhaust would increase from more frequent truck traffic but the potential for generating offensive odors is reduced by not treating the solids on-site. By improving treatment technology, operation of the WWTP could improve air quality slightly after the proposed upgrades are in place.

3.12.3.3 Project Alternative

The footprint of impact is less (4,899 square feet or 0.1 acres) for this alternative because the proposed secondary clarifier would be constructed where the primary sedimentation basin is located. However, this alternative would involve the demolition of the primary sedimentation basin in addition to the existing headworks facility. The expected environmental consequences during construction are similar to those described for the Proposed Action.

Operation of this alternative (including headworks, effluent treatment, and Biosolids treatment 1) would result in treating biosolids on-site. Anaerobic digestion of solids currently occurs on-site, but with proposed upgrades, including a new gas burner, the generation of offensive odors and pollutants would decrease.

3.12.4 Mitigation

To minimize adverse air quality impacts during construction of either the Proposed Action or Project Alternative, water would be applied to Fulton Avenue and the WWTP No. 2 site to reduce the potential for creating dust. No other adverse air quality impacts are anticipated from construction or operation of either the Proposed Action or the Project Alternative, and no additional mitigation is required or proposed.

3.13 Traffic and Safety

3.13.1 Affected Environment

The affected environment includes the existing WWTP No. 2 site and the likely route to WWTP No. 1 and the facultative lagoons (Ocean Boulevard to Highway 101). The existing WWTP No. 2 site is located at the western end of Fulton Avenue, a block west of Empire Boulevard (Cape Arago Highway). Existing traffic activity at the site includes two to three employee trips per day and 2.5 to 5 truck trips per week.

Fulton Avenue is a short five-block-long local residential street that dead-ends at the treatment plant at its western end. No residences are accessed from Fulton Avenue in the block between Cape Arago Highway and the treatment plant. Cape Arago Highway, a north-south arterial, is the major through street on the west side of Coos Bay. Ocean Boulevard, also an arterial, is oriented northwest-southeast and connects Cape Arago Highway with downtown Coos Bay and Highway 101 (a principal arterial or state route). An arterial is defined as a route that goes beyond city limits (DKS Associates, 2004). Approximately 1,998 vehicles were counted, including 52 trucks, on Cape Arago Highway near Pacific Avenue (in the vicinity of the WWTP site) during a two-hour traffic survey (City of Coos Bay, 2002). The traffic count was conducted between 4 p.m. and 6 p.m. on Wednesday, August 4, 2002. During the same traffic survey and time period, 2,571 vehicles including 61 trucks were counted on Ocean Boulevard near Butler Avenue and 4,531 vehicles including 200 trucks were counted on Highway 101 near WWTP No. 1.

3.13.2 Regulatory Environment

Construction traffic is required to comply with the standards of the Oregon Department of Transportation (ODOT). The contractor would be required to submit a traffic control plan to ODOT as part of the proposed project.

3.13.3 Environmental Consequences

3.13.3.1 No Build Alternative

The No Build Alternative would maintain existing traffic conditions that include 2 to 3 employee trips per day and 2.5 to 5 truck trips per week. No traffic or safety impacts would occur from this alternative.

3.13.3.2 Proposed Action

Construction of the proposed action would result in an increase of 2.5 to 5 truck trips per week at the project site. No residences are accessed from Fulton Avenue in between Cape Arago Highway and the WWTP site, thereby minimizing adverse impacts to transportation and safety. Construction traffic would access the site via the Cape Arago Highway that currently receives high traffic volumes. Operation of the WWTP site under this alternative would involve hauling biosolids to WWTP No. 1 two to three times per day. The expected route for hauling biosolids

(Ocean Boulevard to Highway 101) currently experiences high traffic volumes and an additional two to five trucks per day is not anticipated to result in adverse effects. The number of employee trips would not change. Construction or operation of the Proposed Action is not anticipated to result in adverse traffic or safety impacts.

3.13.3.3 Project Alternative

The Project Alternative (including Biosolids treatment Alternative 1 and 2) would have the same construction-related traffic and safety impacts as the Proposed Action. Operation of the Project Alternative (headworks, effluent treatment, and Biosolids treatment Alternative 1) would result in treating biosolids on-site and hauling digested solids two to five times per week to the existing facultative lagoons located south of WWTP No. 1. The expected route for hauling biosolids to the lagoons would likely be Ocean Boulevard to Highway 101, which currently experience high traffic volumes. An increase of 2.5 to 5 trucks per day is not anticipated to result in adverse effects. he number of employee trips would remain the same.

Operation of Biosolids treatment Alternative 2 would eliminate the number of truck trips with the installation two pipelines to transfer primary solids and WAS to WWTP No. 1. The number of employee trips would remain the same.

3.13.4 Mitigation

Mitigation for construction-related traffic and safety impacts are the same for the Proposed Action and the Project Alternative. To mitigate for potential traffic impacts during construction, the contractor will be required to submit a traffic control plan to ODOT. Signage will be required near the construction site to alert passenger vehicles about lowered speed limits and merging trucks. With mitigation measures in place, 2.5 to 5 truck trips per week are not expected to result in adverse traffic impacts.

Operation of the Proposed Action would result in an increase of 2 to 3 trucks per day, whereas operation of the Project Alternative with Biosolids treatment 1 would result in an increase of 2.5 to 5 truck trips per week, and Project Alternative with Biosolids treatment 2 would eliminate truck trips. Although the Proposed Action results in more truck trips, adverse impacts to traffic on Cape Arago Highway, Ocean Boulevard, and Highway 101 are not anticipated due to existing high levels of traffic on these roads. No adverse impacts to traffic or safety are anticipated from either the Proposed Action or the Project Alternative and no mitigation is proposed.

3.14 Environmental Design (Aesthetics)

This section describes the aesthetics of the project alternatives, including environmental design techniques and compatible use.

3.14.1 Affected Environment

The existing WWTP No. 2 site is located at the western end of Fulton Avenue, one block west of Empire Boulevard. An existing flow monitoring station surrounded by a chain-link fence is visible from Cape Arago Highway and nearby commercial structures (Photo 7, Exhibit A). The existing WWTP No. 2 is visible from the Bay and possible the backyards of nearby residences, but is not visible from Cape Arago Highway. The debris stockpile site is situated west of riparian vegetation of First Creek and is only partially visible from Cape Arago Highway.

3.14.2 Regulatory Environment

In general, environmental design is regulated at the local level. Proposed improvements at the WWTP No. 2 site within the City of Coos Bay are subject to standards of the building permit.

3.14.3 Environmental Consequences

3.14.3.1 No Build Alternative

The No Build Alternative would maintain existing conditions.

3.14.3.2 Proposed Action

The proposed action would involve constructing a new pump station and headworks either where the flow monitoring station is located or on the adjacent debris stockpile site. The proposed secondary clarifier and thickening facility would be constructed on the WWTP site. The pump station would be housed in a concrete building 60 feet x 50 feet with a height of 12 feet and a flat roof. The headworks would be constructed of metal and concrete and would be 40 feet by 50 feet with a height of 20 feet. At either location, the pump station and headworks would be protected with a chain-link fence.

3.14.3.3 Project Alternative

The Project Alternative with Biosolids treatment Alternative 1 would also involve constructing a new pump station either where the flow monitoring station is located or on the adjacent debris stockpile site. The proposed secondary clarifier and thickening facility would be constructed on the WWTP site. The difference under this alternative would be the construction of only the screening unit adjacent to the pump station. The screening unit would extend 12 feet below ground and would have an approximate height of 6 feet. A dumpster would need to be located adjacent to the screening unit for disposal of screened material. At either location, the pump station and headworks would be protected with a located chain-link fence.

3.14.4 Mitigation

Features incorporated into the Proposed Action to reduce potential impacts to the surrounding environment include improving a site that is currently developed. Due to the minimal impacts expected during construction, no mitigation will likely be required by the City and none is proposed.

Construction of the proposed pump station and headworks/screening unit at the corner of Fulton Avenue and Cape Arago Highway would likely diminish the visual quality of the area. However, the project vicinity is currently developed with commercial and industrial structures and would not adversely impact aesthetics.

4.0 SUMMARY OF MITIGATION

Table 7 summarizes the proposed mitigation measures. Mitigation would be the same for both the Proposed Action and the Project Alternative.

Table 7. Summary of Mitigation

Environmental Factor	Mitigation (For the Proposed Action and Project Alternative)
Land use	• No mitigation recommended or required.
Floodplains	• Equipment constructed on the debris stockpile site (within the 100-year floodplain of Coos Bay) should comply with the development standards of the City's Flood Damage Prevention Chapter.
Wetlands	• Avoid clearing and grading the banks of First Creek.
Cultural and Historical Resources	• If cultural resources are found during construction, work would stop in the immediate vicinity and the appropriate agencies would be contacted. A data recovery plan would be developed by the professional archaeologist, with input from applicable Tribes regarding treatment of archaeological deposits.
Threatened and Endangered Species	• Remove the old sewer pipe during the ODFW recommended in-water work period of July 1 to September 15. • Comply with the water quality standards of the NPDES permit.
Fish, Wildlife, and Vegetation	• Remove the old sewer pipe during the ODFW recommended in-water work period of July 1 to September 15. • Comply with the water quality standards of the NPDES permit.
Water Quality	• Comply with the NPDES permit requirements issued by DEQ
Socio-Economic/Environmental Justice Issues	• No mitigation recommended or required.
Noise	• Restrict construction to daylight hours (generally 7 a.m. to 6 p.m.) Monday through Friday.
Air Quality	• Dampen Fulton Avenue and the WWTP site to reduce the potential for fugitive dust to arise.
Traffic and Safety	• Contractor will be required to submit a traffic control plan to ODOT. • Signage will be required near the construction site to alert passenger vehicles about lowered speed limits and merging trucks.
Aesthetics	• No mitigation recommended or required.

Notes: DEQ = Department of Environmental Quality

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EXHIBITS

EXHIBIT A – PHOTOGRAPHS

Photo 1 – Looking west at Coos Bay and the southern boundary of WWTP No. 2. Riprap protects the southern, western, northern boundaries of the site.

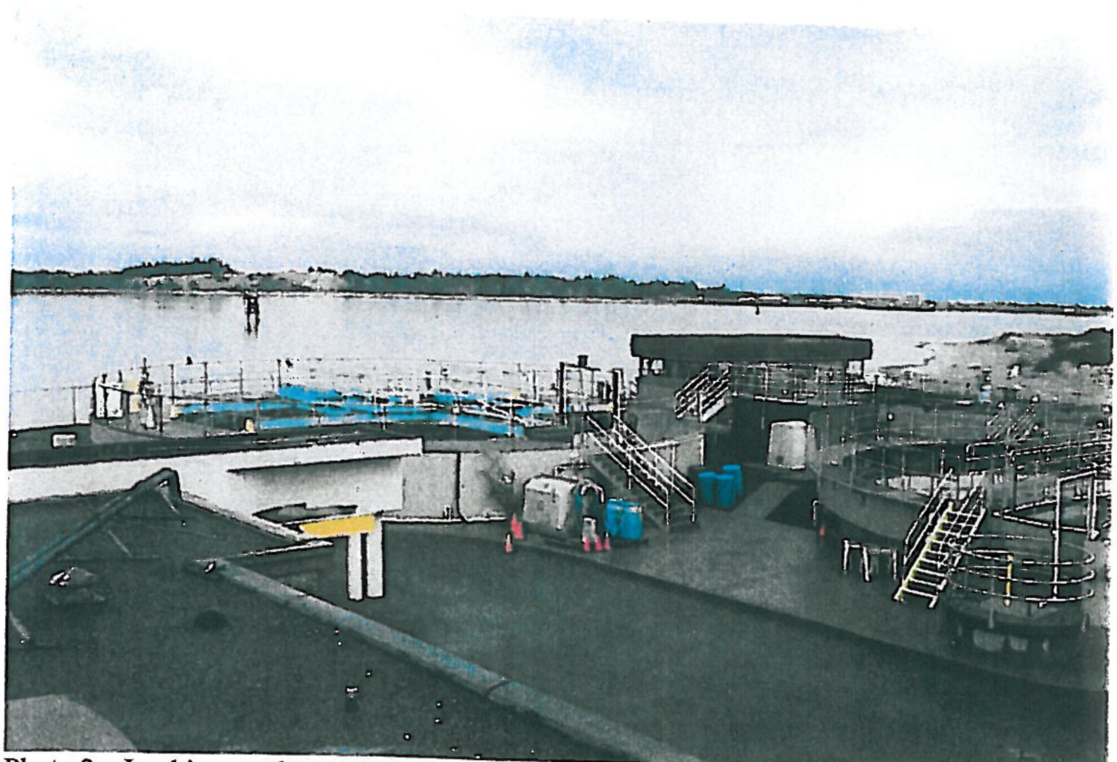

Photo 2 – Looking northwest from the headworks at the secondary clarifier No. 1 (circular structure on left) and primary sedimentation (right). Coos Bay is in the background.

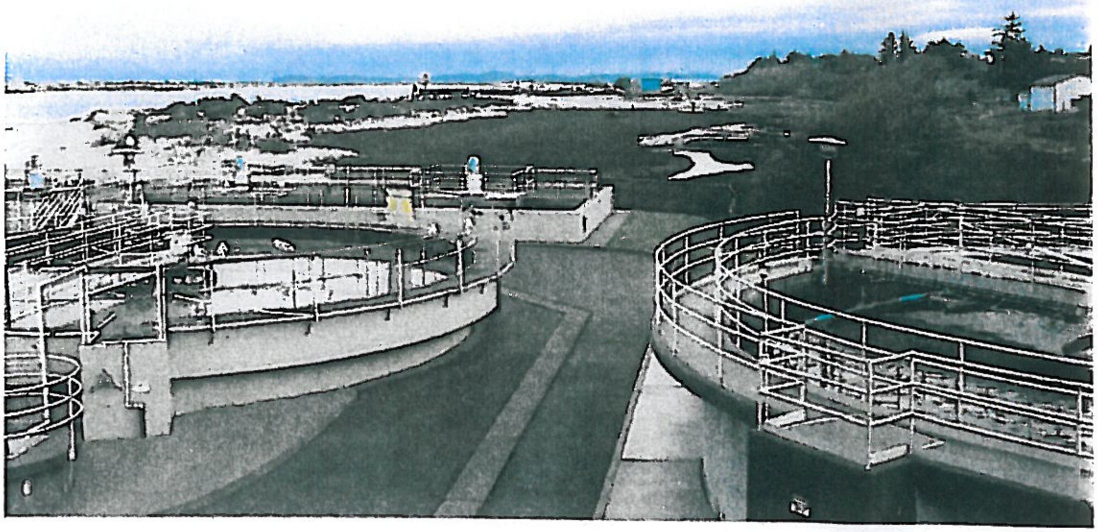

Photo 3 – Looking north from the headworks at primary sedimentation (left), secondary clarifier No. 2 (right), and the two aeration basins (background).

Photo 4 – Influent sewer pipe across First Creek.

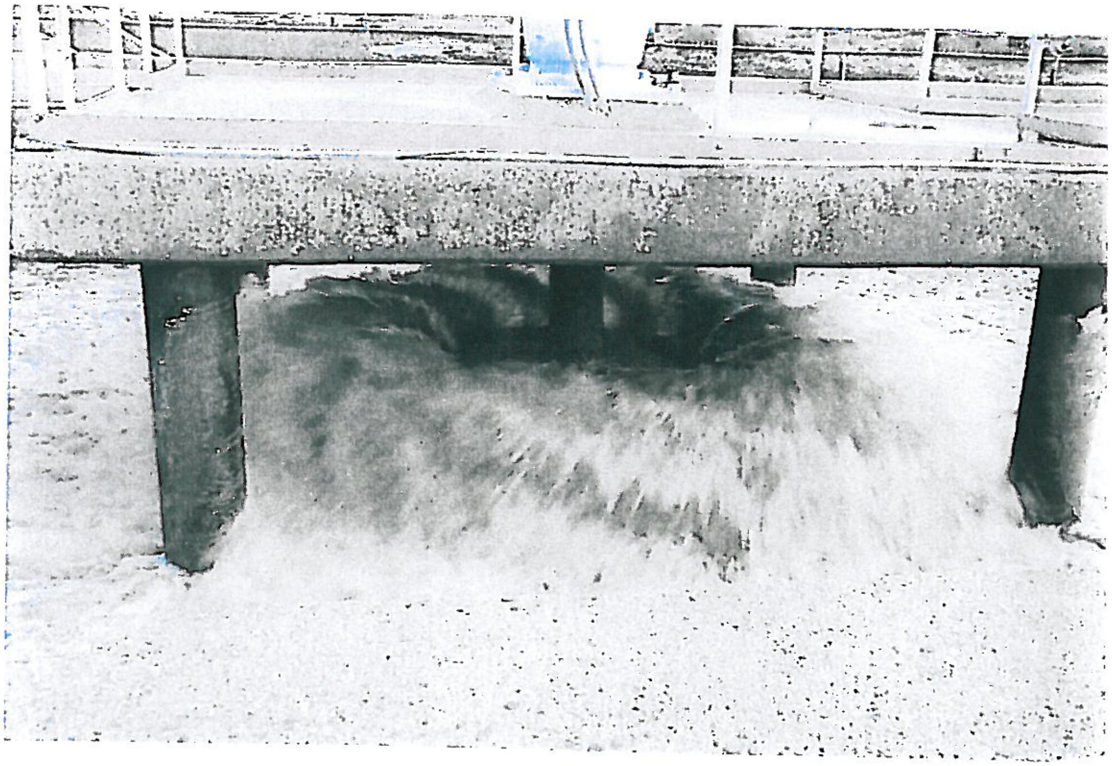

Photo 5: Surface aerator in one of the aeration basins.

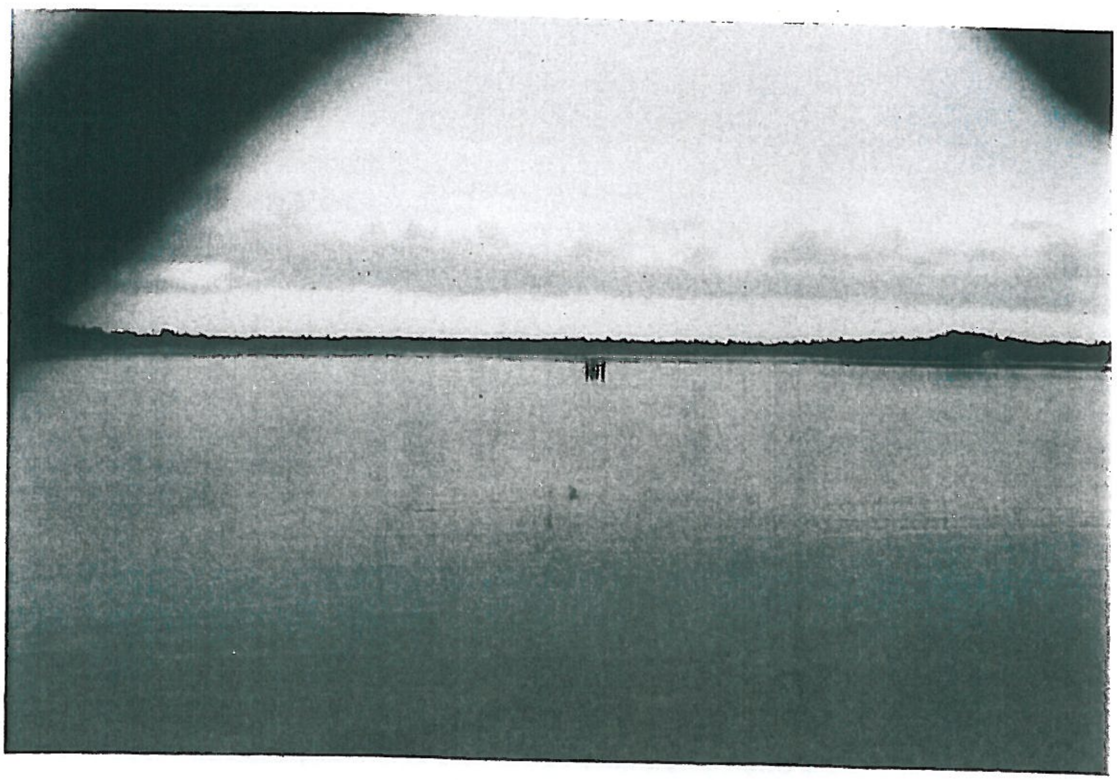

Photo 6: Effluent outfall viewed through the chain-link fence of the WWTP site.

Photo 7: Looking southeast at flow monitoring station and Empire Boulevard (Cape Arago Highway).

Photo 8: City-owned debris stockpile site south of Fulton Avenue.

Photo 9: Debris stockpile site in foreground and riparian vegetation of First Creek in background.

Photo 10: Looking south from the WWTP at beach and forest habitat on adjacent city property.

EXHIBIT B – LETTER FROM STATE HISTORIC PRESERVATION OFFICE

Oregon
Theodore R. Kulongoski, Governor

Parks and Recreation Department
State Historic Preservation Office
725 Summer St. NE, Suite C
Salem, OR 97301-1271
(503) 986-0707
FAX (503) 986-0793
www.hcd.state.or.us

January 24, 2005

JAN 27 2005

Ms. Sarah Hartung
Adolfson Associates, Inc.
333 SW Fifth Avenue, Suite 600
Portland, OR 97204-1743

RE: SHPO Case No. 05-0105
City of Coos Bay Wastewater Treatment Facilities Project
25S 13W 19, 26, Coos Bay, Coos County

Dear Ms. Hartung:

Thank you for your submission for the project referenced above. Unfortunately, the information you provided was not complete enough for us to comment on the above-ground portion of this review. Under NEPA and Section 106 of the National Historic Preservation Act it is the responsibility of the City of Coos Bay, or its chosen delegate, to perform any environmental review to determine if above-ground cultural resources may be affected by the proposed undertaking. It is the duty of the lead agency, or its chosen delegate, to locate National Register properties, survey the area of potential effect for properties that may be eligible for the National Register, make initial determinations of eligibility on such properties, and determine what effects the undertaking may have on these properties. The State Historic Preservation Office then responds to these agency findings within 30 days.

State Archaeologist Dennis Griffin has checked the statewide cultural resource database, and found that there have been no previous archaeological surveys completed anywhere near your proposed project area. However, your project area lies within an area generally perceived to have a high probability for possessing archaeological sites and/or buried human remains. While not having sufficient knowledge to predict the likelihood of archaeological resources within your project area, extreme caution is recommended during future ground disturbing activities. ORS 358.905 and ORS 97.740 protect archaeological sites and objects and human remains on State public and private lands in Oregon. If any archaeological material is discovered during construction activities, all work should cease immediately until a professional archaeologist can assess the discovery.

Our response here is to assist you with your responsibilities under NEPA and Section 106 of the National Historic Preservation Act (per 36 CFR Part 800). It does not satisfy the above-ground "SHPO consultation" requirement of the Section 106 process, nor does it imply concurrence on any above-ground portion of your project. We look forward to receiving the items specified above so we can complete our review and comment in a timely manner.

To further assist you, we have placed the Section 106 forms and guidelines on our website at http://www.oregon.gov/OPRD/HCD/SHPO/preservation_106.shtml. Please feel free to contact Dennis Griffin or me if you have further questions, comments or need additional assistance.

Sincerely,

Sarah Jalving

Sarah Jalving
Historic Compliance Specialist
(503) 986-0679 or Sarah.Jalving@state.or.us

-----Original Message-----
From: JALVING Sarah [mailto:Sarah.Jalving@state.or.us]
Sent: Wednesday, February 02, 2005 2:28 PM
To: Sarah Hartung
Subject: Coos Bay wastewater treatment plant projects

Sarah,
There is no need to complete above-ground Section 106 documentation forms for a structure that is not at least 50 years of age. So unless archaeological resources are uncovered, it seems that your Section 106 responsibilities are taken care of. Thanks and good luck.

Sarah Jalving
Review & Compliance
Oregon State Historic Preservation Office
Heritage Conservation Division
725 Summer St. NE, Suite C
Salem, Oregon 97301
phone: 503-986-0679
fax: 503-986-0793

>>> shartung@adolfson.com 01/27/05 04:41PM >>>
Hello Sarah: Thank you for your response on the Coos Bay wastewater treatment plant projects. I looked on the National Register of historic places and found 20 listings for the City of Coos Bay, but none are located on or adjacent to the existing wastewater treatment plants. Wastewater treatment plant No. 1 (WWTP 1) is located in the NW Section 26, Township 25 South, Range 13 West. Wastewater treatment plant No. 2 (WWTP 2) is located in the SE of Section 19, Township 25 South, Range 13 West.

No buildings or structures are proposed to be demolished at WWTP 1. At WWTP 2, the existing headworks is proposed to be demolished and completely rebuilt on the existing site or just outside the site boundaries. The headworks, constructed in 1990, screen raw sewage and remove grit before primary treatment.

I'm wondering if it's necessary to submit a Section 106 form regarding demolition of the headworks structure?
Thanks for your advisement.

Regards,
Sarah Hartung
Project Ecologist
Adolfson Associates, Inc.
333 SW Fifth Avenue, Suite 600
Portland, OR 97204-1743
Ph: 503-788-5270
Fx: 971-544-0450

EXHIBIT C – USFWS SPECIES LIST

United States Department of the Interior

FISH AND WILDLIFE SERVICE
Oregon Fish and Wildlife Office
2600 SE 98th Avenue, Suite 100
Portland, Oregon 97266
Phone: (503) 231-6179 FAX: (503) 231-6195

TAKE PRIDE IN AMERICA

FEB - 1 2005

Reply To: 8330.SP01(05)
File Name: Sp0161.wpd
TS Number: 05-0986

Sarah Hartung
Adolfson Associates, Inc.
333 SW Fifth Avenue, Suite 600
Portland, Oregon 97204-4174

JAN 28 2005

Subject: Wastewater Treatment Facility No. 2 Project
USFWS Reference # 1-7-05-SP-0161

Dear Ms. Hartung:

This is in response to your letter, dated January 11, 2005, requesting information on listed and proposed endangered and threatened species that may be present within the area of the Wastewater Treatment Facility No. 2 Project in Coos County. The Fish and Wildlife Service (Service) received your correspondence on January 11, 2005.

We have attached a list (Enclosure A) of threatened and endangered species that may occur within the area of the Wastewater Treatment Facility No. 2 Project. The list fulfills the requirement of the Service under section 7(c) of the Endangered Species Act (Act) of 1973, as amended (16 U.S.C. 1531 *et seq.*). Oregon Department of Environmental Quality (ODEQ) requirements under the Act are outlined in Enclosure B.

The purpose of the Act is to provide a means whereby threatened and endangered species and the ecosystems on which they depend may be conserved. Under section 7(a)(1) and 7(a)(2) of the Act and pursuant to 50 CFR 402 *et seq.*, ODEQ is required to utilize their authorities to carry out programs which further species conservation and to determine whether projects may affect threatened and endangered species, and/or critical habitat. A Biological Assessment is required for construction projects (or other undertakings having similar physical impacts) which are major Federal actions significantly affecting the quality of the human environment as defined in the National Environmental Policy Act (NEPA) (42 U.S.C. 4332 (2)(c)). For projects other than major construction activities, the Service suggests that a biological evaluation similar to the Biological Assessment be prepared to determine whether they may affect listed and proposed species. Recommended contents of a Biological Assessment are described in Enclosure B, as well as 50 CFR 402.12.

If ODEQ determines, based on the Biological Assessment or evaluation, that threatened and endangered species and/or critical habitat may be affected by the project, ODEQ is required to consult with the Service following the requirements of 50 CFR 402 which implement the Act.

Enclosure A includes a list of candidate species under review for listing. The list reflects changes to the candidate species list published May 4, 2004, in the Federal Register (Vol. 69, No. 86, 24876) and the addition of "species of concern." Candidate species have no protection under the Act but are included for consideration as it is possible candidates could be listed prior to project completion. Species of concern are those taxa whose conservation status is of concern to the Service (many previously known as Category 2 candidates), but for which further information is still needed.

If a proposed project may affect only candidate species or species of concern, ODEQ is not required to perform a Biological Assessment or evaluation or consult with the Service. However, the Service recommends addressing potential impacts to these species in order to prevent future conflicts. Therefore, if early evaluation of the project indicates that it is likely to adversely impact a candidate species or species of concern, ODEQ may wish to request technical assistance from this office.

Your interest in endangered species is appreciated. The Service encourages ODEQ to investigate opportunities for incorporating conservation of threatened and endangered species into project planning processes as a means of complying with the Act. If you have questions regarding your responsibilities under the Act, please contact Kevin Maurice or Corissa Larvik at (503) 231-6179. All correspondence should include the above referenced file number. For questions regarding salmon and steelhead trout, please contact NOAA Fisheries Service, 525 NE Oregon Street, Suite 500, Portland, Oregon 97232, (503) 230-5400.

Sincerely,

K J Maurice

for Kemper M. McMaster
State Supervisor

Enclosures
1-7-05-SP-0161

cc electronic:
Nongame, Oregon Department of Fish and Wildlife, Salem, Oregon.

Enclosure A

FEDERALLY LISTED AND PROPOSED ENDANGERED AND THREATENED SPECIES, CANDIDATE SPECIES AND SPECIES OF CONCERN THAT MAY OCCUR WITHIN THE AREA OF THE WASTEWATER TREATMENT FACILITY NO. 2 PROJECT
1-7-05-SP-0161

LISTED SPECIES[1/]

Mammals		
Steller sea lion	*Eumetopias jubatus*	**T
Birds		
Marbled murrelet[2/]	*Brachyramphus marmoratus*	CH T
Western snowy plover (coastal)[3/]	*Charadrius alexandrinus nivosus*	CH T
Bald eagle[4/]	*Haliaeetus leucocephalus*	T
Brown pelican	*Pelecanus occidentalis*	E
Northern spotted owl[5/]	*Strix occidentalis caurina*	CH T
Fish		
Coho salmon (Oregon Coast)[6/]	*Oncorhynchus kisutch*	**T
Plants		
Western lily	*Lilium occidentale*	E

PROPOSED SPECIES

None

CANDIDATE SPECIES

Mammals		
Fisher[7/]	*Martes pennanti*	
Fish		
Steelhead (Oregon Coast)[8/]	*Oncorhynchus mykiss*	**CF

SPECIES OF CONCERN

Mammals	
White-footed vole	*Arborimus albipes*
Red tree vole	*Arborimus longicaudus*
Pacific western big-eared bat	*Corynorhinus townsendii townsendii*
Silver-haired bat	*Lasionycteris noctivagans*
Long-eared myotis (bat)	*Myotis evotis*
Fringed myotis (bat)	*Myotis thysanodes*
Long-legged myotis (bat)	*Myotis volans*
Yuma myotis (bat)	*Myotis yumanensis*
Birds	
Band-tailed pigeon	*Columba fasciata*
Olive-sided flycatcher	*Contopus cooperi borealis*

Yellow-breasted chat	*Icteria virens*
Mountain quail	*Oreortyx pictus*
Oregon vesper sparrow	*Pooecetes gramineus affinis*
Purple martin	*Progne subis*
<u>Amphibians and Reptiles</u>	
Tailed frog	*Ascaphus truei*
Northwestern pond turtle	*Emys marmorata marmorata*
Northern red-legged frog	*Rana aurora aurora*
Southern torrent salamander	*Rhyacotriton variegatus*
<u>Fish</u>	
Green sturgeon	*Acipenser medirostris*
River lamprey	*Lampetra ayresi*
Pacific lamprey	*Lampetra tridentata*
Coastal cutthroat trout (Oregon Coast)	*Oncorhynchus clarki clarki*
<u>Invertebrates</u>	
Newcomb's littorine snail	*Algamorda newcombiana*
California floater (mussel)	*Anodonta californiensis*
<u>Plants</u>	
Pt. Reyes bird's-beak	*Cordylanthus maritimus ssp. palustris*
Moss	*Limbella fryei*

(E) - Listed Endangered *(T) - Listed Threatened* *(CH) - Critical Habitat has been designated for this species*
(PE) - Proposed Endangered *(PT) - Proposed Threatened* *(PCH) - Critical Habitat has been proposed for this species*
(S) - Suspected *(D) - Documented*

Species of Concern - Taxa whose conservation status is of concern to the Service (many previously known as Category 2 candidates), but for which further information is still needed.

(CF) - Candidate: National Marine Fisheries Service designation for any species being considered by the Secretary for listing for endangered or threatened species, but not yet the subject of a proposed rule.

*** Consultation with National Marine Fisheries Service may be required.*

1/ *U. S. Department of Interior, Fish and Wildlife Service, October 31, 2000, <u>Endangered and Threatened Wildlife and Plants</u>, 50 CFR 17.11 and 17.12*

2/ *Federal Register Vol. 57, No. 45328, October 01, 1992, Final Rule - Marbled Murrelet*

3/ *Federal Register Vol. 64, No. 234, December 7, 1999, Final Rule-Critical Habitat for the Western Snowy Plover*

4/ *Federal Register Vol. 60, No. 133, July 12, 1995 - Final Rule - Bald Eagle*

5/ *Federal Register Vol. 57, No. 10, January 15, 1992, Final Rule-Critical Habitat for the Northern Spotted Owl*

6/ *Federal Register Vol. 63, No. 153, August 10, 1998, Final Rule-Oregon Coast Coho Salmon*

7/ *Federal Register Vol. 69, No.68, April 8, 2004, 12-Month Finding for a Petition to List the West Coast Distinct Population Segment of the Fisher*

8/ *Federal Register Vol. 63, No. 53, March 19, 1998, Final Rule-West Coast Steelhead*

ATTACHMENT B

FEDERAL AGENCIES RESPONSIBILITIES UNDER SECTION 7(a) and (c) OF THE ENDANGERED SPECIES ACT

SECTION 7(a)-Consultation/Conference

Requires:

1) Federal agencies to utilize their authorities to carry out programs to conserve endangered and threatened species;

2) Consultation with FWS when a Federal action may affect a listed endangered or threatened species to insure that any action authorized, funded or carried out by a Federal agency is not likely to jeopardize the continued existence of listed species or result in the destruction or adverse modification of Critical Habitat. The process is initiated by the Federal agency after they have determined if their action may affect (adversely or beneficially) a listed species; and

3) Conference with FWS when a Federal action is likely to jeopardize the continued existence of a proposed species or result in destruction or adverse modification of proposed Critical Habitat.

SECTION 7(c)-Biological Assessment for Major Construction Projects[1]

Requires Federal agencies or their designees to prepare a Biological Assessment (BA) for construction projects only. The purpose of the BA is to identify proposed and/or listed species which are/is likely to be affected by a construction project. The process is initiated by a Federal agency in requesting a list of proposed and listed threatened and endangered species (list attached). The BA should be completed within 180 days after its initiation (or within such a time period as is mutually agreeable). If the BA is not initiated within 90 days of receipt of the species list, the accuracy of the species list should be informally verified with our Service. No irreversible commitment of resources is to be made during the BA process which would foreclose reasonable and prudent alternatives to protect endangered species. Planning, design, and administrative actions may be taken; however, no construction may begin.

To complete the BA, your agency or its designee should: (1) conduct an on-site inspection of the area to be affected by the proposal which may include a detailed survey of the area to determine if the species is present and whether suitable habitat exists for either expanding the existing population or for potential reintroduction of the species; (2) review literature and scientific data to determine species distribution, habitat needs, and other biological requirements; (3) interview experts including those within FWS, National Marine Fisheries Service, State conservation departments, universities, and others who may have data not yet published in scientific literature; (4) review and analyze the effects of the proposal on the species in terms of individuals and populations, including consideration of cumulative effects of the proposal on the species and its habitat; (5) analyze alternative actions that may provide conservation measures and (6) prepare a report documenting the results, including a discussion of study methods used, any problems encountered, and other relevant information. The BA should conclude whether or not a listed species will be affected. Upon completion, the report should be forwarded to our Portland Office.

---

[1]A construction project (or other undertaking having similar physical impacts) which is a major Federal action significantly affecting the quality of the human environment as referred to in NEPA (42 U.S.C. 4332. (2)c). On projects other that construction, it is suggested that a biological evaluation similar to the biological assessment be undertaken to conserve species influenced by the Endangered Species Act.

Appendix B

NATIONAL POLLUTANT DISCHARGE ELIMINATION SYSTEM
WASTE DISCHARGE PERMIT

Department of Environmental Quality
Western Region – Salem Office
750 Front Street NE, Suite 120, Salem, OR 97301-1039
Telephone: (503) 378-8240

Issued pursuant to ORS 468B.050 and The Federal Clean Water Act

ISSUED TO:

Coos Bay, City of
500 Central Avenue
Coos Bay, OR 97420

SOURCES COVERED BY THIS PERMIT:

Type of Waste	Outfall Number	Outfall Location
Treated Wastewater	001	R.M. 3.8
Emergency Overflows:		
Pump Station #7, 421 Morrison Street	002	Coos Bay, R.M. 6.0
P.S. #8, 1812 Newmark	003	Coos Bay, R.M. 6.0
P.S. #14, 150 Mill Street	004	Coos Bay, R.M. 5.25
P.S. #16, 999 Lakeshore Drive	005	Coos Bay, R.M. 6.0
Flow Monitoring Station, West end of Fulton Street	006	Coos Bay, R.M. 4.5

FACILITY TYPE AND LOCATION:

Activated Sludge
Coos Bay STP #2
100 Fulton Street
Coos Bay, Oregon

Treatment System Class: Level IV
Collection System Class: Level III

RECEIVING STREAM INFORMATION:

Basin: South Coast
Sub-Basin: Coos
Receiving Stream: Coos Bay
Hydro Code: 14A*COOS 3.8 D
LLID: 1243397433543-3.8-D
County: Coos

EPA REFERENCE NO: OR002358-2

Issued in response to Application No. 994488 received September 11, 1995.

This permit is issued based on the land use findings in the permit record.

ichael H. Kortenhof, Water Quality Manager
estern Region

August 21, 2003
Date

PERMITTED ACTIVITIES

Until this permit expires or is modified or revoked, the permittee is authorized to construct, install, modify, or operate a wastewater collection, treatment, control and disposal system and discharge to public waters adequately treated wastewaters only from the authorized discharge point or points established in Schedule A and only in conformance with all the requirements, limitations, and conditions set forth in the attached schedules as follows:

Unless specifically authorized by this permit, by another NPDES or WPCF permit, or by Oregon Administrative Rule, any other direct or indirect discharge to waters of the state is prohibited, including discharge to an underground injection control system.

SCHEDULE A

1. **Waste Discharge Limitations not to be exceeded after permit issuance (see Note 4).**

a. Treated Effluent Outfall 001

(1) May 1 - October 31:

Parameter	Average Effluent Concentrations Monthly	Weekly	Monthly* Average lb/day	Weekly* Average lb/day	Daily* Maximum lbs
BOD_5	20 mg/L	30 mg/L	340	510	670
TSS	20 mg/L	30 mg/L	340	510	670

(2) November 1 - April 30:

Parameter	Average Effluent Concentrations Monthly	Weekly	Monthly* Average lb/day	Weekly* Average lb/day	Daily* Maximum lbs
BOD_5	30 mg/L	45 mg/L	510	760	1000
TSS	30 mg/L	45 mg/L	510	760	1000

* Average dry weather design flow to the facility equals 2.02 MGD. All mass load limits are based on design average dry weather flow to the facility.

Waste Discharge Limitations not to be exceeded after submitting documentation that the authority to implement OAR 340-041-0120(9)(a)(G)(iv) in tributary collection systems has been obtained (See Note 4).

a. Treated Effluent Outfall 001

(1) May 1 - October 31:

Parameter	Average Effluent Concentrations Monthly	Weekly	Monthly* Average lb/day	Weekly* Average lb/day	Daily* Maximum lbs
BOD_5	20 mg/L	30 mg/L	340	510	670
TSS	20 mg/L	30 mg/L	340	510	670

(2) November 1 - April 30:

Parameter	Average Effluent Concentrations Monthly	Weekly	Monthly* Average lb/day	Weekly* Average lb/day	Daily* Maximum lbs
BOD_5	30 mg/L	45 mg/L	700	1100	1400
TSS	30 mg/L	45 mg/L	700	1100	1400

* Average dry weather design flow to the facility equals 2.02 MGD. Summer mass load limits based upon average dry weather design flow to the facility. Winter mass load limits based upon average wet weather design flow to the facility equaling 2.8 MGD. The daily mass load limit is suspended on any day in which the flow to the treatment facility exceeds 4.04 MGD (twice the design average dry weather flow).

3. **Other waste Discharge Limitations not to be exceeded after permit issuance.**

a. Treated Effluent Outfall 001

(1)

Other parameters (year-round except as noted)	Limitations
Fecal Coliform Bacteria	Shall not exceed a monthly median of 14 organisms per 100 mL. Not more than 10 percent of the samples shall exceed 43 organisms per 100 mL. (See Note 2)
pH	Shall be within the range of 6.0 - 9.0
BOD_5 and TSS Removal Efficiency	Shall not be less than 85% monthly average for BOD_5 and TSS.
Total Residual Chlorine	Shall not exceed a monthly average concentration of 0.02 mg/l and a daily maximum concentration of 0.05 mg/l.
Ammonia-N (May 1 – October 31)	Shall not exceed a monthly average concentration of 20 mg/L and a daily maximum concentration of 30 mg/L (See Note 3)
Excess Thermal Load (May 1 – October 31)	Shall not exceed 37 Million kcals/day as a weekly average. (See Note 1)

(2) Except as provided for in OAR 340-45-080, no wastes shall be discharged and no activities shall be conducted which violate Water Quality Standards as adopted in OAR 340-41-0325 except in the following defined mixing zone:

The allowable mixing zone is that portion of Coos Bay contained within a radius of fifty (50) feet from the outfall. The Zone of Immediate Dilution (ZID) shall be defined as that portion of the allowable mixing zone that is within five (5) feet of the point of discharge.

b. Emergency Overflow Outfalls 002 through 006

(1) No wastes shall be discharged from these outfalls and no activities shall be conducted which violate water quality standards as adopted in OAR 340-041-0325, unless the cause of the discharge is due to storm events as allowed under OAR 340-41-120 (13) or (14).

(2) Raw sewage discharges are prohibited to waters of the State from November 1 through May 21, except during a storm event greater than the one-in-five-year, 24-hour duration storm, and from May 22 through October 31, except during a storm event greater than the one-in-ten-year, 24-hour duration storm.

If an overflow occurs between May 22 and June 1, and if the permittee demonstrates to the Department's satisfaction that no increase in risk to beneficial uses occurred because of the overflow, no violation shall be triggered if the storm associated with the overflow was greater than the one-in-five-year, 24-hour duration storm.

c. No activities shall be conducted that could cause an adverse impact on existing or potential beneficial uses of groundwater. All wastewater and process related residuals shall be managed and disposed in a manner that will prevent a violation of the Groundwater Quality Protection Rules (OAR 340-040).

IOTES:

1. The thermal load limit was calculated using the average dry weather design flow and an estimated maximum weekly effluent temperature. This permit may be reopened, and the maximum allowable thermal load modified (up or down), when more accurate effluent temperature data becomes available. In addition, if the Total Maximum Daily Load (TMDL) for temperature for this sub-basin assigns a Waste Load Allocation (WLA) to this source, this permit may be re-opened to establish new thermal load limits and/or new temperature conditions or requirements.

2. This permit may be reopened and modified as necessary to incorporate any Waste Load Allocation (WLA) or Best Management Practice established by the TMDL for bacteria for this sub-basin.

3. The Department is currently in the process of revising the ammonia criteria. These limits are based upon the existing criteria and is considered "interim". Once the ammonia criteria is revised, the Department intends to reopen this permit and add to, modify or delete the limitations and requirements relating to ammonia.

4. The waste discharge limits in Schedule A, Condition 2 shall automatically become effective upon submittal of documentation to the Department that the City of Coos Bay has acquired and has accepted the necessary legal authority to implement the provisions of OAR 340-041-0120(9)(a)(G)(iv).

SCHEDULE B

1. **Minimum Monitoring and Reporting Requirements** (unless otherwise approved in writing by the Department).
The permittee shall monitor the parameters as specified below at the locations indicated. The laboratory used by the permittee to analyze samples shall have a quality assurance/quality control (QA/QC) program to verify the accuracy of sample analysis. If QA/QC requirements are not met for any analysis, the results shall be included in the report, but not used in calculations required by this permit. When possible, the permittee shall re-sample in a timely manner for parameters failing the QA/QC requirements, analyze the samples, and report the results.

a. Influent

The facility influent sampling locations are the following:
Influent grab and composite samples and measurements are taken from the manhole just before the influent wet well. The composite sampler is located in the motor/generator room on top of the wet well.

Item or Parameter	Minimum Frequency	Type of Sample
Total Flow (MGD)	Daily	Measurement
Flow Meter Calibration	Semi-Annual	Verification
BOD_5	2/Week	Composite
TSS	2/Week	Composite
pH	3/Week	Grab
Toxics:		
Metals (Ag, As, Cd, Cr, Cu, Hg, Mo, Ni, Pb, Se, Zn) & Cyanide, measured as total is mg/L (See Note 1)	Semi-annually using 3 consecutive days between Monday and Friday, inclusive	24-hour daily composite (See Note 2)

b. Treated Effluent Outfall 001

The facility effluent sampling locations are the following:
Effluent grab and composite samples and measurements are taken just before the effluent weir of the chlorine contact chamber. The composite sampler is located on the walkway over the chlorine contact chamber.

Item or Parameter	Minimum Frequency	Type of Sample
BOD_5	2/Week	Composite
TSS	2/Week	Composite
pH	3/Week	Grab
Fecal Coliform	2/Week	Grab
Quantity Chlorine Used	Daily	Measurement
Chlorine Residual	Daily	Grab
Pounds Discharged (BOD_5 and TSS)	2/Week	Calculation
Average Percent Removed (BOD_5 and TSS)	Monthly	Calculation
Toxics:		
Metals (As, Cd, Cr, Cu, Hg, Mo, Ni, Pb, Se, Zn) & Cyanide, measured as total in mg/l (See Note 1)	Semi-annually using 3 consecutive days between Monday and Friday, inclusive	24-hour daily composite (See Note 2)

b. Treated Effluent Outfall 001 (Continued)

Item or Parameter	Minimum Frequency	Type of Sample
Toxics (Continued):		
Whole Effluent Toxicity (See Note 3)	Semi-annually	Acute & chronic
Ammonia-N	Weekly	Composite
Silver (See Note 1)	Once per Month and Semi-annually using 3 consecutive days between Monday and Friday, inclusive	24-hour daily composite (See Note 2)
Temperature:		
Effluent Temperature, Daily Max (See Note 7)	Daily	Continuous
Effluent Temperature, Average of Daily Maximums (See Note 7)	Weekly	Calculation
Excess Thermal Load	Weekly (May 1 – October 31)	Calculation (See Note 7)

c. Biosolids Management

Item or Parameter	Minimum Frequency	Type of Sample
Biosolids analysis including: Total Solids (% dry wt.) Volatile solids (% dry wt.) Biosolids nitrogen for: NH_3-N; NO_3-N; & TKN (% dry wt.) Phosphorus (% dry wt.) Potassium (% dry wt.) pH (standard units)	Annually	Composite sample to be representative of the product to be land applied from the storage lagoon (See Note 4)
Biosolids metals content for: Ag, As, Cd, Cr, Cu, Hg, Mo, Ni, Pb, Se & Zn, measured as total in mg/kg	Semi-Annually	Composite sample to be representative of the product to be land applied from the storage lagoon (See Note 4)
Record of locations where biosolids are applied on each DEQ approved site. (Site location maps to be maintained at treatment facility for review upon request by DEQ)	Each Occurrence	Date, volume & locations where Biosolids were applied recorded on site location map.
Record of % volatile solids reduction accomplished through stabilization	Monthly	Calculation (See Note 5)
Record of digestion days (mean cell residence time)	Monthly	Calculation (See Note 6)
Daily Minimum Sludge Temperature	Daily	Record

d. Emergency Overflow Outfalls 002 through 006

Item or Parameter	Minimum Frequency	Type of Sample
Flow	Daily (during each occurrence)	Estimate duration and volume

e. Receiving Stream (within 500 feet of the Outfall 001 but outside the effluent plume)

Item or Parameter	Minimum Frequency	Type of Sample
Toxics:		
Metals (Ag, As, Cd, Cr, Cu, Hg, Mo, Ni, Pb, Se, Zn) & Cyanide, measured as total in mg/L (See Note 8)	Semi-annually (one day of the 3 consecutive days of influent and effluent testing)	Grab

2. **Reporting Procedures**

a. Monitoring results shall be reported on approved forms. The reporting period is the calendar month. Reports must be submitted to the appropriate Department office by the 15th day of the following month.

b. State monitoring reports shall identify the name, certificate classification and grade level of each principal operator designated by the permittee as responsible for supervising the wastewater collection and treatment systems during the reporting period. Monitoring reports shall also identify each system classification as found on page one of this permit.

c. Monitoring reports shall also include a record of the quantity and method of use of all Biosolids and sludge removed from the treatment facility and a record of all applicable equipment breakdowns and bypassing.

3. **Report Submittals**

a. The permittee shall have in place a program to identify and reduce inflow and infiltration into the sewage collection system. An annual report shall be submitted to the Department by June 1 each year which details sewer collection maintenance activities that reduce inflow and infiltration. The report shall state those activities that have been done in the previous year and those activities planned for the following year.

b. For any year in which biosolids are land applied, a report shall be submitted to the Department by February 19 of the following year that describes solids handling activities for the previous year and includes, but is not limited to, the required information outlined in OAR 340-50-035(6)(a)-(e).

NOTES:

1. For influent and effluent cyanide samples, at least six (6) discrete grab samples shall be collected over the operating day. Each aliquot shall not be less than 100 mL and shall be collected and composited into a larger container which has been preserved with sodium hydroxide for cyanide samples to insure sample integrity. Monitoring for mercury during the first year after permit issuance shall be conducted in accordance with EPA Method 1631. Monitoring for silver during the first year after permit issuance shall be conducted using a test method with a detection limit of 0.1 µg/L or less. After the first year, mercury and silver monitoring of the effluent may be conducted according to any test procedures approved by 40 CFR Part 136, unless otherwise notified in writing by the Department. For all tests, the method detection limit shall be reported along with the sample result.

2. Daily 24-hour composite samples shall be analyzed and reported separately. Toxic monitoring results and toxics removal efficiency calculations shall be tabulated and submitted with the Pretreatment Program Annual Report as required in Schedule E. Except for effluent monitoring results for mercury and silver, submittal of toxic monitoring results with the monthly Discharge Monitoring Report is not required.

3. Beginning no later than December 31, 2003, the permittee shall conduct Whole Effluent Toxicity testing for a period of one (1) year in accordance with the frequency specified above. If the Whole Effluent Toxicity tests show that the effluent samples are not toxic at the dilutions determined to occur at the Zone of Immediate Dilution and the Mixing Zone, no further Whole Effluent Toxicity testing will be required during this permit cycle. Note that Whole Effluent Toxicity test results will be required along with the next NPDES permit renewal application.

4. Composite samples from the Storage lagoon or pond shall be taken from reference areas in the Storage lagoon or pond pursuant to the approved Biosolids Management Plan. Inorganic pollutant monitoring must be conducted according to Test Methods for Evaluating Solid Waste, Physical/Chemical Methods, Second Edition (1982) with Updates I and II and third Edition (1986) with Revision I.

5. Calculation of the % volatile solids reduction is to be based on comparison of a representative grab sample of total and volatile solids entering each digester and a representative composite sample of solids exiting each digester withdrawal line (as defined in the approved Biosolids Management Plan).

6. The days of digestion shall be calculated by dividing the effective digester volume by the average daily volume of Biosolids production.

7. Temperature monitoring and reporting shall begin no later than October 20, 2003. Excess Thermal Load shall be calculated as follows:
(Weekly average of daily maximum effluent temperatures in °F - applicable summer stream temperature standard, 64°F) X (Weekly average of daily flow in MGD) X 2.10 conversion factor = Excess Thermal Load, in Million kcals/day.

8. For receiving stream samples, at least six (6) discrete grab samples shall be collected over the operating day. Each aliquot shall not be less than 100 mL and shall be collected and composited into a larger container which has been preserved with sodium hydroxide for cyanide samples to insure sample integrity. Monitoring for mercury shall be conducted in accordance with EPA Method 1631. Monitoring for silver shall be conducted using a test method with a detection limit of 0.1 µg/L or less. Monitoring of toxics in Coos Bay shall be conducted during the first year after permit issuance. After the first year, monitoring of Coos Bay may be eliminated unless otherwise notified in writing by the Department. For all tests, the method detection limit shall be reported along with the sample result.

SCHEDULE C

Compliance Schedules and Conditions

1. Within 180 days after the limits in Schedule A, Condition 2 become effective, the permittee shall submit to the Department for review and approval a proposed program and time schedule for identifying and reducing inflow. Within 60 days of receiving written Department comments, the permittee shall submit a final approvable program and time schedule. The program shall consist of the following:

   a. Identification of all overflow points and verification that sewer system overflows are not occurring up to a 24-hour, 5-year storm event or equivalent;

   b. Monitoring of all pump station overflow points;

   c. A program for identifying and removing all inflow sources into the permittee's sewer system over which the permittee has legal control; and

   d. If the permittee does not have the necessary legal authority for all portions of the sewer system or treatment facility, a program and schedule for gaining legal authority to require inflow reduction and a program and schedule for removing inflow sources.

2. By no later than November 19, 2003, the permittee shall submit to the Department a report which either identifies known sewage overflow locations and a plan for estimating the frequency, duration and quantity of sewage overflowing, or confirms that there are no overflow points. The report shall also provide a schedule to eliminate the overflow(s), if any.

3. The permittee is expected to meet the compliance dates which have been established in this schedule. Either prior to or no later than 14 days following any lapsed compliance date, the permittee shall submit to the Department a notice of compliance or noncompliance with the established schedule. The Director may revise a schedule of compliance if he determines good and valid cause resulting from events over which the permittee has little or no control.

SCHEDULE D

Special Conditions

1. Prior to increasing thermal load (flow or temperature) beyond the current permit limitations, the Permittee shall notify the Department and apply for and be issued a permit modification allowing the increase.

2. All biosolids shall be managed in accordance with the current, DEQ approved biosolids management plan, and the site authorization letters issued by the DEQ. Any changes in solids management activities that significantly differ from operations specified under the approved plan require the prior written approval of the DEQ.

   All new biosolids application sites shall meet the site selection criteria set forth in OAR 340-50-0070 and must be located within Coos County. All currently approved sites are located in Coos County. No new public notice is required for the continued use of these currently approved sites. Property owners adjacent to any newly approved application sites shall be notified, in writing or by any method approved by DEQ, of the proposed activity prior to the start of application. For proposed new application sites that are deemed by the DEQ to be sensitive with respect to residential housing, runoff potential or threat to groundwater, an opportunity for public comment shall be provided in accordance with OAR 340-50-0030.

3. This permit may be modified to incorporate any applicable standard for biosolids use or disposal promulgated under section 405(d) of the Clean Water Act, if the standard for biosolids use or disposal is more stringent than any requirements for biosolids use or disposal in the permit, or controls a pollutant or practice not limited in this permit.

   Whole Effluent Toxicity Testing

   a. The permittee shall conduct whole effluent toxicity tests as specified in Schedule B of this permit.

   b. Whole Effluent Toxicity tests may be dual end-point tests, only for the fish tests, in which both acute and chronic end-points can be determined from the results of a single chronic test (the acute end-point shall be based upon a 48-hour time period).

   c. Acute Toxicity Testing - Organisms and Protocols

      (1) The permittee shall conduct 48-hour static renewal tests with the *Ceriodaphnia dubia* (water flea) and the *Pimephales promelas* (fathead minnow).

      (2) The presence of acute toxicity will be determined as specified in **Methods for Measuring the Acute Toxicity of Effluents and Receiving Waters to Freshwater and Marine Organisms**, Fourth Edition, EPA/600/4-90/027F, August 1993.

      (3) An acute Whole Effluent Toxicity test shall be considered to show toxicity if there is a statistically significant difference in survival between the control and 100 percent effluent, unless the permit specifically provides for a Zone of Immediate Dilution (ZID) for biotoxicity. If the permit specifies such a ZID, acute toxicity shall be indicated when a statistically significant difference in survival occurs at dilutions greater than that which is found to occur at the edge of the ZID.

   d. Chronic Toxicity Testing - Organisms and Protocols

      (1) The permittee shall conduct tests with: the fish species *Atherinops affinis* (topsmelt) and one invertebrate species. The invertebrate species must be one of the following: *Holmesimysis*

costata (mysid); *Crassostrea gigas* (Pacific Oyster); *Mytilus edulis, M. californianus, M. galloprovincialis, or M. trossulus* (mussels).

(2) The presence of chronic toxicity shall be estimated as specified in **Short-Term Methods for Estimating the Chronic Toxicity of Effluents and Receiving Waters to West Coast Marine and Estuarine Organisms**, First Edition, EPA/600/R-95/136, August 1995.

(3) A chronic Whole Effluent Toxicity test shall be considered to show toxicity if a statistically significant difference in survival, growth, or reproduction occurs at dilutions greater than that which is known to occur at the edge of the mixing zone. If there is no dilution data for the edge of the mixing zone, any chronic Whole Effluent Toxicity test that shows a statistically significant effect in 100 percent effluent as compared to the control shall be considered to show toxicity.

e. Quality Assurance

(1) Quality assurance criteria, statistical analyses and data reporting for the Whole Effluent Toxicity tests shall be in accordance with the EPA documents stated in this condition and the Department's **Whole Effluent Toxicity Testing Guidance Document**, January 1993.

f. Evaluation of Causes and Exceedances

(1) If toxicity is shown, as defined in sections c.(3) or d.(3) of this permit condition, another toxicity test using the same species and Department approved methodology shall be conducted within two weeks, unless otherwise approved by the Department. If the second test also indicates toxicity, the permittee shall follow the procedure described in section f.(2) of this permit condition.

(2) If two consecutive Whole Effluent Toxicity test results indicate acute and/or chronic toxicity, as defined in sections c.(3) or d.(3) of this permit condition, the permittee shall evaluate the source of the toxicity and submit a plan and time schedule for demonstrating compliance with water quality standards. Upon approval by the Department, the permittee shall implement the plan until compliance has been achieved. Evaluations shall be completed and plans submitted to the Department within 6 months unless otherwise approved in writing by the Department.

g. Reporting

(1) Along with the test results, the permittee shall include: 1. The dates of sample collection and initiation of each toxicity test; 2. The type of production; and 3. The flow rate at the time of sample collection. Effluent at the time of sampling for Whole Effluent Toxicity testing should include samples of required parameters stated under Schedule B, condition 1. of this permit.

(2) The permittee shall make available to the Department, on request, the written standard operating procedures they, or the laboratory performing the Whole Effluent Toxicity tests, are using for all toxicity tests required by the Department.

h. Reopener

(1) If Whole Effluent Toxicity testing indicates acute and/or chronic toxicity, the Department may reopen and modify this permit to include new limitations and/or conditions as determined by the Department to be appropriate, and in accordance with procedures outlined in Oregon Administrative Rules, Chapter 340, Division 45.

5. A priority pollutant scan shall be performed at least once during the term of this permit and must be submitted to the Department as part of the Permittee's NPDES permit renewal application. The permittee shall perform chemical analysis of its influent, effluent and biosolids to be beneficially used for the specific toxic pollutants listed in Tables II and III of Appendix D of 40 CFR Part 122. The influent and effluent samples shall be 24-hour daily composites, except where sampling volatile compounds. In this case, six (6) discrete samples (not less than 100 mL) collected over the operating day are acceptable. The permittee shall take special precautions in compositing the individual grab samples for the volatile organics to insure sample integrity (i.e. no exposure to the outside air). Alternately, the discrete samples collected for volatiles may be analyzed separately and averaged. For biosolids analyses, a composite of weekly grab samples for the final product shall be used.

6. The permittee shall comply with Oregon Administrative Rules (OAR), Chapter 340, Division 49, "Regulations Pertaining To Certification of Wastewater System Operator Personnel" and accordingly:

   a. The permittee shall have its wastewater system supervised by one or more operators who are certified in a classification and grade level (equal to or greater) that corresponds with the classification (collection and/or treatment) of the system to be supervised as specified on page one of this permit.

Note: A "supervisor" is defined as the person exercising authority for establishing and executing the specific practice and procedures of operating the system in accordance with the policies of the permittee and requirements of the waste discharge permit. "Supervise" means responsible for the technical operation of a system, which may affect its performance or the quality of the effluent produced. Supervisors are not required to be on-site at all times.

   b. The permittee's wastewater system may not be without supervision (as required by Special Condition 6.a. above) for more than thirty (30) days. During this period, and at any time that the supervisor is not available to respond on-site (i.e. vacation, sick leave or off-call), the permittee must make available another person who is certified at no less than one grade lower then the system classification.

   c. If the wastewater system has more than one daily shift, the permittee shall have the shift supervisor, if any, certified at no less than one grade lower than the system classification.

   d. The permittee is responsible for ensuring the wastewater system has a properly certified supervisor available at all times to respond on-site at the request of the permittee and to any other operator.

   e. The permittee shall notify the Department of Environmental Quality in writing within thirty (30) days of replacement or redesignation of certified operators responsible for supervising wastewater system operation. The notice shall be filed with the Water Quality Division, Operator Certification Program, 811 SW 6th Ave, Portland, OR 97204. This requirement is in addition to the reporting requirements contained under Schedule B of this permit.

   f. Upon written request, the Department may grant the permittee reasonable time, not to exceed 120 days, to obtain the services of a qualified person to supervise the wastewater system. The written request must include justification for the time needed, a schedule for recruiting and hiring, the date the system supervisor availability ceased and the name of the alternate system supervisor(s) as required by 6.b. above.

7. The permittee shall notify the appropriate DEQ Office in accordance with the response times noted in the General Conditions of this permit, of any malfunction so that corrective action can be coordinated between the permittee and the Department.

8. Unless otherwise approved in writing from the Department, the wastewater treatment facility shall not be allowed to accept for treatment the following types of waste: Domestic Septic Tank waste from single family dwellings and Domestic Septage from septic tanks, holding tanks, chemical toilets, marine Type III privies, and vault toilets.

9. The permittee shall not be required to perform a hydrogeologic characterization or groundwater monitoring during the term of this permit provided:

   a. The facilities are operated in accordance with the permit conditions, and;

   b. There are no adverse groundwater quality impacts (complaints or other indirect evidence) resulting from the facility's operation.

   If warranted, at permit renewal the Department may evaluate the need for a full assessment of the facilities impact on groundwater quality.

SCHEDULE E

Pretreatment Activities

The permittee shall implement the following pretreatment activities:

1. The permittee shall conduct and enforce its Pretreatment Program, as approved by the Department, and comply with the General Pretreatment Regulations (40 CFR Part 403). The permittee shall secure and maintain sufficient resources and qualified personnel to carry out the program implementation procedures described in this permit.

2. The permittee shall adopt all legal authority necessary to fully implement its approved pretreatment program and to comply with all applicable State and Federal pretreatment regulations. The permittee must also establish, where necessary, contracts or agreements with contributing jurisdictions to ensure compliance with pretreatment requirements by industrial users within these jurisdictions. These contracts or agreements shall identify the agency responsible for all implementation and enforcement activities to be performed in the contributing jurisdictions. Regardless of jurisdictional situation, the permittee is responsible for ensuring that all aspects of the pretreatment program are fully implemented and enforced.

3. The permittee shall update its inventory of industrial users at a frequency and diligence adequate to ensure proper identification of industrial users subject to pretreatment standards, but no less than once per year. The permittee shall notify these industrial users of applicable pretreatment standards in accordance with 40 CFR § 403.8(f)(2)(iii).

4. The permittee shall enforce categorical pretreatment standards promulgated pursuant to Section 307(b) and (c) of the Act, prohibited discharge standards as set forth in 40 CFR § 403.5(a) and (b), or local limitations developed by the permittee in accordance with 40 CFR § 403.5(c), whichever are more stringent, or are applicable to nondomestic users discharging wastewater to the collection system. Locally derived discharge limitations shall be defined as pretreatment standards under Section 307(d) of the Act.

   A technical evaluation of the need to revise local limits shall be performed at least once during the term of this permit and must be submitted to the Department as part of the permittee's NPDES permit application, unless the Department requires in writing that it be submitted sooner. Limits development will be in accordance with the procedures established by the Department.

5. The permittee shall issue individual discharge permits to all Significant Industrial Users in a timely manner. The permittee shall also reissue and/or modify permits, where necessary, in a timely manner. Discharge permits must contain, at a minimum, the conditions identified in 40 CFR § 403.8(f)(1)(iii). Unless a more stringent definition has been adopted by the permittee, the definition of Significant Industrial User shall be as stated in 40 CFR § 403.3(t).

6. The permittee shall randomly sample and analyze industrial user effluents at a frequency commensurate with the character, consistency, and volume of the discharge. At a minimum, the permittee shall sample all Significant Industrial Users for all regulated pollutants twice per year. Alternatively, at a minimum, the permittee shall sample all Significant Industrial Users for all regulated pollutants once per year, if the permittee has pretreatment program criteria in its approved procedures for determining appropriate sampling levels for industrial users, and provided the sampling criteria indicate once per year sampling is adequate. At a minimum, the permittee shall conduct a complete facility inspection once per year. Additionally, at least once every two years the permittee shall evaluate the need for each Significant Industrial User to develop a slug control plan. Where a plan is deemed necessary, it shall conform to the requirements of 40 CFR § 403.8(f)(2)(v).

Where the permittee elects to conduct all industrial user monitoring in lieu of requiring self-monitoring by the user, the permittee shall gather all information which would otherwise have been submitted by the user. The permittee shall also perform the sampling and analyses in accordance with the protocols established for the user.

Sample collection and analysis, and the gathering of other compliance data, shall be performed with sufficient care to produce evidence admissible in enforcement proceedings or in judicial actions. Unless specified otherwise by the Director in writing, all sampling and analyses shall be performed in accordance with 40 CFR Part 136.

7. The permittee shall review reports submitted by industrial users and identify all violations of the user's permit or the permittee's local ordinance.

8. The permittee shall investigate all instances of industrial user noncompliance and shall take all necessary steps to return users to compliance. The permittee's enforcement actions shall track its approved Enforcement Response Plan, developed in accordance with 40 CFR § 403.8(f)(5). If the permittee has not developed an approved Enforcement Response Plan, it shall develop and submit a draft to the Department for review within 90 days of the issuance of this permit.

9. The permittee shall publish, at least annually in the largest daily newspaper published in the permittee's service area, a list of all industrial users which, at any time in the previous 12 months, were in Significant Noncompliance with applicable pretreatment requirements. For the purposes of this requirement, an industrial user is in Significant Noncompliance if it meets one or more of the criteria listed in 40 CFR 403.8(f)(2)(vii).

10. The permittee must develop and maintain a data management system designed to track the status of the industrial user inventory, discharge characteristics, and compliance. In accordance with 40 CFR § 403.12(o), the permittee shall retain all records relating to pretreatment program activities for a minimum of three years, and shall make such records available to the Department and USEPA upon request. The permittee shall also provide public access to information considered effluent data under 40 CFR Part 2.

11. The permittee shall submit by March 1 of each year, a report that describes the permittee's pretreatment program during the previous calendar year. The content and format of this report shall be as established by the Department.

12. The permittee shall submit in writing to the Department a statement of the basis for any proposed modification of its approved program and a description of the proposed modification in accordance with 40 CFR § 403.18. No substantial program modifications may be implemented by the permittee prior to receiving written authorization from the Department.

NPDES GENERAL CONDITIONS
(SCHEDULE F)

SECTION A. STANDARD CONDITIONS

1. Duty to Comply

The permittee must comply with all conditions of this permit. Any permit noncompliance constitutes a violation of Oregon Revised Statutes (ORS) 468B.025 and is grounds for enforcement action; for permit termination, suspension, or modification; or for denial of a permit renewal application.

2. Penalties for Water Pollution and Permit Condition Violations

Oregon Law (ORS 468.140) allows the Director to impose civil penalties up to $10,000 per day for violation of a term, condition, or requirement of a permit.

In addition, a person who unlawfully pollutes water as specified in ORS 468.943 or ORS 468.946 is subject to criminal prosecution.

3. Duty to Mitigate

The permittee shall take all reasonable steps to minimize or prevent any discharge or sludge use or disposal in violation of this permit which has a reasonable likelihood of adversely affecting human health or the environment. In addition, upon request of the Department, the permittee shall correct any adverse impact on the environment or human health resulting from noncompliance with this permit, including such accelerated or additional monitoring as necessary to determine the nature and impact of the noncomplying discharge.

4. Duty to Reapply

If the permittee wishes to continue an activity regulated by this permit after the expiration date of this permit, the permittee must apply for and have the permit renewed. The application shall be submitted at least 180 days before the expiration date of this permit.

The Director may grant permission to submit an application less than 180 days in advance but no later than the permit expiration date.

5. Permit Actions

This permit may be modified, suspended, revoked and reissued, or terminated for cause including, but not limited to, the following:

a. Violation of any term, condition, or requirement of this permit, a rule, or a statute;

b. Obtaining this permit by misrepresentation or failure to disclose fully all material facts; or

c. A change in any condition that requires either a temporary or permanent reduction or elimination of the authorized discharge.

The filing of a request by the permittee for a permit modification or a notification of planned changes or anticipated noncompliance, does not stay any permit condition.

6. Toxic Pollutants

The permittee shall comply with any applicable effluent standards or prohibitions established under Section 307(a) of the Clean Water Act for toxic pollutants within the time provided in the regulations that establish those standards or prohibitions, even if the permit has not yet been modified to incorporate the requirement.

7. Property Rights

The issuance of this permit does not convey any property rights of any sort, or any exclusive privilege.

8. Permit References

Except for effluent standards or prohibitions established under Section 307(a) of the Clean Water Act for toxic pollutants and standards for sewage sludge use or disposal established under Section 405(d) of the Clean Water Act, all rules and statutes referred to in this permit are those in effect on the date this permit is issued.

SECTION B. OPERATION AND MAINTENANCE OF POLLUTION CONTROLS

1. Proper Operation and Maintenance

The permittee shall at all times properly operate and maintain all facilities and systems of treatment and control (and related appurtenances) which are installed or used by the permittee to achieve compliance with the conditions of this permit. Proper operation and maintenance also includes adequate laboratory controls, and appropriate quality assurance procedures. This provision requires the operation of back-up or auxiliary facilities or similar systems which are installed by a permittee only when the operation is necessary to achieve compliance with the conditions of the permit.

2. Duty to Halt or Reduce Activity

For industrial or commercial facilities, upon reduction, loss, or failure of the treatment facility, the permittee shall, to the extent necessary to maintain compliance with its permit, control production or all discharges or both until the facility is restored or an alternative method of treatment is provided. This requirement applies, for example, when the primary source of power of the treatment facility fails or is reduced or lost. It shall not be a defense for a permittee in an enforcement action that it would have been necessary to halt or reduce the permitted activity in order to maintain compliance with the conditions of this permit.

3. Bypass of Treatment Facilities

a. Definitions

(1) "Bypass" means intentional diversion of waste streams from any portion of the treatment facility. The term "bypass" does not include nonuse of singular or multiple units or processes of a treatment works when the nonuse is insignificant to the quality and/or quantity of the effluent produced by the treatment works. The term "bypass" does not apply if the diversion does not cause effluent limitations to be exceeded, provided the diversion is to allow essential maintenance to assure efficient operation.

(2) "Severe property damage" means substantial physical damage to property, damage to the treatment facilities or treatment processes which causes 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.

b. Prohibition of bypass.

(1) Bypass is prohibited unless:

(a) Bypass was necessary to prevent loss of life, personal injury, or severe property damage;

(b) There were no feasible alternatives to the bypass, such as the use of auxiliary treatment facilities, retention of untreated wastes, or maintenance during normal periods of equipment downtime. This condition is not satisfied if adequate backup equipment should have been installed in the exercise of reasonable engineering judgement to prevent a bypass which occurred during normal periods of equipment downtime or preventative maintenance; and

(c) The permittee submitted notices and requests as required under General Condition B.3.c.

(2) The Director may approve an anticipated bypass, after considering its adverse effects and any alternatives to bypassing, when the Director determines that it will meet the three conditions listed above in General Condition B.3.b.(1).

c. Notice and request for bypass.

(1) Anticipated bypass. If the permittee knows in advance of the need for a bypass, it shall submit prior written notice, if possible at least ten days before the date of the bypass.

(2) Unanticipated bypass. The permittee shall submit notice of an unanticipated bypass as required in General Condition D.5.

4. <u>Upset</u>

a. Definition. "Upset" means an exceptional incident in which there is unintentional and temporary noncompliance with technology based permit effluent limitations because of factors beyond the reasonable control of the permittee. An upset does not include noncompliance to the extent caused by operation error, improperly designed treatment facilities, inadequate treatment facilities, lack of preventative maintenance, or careless or improper operation.

b. Effect of an upset. An upset constitutes an affirmative defense to an action brought for noncompliance with such technology based permit effluent limitations if the requirements of General Condition B.4.c are met. No determination made during administrative review of claims that noncompliance was caused by upset, and before an action for noncompliance, is final administrative action subject to judicial review.

c. Conditions necessary for a demonstration of upset. A permittee who wishes to establish the affirmative defense of upset shall demonstrate, through properly signed, contemporaneous operating logs, or other relevant evidence that:

(1) An upset occurred and that the permittee can identify the causes(s) of the upset;

(2) The permitted facility was at the time being properly operated;

(3) The permittee submitted notice of the upset as required in General Condition D.5, hereof (24-hour notice); and

(4) The permittee complied with any remedial measures required under General Condition A.3 hereof.

d. Burden of proof. In any enforcement proceeding the permittee seeking to establish the occurrence of an upset has the burden of proof.

5. Treatment of Single Operational Event

For purposes of this permit, A Single Operational Event which leads to simultaneous violations of more than one pollutant parameter shall be treated as a single violation. A single operational event is an exceptional incident which causes simultaneous, unintentional, unknowing (not the result of a knowing act or omission), temporary noncompliance with more than one Clean Water Act effluent discharge pollutant parameter. A single operational event does not include Clean Water Act violations involving discharge without a NPDES permit or noncompliance to the extent caused by improperly designed or inadequate treatment facilities. Each day of a single operational event is a violation.

6. Overflows from Wastewater Conveyance Systems and Associated Pump Stations

a. Definitions

(1) "Overflow" means the diversion and discharge of waste streams from any portion of the wastewater conveyance system including pump stations, through a designed overflow device or structure, other than discharges to the wastewater treatment facility.

(2) "Severe property damage" means substantial physical damage to property, damage to the conveyance system or pump station which causes them to become inoperable, or substantial and permanent loss of natural resources which can reasonably be expected to occur in the absence of an overflow.

(3) "Uncontrolled overflow" means the diversion of waste streams other than through a designed overflow device or structure, for example to overflowing manholes or overflowing into residences, commercial establishments, or industries that may be connected to a conveyance system.

b. Prohibition of overflows. Overflows are prohibited unless:

(1) Overflows were unavoidable to prevent an uncontrolled overflow, loss of life, personal injury, or severe property damage;

(2) There were no feasible alternatives to the overflows, such as the use of auxiliary pumping or conveyance systems, or maximization of conveyance system storage; and

(3) The overflows are the result of an upset as defined in General Condition B.4. and meeting all requirements of this condition.

c. Uncontrolled overflows are prohibited where wastewater is likely to escape or be carried into the waters of the State by any means.

d. Reporting required. Unless otherwise specified in writing by the Department, all overflows and uncontrolled overflows must be reported orally to the Department within 24 hours from the time the permittee becomes aware of the overflow. Reporting procedures are described in more detail in General Condition D.5.

7. Public Notification of Effluent Violation or Overflow

If effluent limitations specified in this permit are exceeded or an overflow occurs, upon request by the Department, the permittee shall take such steps as are necessary to alert the public about the extent and nature of the discharge. Such steps may include, but are not limited to, posting of the river at access points and other places, news releases, and paid announcements on radio and television.

8. Removed Substances

Solids, sludges, filter backwash, or other pollutants removed in the course of treatment or control of wastewaters shall be disposed of in such a manner as to prevent any pollutant from such materials from entering public waters, causing nuisance conditions, or creating a public health hazard.

SECTION C. MONITORING AND RECORDS

1. Representative Sampling

Sampling and measurements taken as required herein shall be representative of the volume and nature of the monitored discharge. All samples shall be taken at the monitoring points specified in this permit and shall be taken, unless otherwise specified, before the effluent joins or is diluted by any other waste stream, body of water, or substance. Monitoring points shall not be changed without notification to and the approval of the Director.

2. Flow Measurements

Appropriate flow measurement devices and methods consistent with accepted scientific practices shall be selected and used to ensure the accuracy and reliability of measurements of the volume of monitored discharges. The devices shall be installed, calibrated and maintained to insure that the accuracy of the measurements is consistent with the accepted capability of that type of device. Devices selected shall be capable of measuring flows with a maximum deviation of less than ± 10 percent from true discharge rates throughout the range of expected discharge volumes.

3. Monitoring Procedures

Monitoring must be conducted according to test procedures approved under 40 CFR Part 136, unless other test procedures have been specified in this permit.

4. Penalties of Tampering

The Clean Water Act provides that any person who falsifies, tampers with, or knowingly renders inaccurate, any monitoring device or method required to be maintained under this permit shall, upon conviction, be punished by a fine of not more than $10,000 per violation, or by imprisonment for not more than two years, or by both. If a conviction of a person is for a violation committed after a first conviction of such person, punishment is a fine not more than $20,000 per day of violation, or by imprisonment of not more than four years or both.

5. Reporting of Monitoring Results

Monitoring results shall be summarized each month on a Discharge Monitoring Report form approved by the Department. The reports shall be submitted monthly and are to be mailed, delivered or otherwise transmitted by the 15th day of the following month unless specifically approved otherwise in Schedule B of this permit.

6. Additional Monitoring by the Permittee

If the permittee monitors any pollutant more frequently than required by this permit, using test procedures approved under 40 CFR 136 or as specified in this permit, the results of this monitoring shall be included in the calculation and reporting of the data submitted in the Discharge Monitoring Report. Such increased frequency shall also be indicated. For a pollutant parameter that may be sampled more than once per day (e.g., Total Chlorine Residual), only the average daily value shall be recorded unless otherwise specified in this permit.

7. Averaging of Measurements

Calculations for all limitations which require averaging of measurements shall utilize an arithmetic mean, except for bacteria which shall be averaged as specified in this permit.

8. Retention of Records

Except for records of monitoring information required by this permit related to the permittee's sewage sludge use and disposal activities, which shall be retained for a period of at least five years (or longer as required by 40 CFR part 503), the permittee shall retain records of all monitoring information, including all calibration and maintenance records of all original strip chart recordings for continuous monitoring instrumentation, copies of all reports required by this permit, and records of all data used to complete the application for this permit, for a period of at least 3 years from the date of the sample, measurement, report or application. This period may be extended by request of the Director at any time.

9. Records Contents

Records of monitoring information shall include:

a. The date, exact place, time and methods of sampling or measurements;

b. The individual(s) who performed the sampling or measurements;

c. The date(s) analyses were performed;

d. The individual(s) who performed the analyses;

e. The analytical techniques or methods used; and

f. The results of such analyses.

10. Inspection and Entry

The permittee shall allow the Director, or an authorized representative upon the presentation of credentials to:

a. Enter upon the permittee's premises where a regulated facility or activity is located or conducted, or where records must be kept under the conditions of this permit;

b. Have access to and copy, at reasonable times, any records that must be kept under the conditions of this permit;

c. Inspect at reasonable times any facilities, equipment (including monitoring and control equipment), practices, or operations regulated or required under this permit, and

d. Sample or monitor at reasonable times, for the purpose of assuring permit compliance or as otherwise authorized by state law, any substances or parameters at any location.

,ECTION D. REPORTING REQUIREMENTS

1. Planned Changes

The permittee shall comply with Oregon Administrative Rules (OAR) 340, Division 52, "Review of Plans and Specifications". Except where exempted under OAR 340-52, no construction, installation, or modification involving disposal systems, treatment works, sewerage systems, or common sewers shall be commenced until the plans and specifications are submitted to and approved by the Department. The permittee shall give notice to the Department as soon as possible of any planned physical alternations or additions to the permitted facility.

2. Anticipated Noncompliance

The permittee shall give advance notice to the Director of any planned changes in the permitted facility or activity which may result in noncompliance with permit requirements.

3. Transfers

This permit may be transferred to a new permittee provided the transferee acquires a property interest in the permitted activity and agrees in writing to fully comply with all the terms and conditions of the permit and the rules of the Commission. No permit shall be transferred to a third party without prior written approval from the Director. The permittee shall notify the Department when a transfer of property interest takes place.

4. Compliance Schedule

Reports of compliance or noncompliance with, or any progress reports on interim and final requirements contained in any compliance schedule of this permit shall be submitted no later than 14 days following each schedule date. Any reports of noncompliance shall include the cause of noncompliance, any remedial actions taken, and the probability of meeting the next scheduled requirements.

5. Twenty-Four Hour Reporting

The permittee shall report any noncompliance which may endanger health or the environment. Any information shall be provided orally (by telephone) within 24 hours, unless otherwise specified in this permit, from the time the permittee becomes aware of the circumstances. During normal business hours, the Department's Regional office shall be called. Outside of normal business hours, the Department shall be contacted at 1-800-452-0311 (Oregon Emergency Response System).

A written submission shall also be provided within 5 days of the time the permittee becomes aware of the circumstances. If the permittee is establishing an affirmative defense of upset or bypass to any offense under ORS 468.922 to 468.946, and in which case if the original reporting notice was oral, delivered written notice must be made to the Department or other agency with regulatory jurisdiction within 4 (four) calendar days. The written submission shall contain:

a. A description of the noncompliance and its cause;

b. The period of noncompliance, including exact dates and times;

c. The estimated time noncompliance is expected to continue if it has not been corrected;

d. Steps taken or planned to reduce, eliminate, and prevent reoccurrence of the noncompliance; and

e. Public notification steps taken, pursuant to General Condition B.7.

The following shall be included as information which must be reported within 24 hours under this paragraph:

a. Any unanticipated bypass which exceeds any effluent limitation in this permit.

b. Any upset which exceeds any effluent limitation in this permit.

c. Violation of maximum daily discharge limitation for any of the pollutants listed by the Director in this permit.

The Department may waive the written report on a case-by-case basis if the oral report has been received within 24 hours.

6. Other Noncompliance

The permittee shall report all instances of noncompliance not reported under General Condition D.4 or D.5, at the time monitoring reports are submitted. The reports shall contain:

a. A description of the noncompliance and its cause;

b. The period of noncompliance, including exact dates and times;

c. The estimated time noncompliance is expected to continue if it has not been corrected; and

d. Steps taken or planned to reduce, eliminate, and prevent reoccurrence of the noncompliance.

7. Duty to Provide Information

The permittee shall furnish to the Department, within a reasonable time, any information which the Department may request to determine compliance with this permit. The permittee shall also furnish to the Department, upon request, copies of records required to be kept by this permit.

Other Information: When the permittee becomes aware that it failed to submit any relevant facts in a permit application, or submitted incorrect information in a permit application or any report to the Department, it shall promptly submit such facts or information.

8. Signatory Requirements

All applications, reports or information submitted to the Department shall be signed and certified in accordance with 40 CFR 122.22.

9. Falsification of Information

A person who supplies the Department with false information, or omits material or required information, as specified in ORS 468.953 is subject to criminal prosecution.

10. Changes to Indirect Dischargers - **[Applicable to Publicly Owned Treatment Works (POTW) only]**

The permittee must provide adequate notice to the Department of the following:

a. Any new introduction of pollutants into the POTW from an indirect discharger which would be subject to section 301 or 306 of the Clean Water Act if it were directly discharging those pollutants and;

b. Any substantial change in the volume or character of pollutants being introduced into the POTW by a source introducing pollutants into the POTW at the time of issuance of the permit.

c. For the purposes of this paragraph, adequate notice shall include information on (i) the quality and quantity of effluent introduced into the POTW, and (ii) any anticipated impact of the change on the quantity or quality of effluent to be discharged from the POTW.

11. Changes to Discharges of Toxic Pollutant - **[Applicable to existing manufacturing, commercial, mining, and silvicultural dischargers only]**

The permittee must notify the Department as soon as they know or have reason to believe of the following:

a. That any activity has occurred or will occur which would result in the discharge, on a routine or frequent basis, of any toxic pollutant which is not limited in the permit, if that discharge will exceed the highest of the following "notification levels:

(1) One hundred micrograms per liter (100 μg/L);

(2) Two hundred micrograms per liter (200 μg/L) for acrolein and acrylonitrile; five hundred micrograms per liter (500 μg/L) for 2,4-dinitrophenol and for 2-methyl-4,6-dinitrophenol; and one milligram per liter (1 mg/L) for antimony;

(3) Five (5) times the maximum concentration value reported for that pollutant in the permit application in accordance with 40 CFR 122.21(g)(7); or

(4) The level established by the Department in accordance with 40 CFR 122.44(f).

b. That any activity has occurred or will occur which would result in any discharge, on a non-routine or infrequent basis, of a toxic pollutant which is not limited in the permit, if that discharge will exceed the highest of the following "notification levels":

(1) Five hundred micrograms per liter (500 μg/L);

(2) One milligram per liter (1 mg/L) for antimony;

(3) Ten (10) times the maximum concentration value reported for that pollutant in the permit application in accordance with 40 CFR 122.21(g)(7); or

(4) The level established by the Department in accordance with 40 CFR 122.44(f).

SECTION E. DEFINITIONS

1. BOD means five-day biochemical oxygen demand.
2. TSS means total suspended solids.
3. mg/L means milligrams per liter.
4. kg means kilograms.
5. m^3/d means cubic meters per day.
6. MGD means million gallons per day.
7. Composite sample means a sample formed by collecting and mixing discrete samples taken periodically and based on time or flow.
8. FC means fecal coliform bacteria.
9. Technology based permit effluent limitations means technology-based treatment requirements as defined in 40 CFR 125.3, and concentration and mass load effluent limitations that are based on minimum design criteria specified in OAR 340-41.
10. CBOD means five day carbonaceous biochemical oxygen demand.
11. Grab sample means an individual discrete sample collected over a period of time not to exceed 15 minutes.
12. Quarter means January through March, April through June, July through September, or October through December.
13. Month means calendar month.
14. Week means a calendar week of Sunday through Saturday.
15. Total residual chlorine means combined chlorine forms plus free residual chlorine.
16. The term "bacteria" includes but is not limited to fecal coliform bacteria, total coliform bacteria, and E. coli bacteria.
17. POTW means a publicly owned treatment works.

MODIFICATION

This Modification Shall Be Attached To and Made A Part Of Permit #100771

NATIONAL POLLUTANT DISCHARGE ELIMINATION SYSTEM WASTE DISCHARGE PERMIT

Department of Environmental Quality
Western Region – Salem Office
750 Front Street NE, Suite 120, Salem, OR 97301-1039
Telephone: (503) 378-8240

Issued pursuant to ORS 468B.050 and The Federal Clean Water Act

ISSUED TO:

Coos Bay, City of
500 Central Avenue
Coos Bay, OR 97420

SOURCES COVERED BY THIS PERMIT:

Type of Waste	Outfall Number	Outfall Location
Treated Wastewater	001	R.M. 3.8
Emergency Overflows:		
Pump Station #7, 421 Morrison Street	002	Coos Bay, R.M. 6.0
P.S. #8, 1812 Newmark	003	Coos Bay, R.M. 6.0
P.S. #14, 150 Mill Street	004	Coos Bay, R.M. 5.25
P.S. #16, 999 Lakeshore Drive	005	Coos Bay, R.M. 6.0
Flow Monitoring Station, West end of Fulton Street	006	Coos Bay, R.M. 4.5

FACILITY TYPE AND LOCATION:

Activated Sludge
Coos Bay STP #2
100 Fulton Street
Coos Bay, Oregon

Treatment System Class: Level IV
Collection System Class: Level III

RECEIVING STREAM INFORMATION:

Basin: South Coast
Sub-Basin: Coos
Receiving Stream: Coos Bay
Hydro Code: 14A*COOS 3.8 D
LLID: 1243397433543-3.8-D
County: Coos

EPA REFERENCE NO: OR002358-2

This permit was originally issued on August 21, 2003 in response to Application No. 994488 received September 11, 1995. This is a Department initiated modification in accordance with OAR 340-045-0055, Application No. 982770. This permit was issued based on the land use findings in the permit record.

Michael H. Kortenhof, Western Region Water Quality Manager

December 15, 2004
Date

ADDENDUM NO. 1

Modification #1 – Permit No. 100771, Schedule A, Condition 3.a (1) is modified to add Note 5 to the Total Residual Chlorine limit. Note 5 shall read as follows:

5. When the total residual chlorine limitation is lower than 0.10 mg/L, the Department will use 0.10 mg/L as the compliance evaluation level (i.e. daily maximum concentrations below 0.10 mg/L will be considered in compliance with the limitation).

Modification #2 – Permit No. 100771, Schedule B, Condition 1.a. (Influent Monitoring Requirements) is modified to delete the requirement to monitor metals and cyanide semi-annually. The Condition shall read as follows:

a. Influent

The facility influent grab and composite samples and measurements are taken from the manhole just before the influent wet well. The composite sampler is located in the motor/generator room on top of the wet well.

Item or Parameter	Minimum Frequency	Type of Sample
Total Flow (MGD)	Daily	Measurement
Flow Meter Calibration	Semi-Annual	Verification
BOD_5	2/Week	Composite
TSS	2/Week	Composite
pH	3/Week	Grab

Modification #3 – Permit No. 100771, Schedule B, Condition 1.b. (Effluent Monitoring Requirements) is modified to delete the requirement to monitor metals and cyanide semi-annually and silver monthly. In addition, Schedule B, Condition 1.b. is modified to require Whole Effluent Toxicity monitoring annually for the remainder of the permit cycle and to perform at least three "priority pollutant" scans during the remainder of the permit cycle. The Condition shall read as follows:

b. Treated Effluent Outfall 001

The facility effluent grab and composite samples and measurements are taken just before the effluent weir of the chlorine contact chamber except for the total chlorine residual sample. The total chlorine residual sample is taken from the first manhole on the outfall pipeline. The composite sampler is located on the walkway over the chlorine contact chamber.

Item or Parameter	Minimum Frequency	Type of Sample
BOD_5	2/Week	Composite
TSS	2/Week	Composite
pH	3/Week	Grab
Fecal Coliform	2/Week	Grab
Ammonia-N	Weekly	Composite
Quantity Chlorine Used	Daily	Measurement
Chlorine Residual	Daily	Grab
Pounds Discharged (BOD_5 and TSS)	2/Week	Calculation

Average Percent Removed (BOD_5 and TSS)	Monthly	Calculation
Toxics:		
Whole Effluent Toxicity (See Note 3)	Annually	Acute & chronic
Priority Pollutants	(See Note 9)	24-hour Composite
Temperature:		
Effluent Temperature, Daily Max (See Note 7)	Daily	Continuous
Effluent Temperature, Average of Daily Maximums (See Note 7)	Weekly	Calculation
Excess Thermal Load	Weekly (May 1 – October 31)	Calculation (See Note 7)

Modification #4 – Permit No. 100771, Schedule B Notes are modified to delete Notes 1, 2 and 8.

Modification #5 – Permit No. 100771, Schedule B, Note 3 is modified to read as follows:

3. Beginning in calendar year 2005, the permittee shall conduct Whole Effluent Toxicity testing for a period of three (3) years in accordance with the frequency specified above. If the Whole Effluent Toxicity tests show that the effluent samples are not toxic at the dilutions determined to occur at the Zone of Immediate Dilution and the Mixing Zone, no further Whole Effluent Toxicity testing will be required during this permit cycle. Note that at least four Whole Effluent Toxicity test results will be required along with the next NPDES permit renewal application.

Modification #6 – Permit No. 100771, Schedule B, Note 9 is added and shall read as follows:

9. The permittee shall perform all testing required in Part D of EPA Form 2A. The testing includes all metals (total recoverable), cyanide, phenols, hardness and the 85 pollutants included under volatile organic, acid extractable and base-neutral compounds. Three scans are required during the 4 ½ years after permit issuance. Two of the three scans must be performed no fewer than four months and no more than eight months apart. The effluent samples shall be 24-hour daily composites, except where sampling volatile compounds. In this case, six discrete samples (not less than 40 mL) collected over the operating day are acceptable. The permittee shall take special precautions in compositing the individual grab samples for the volatile organics to insure sample integrity (i.e. no exposure to the outside air). Alternately, the discrete samples collected for volatiles may be analyzed separately and averaged.

Modification #7 – Permit No. 100771, Schedule D, Condition 5 (Priority Pollutant Scan procedures) is deleted.

Modification #8 – Permit No. 100771, Schedule E is deleted.

BEFORE THE ENVIRONMENTAL QUALITY COMMISSION

OF THE STATE OF OREGON

IN THE MATTER OF:	)	MUTUAL AGREEMENT
CITY OF COOS BAY,	)	AND ORDER
Wastewater Facility No. 2,	)	NO. WQ WQ/M-WR-03-022
	)	
Permittee	)	COOS COUNTY
	)	

WHEREAS:

1. On August 21, 2003, the Department of Environmental Quality (Department or DEQ) issued National Pollutant Discharge Elimination System (NPDES) Waste Discharge Permit Number 100771 (Permit) to the City of Coos Bay (Permittee). The Permit authorizes the Permittee to construct, install, modify or operate wastewater treatment control and disposal facilities (facilities) and discharge adequately treated wastewaters into Coos Bay, waters of the state, in conformance with the requirements, limitations and conditions set forth in the Permit. The Permit expires on December 31, 2007.

2. Condition 1 of Schedule A of the Permit does not allow Permittee to exceed the waste discharge limitations for fecal coliform, total residual chlorine and ammonia at Outfall 001 after the Permit issuance date. The fecal coliform limitations are a monthly median of 14 organisms per 100 mL with not more than 10 percent of the samples exceeding 43 organisms per 100 mL. The total residual chlorine limitations are 0.02 mg/L monthly average and 0.05 mg/L daily maximum. The ammonia limitations are 20 mg/L monthly average and 30 mg/L daily maximum.

3. DEQ and the Permittee recognize that until new or modified facilities are constructed and put into full operation, Permittee will likely violate the fecal coliform, total residual chlorine and ammonia effluent limitations at times.

4. (a) Permittee presently is capable of treating its effluent so as to meet effluent limitations, measured as specified in the Permit, of 200 organisms per 100 mL as a monthly

geometric mean and 400 organisms per 100 mL as a weekly geometric mean for fecal coliform, 1.0 mg/L monthly average for total residual chlorine and 40 mg/L monthly average and 60 mg/L daily maximum for ammonia.

(b) After completion of the Phase I improvements, the Permittee will be capable of treating its effluent so as to meet effluent limitations, measured as specified in the Permit, of not more than 10 percent of the samples exceeding 43 fecal coliform organisms per 100 mL, 0.25 mg/L monthly average and 0.50 mg/L daily maximum for total residual chlorine and 40 mg/L monthly average and 60 mg/L daily maximum for ammonia. During the start up period in Paragraph 7.B(7), the Permittee shall operate the facilities as effectively as practicable but shall not be required to meet any specific pollutant limitation.

5. The Department and Permittee recognize that the Environmental Quality Commission has the power to impose a civil penalty and to issue an abatement order for violations of conditions of the Permit. Therefore, pursuant to ORS 183.415(5), the Department and Permittee wish to limit and resolve the future violations referred to in Paragraph 3 in advance by this Mutual Agreement and Order (MAO).

6. This MAO is not intended to settle any violation of any interim effluent limitations set forth in Paragraph 4 above. Furthermore, this MAO is not intended to limit, in any way, the Department's right to proceed against Permittee in any forum for any past or future violations not expressly settled herein.

NOW THEREFORE, it is stipulated and agreed that:

7. The Environmental Quality Commission shall issue a final order:

A. Requiring Permittee to comply with the following schedule for Phase I improvements:

(1) By no later than thirty (30) days after issuance of this MAO, the Permittee shall submit to the Department a plan for notifying the public of the potential discharge of bacteria levels exceeding the shellfish standard. The plan shall include procedures

to be followed by the Permittee that may include, but not be limited to, media notifications, posting of warning signs and other public notification steps. Upon approval of the Department, the Permittee shall implement the plan.

(2) By no later than fifteen (15) months after issuance of this MAO, the Permittee shall design, construct and initiate operation of interim dechlorination facilities. It is recognized that the facilities will be low cost and temporary in nature but must be designed to reduce the bacteria and chlorine levels in the effluent to comply with the post -Phase I interim limits in Paragraph 4(b). To the extent possible, the facilities may be used permanently as part of the Phase II improvements.

B. Requiring Permittee to comply with the following schedule for Phase II improvements:

(1) By no later than eighteen months after issuance of this MAO, the Permittee shall submit a draft Facilities Plan to the Department that evaluates alternatives for complying with all water quality standards and ensures that the Permittee can continuously comply with all effluent limitations included in Permittee's Permit.

(2) By no later than ninety (90) days of receiving Department comments, the Permittee shall submit a final approvable Facilities Plan for providing wastewater control facilities as needed to assure that the Permittee can continuously comply with all water quality standards and effluent limitations included in Permittee's Permit. If the Facilities Plan recommends new facilities that will result in a new or modified NPDES Permit, the Facilities Plan submittal shall include an application for a new or modified NPDES Permit.

(3) By no later than nine (9) months after Department approval of the Facilities Plan, the Permittee shall submit draft engineering plans and specifications for the necessary wastewater control facilities to the Department.

(4) By no later than sixty (60) days after of receiving Department comments, the Permittee shall submit a final approvable engineering plans and specifications

for the necessary wastewater control facilities to the Department.

(5) By no later than four (4) months after Department approval of the engineering plans and specifications, Permittee shall award a contract for the construction of the necessary wastewater control facilities.

(6) By no later than two (2) years after award a contract, the Permittee shall complete construction of the approved wastewater control facilities and initiate operations.

(7) By no later than sixty (60) days after the completion of construction, the Permittee shall attain operation level of the wastewater treatment facilities and comply with all water quality standards and all effluent limitations in Permittee's permit.

C. Requiring Permittee to meet the interim effluent limitations set forth in Paragraph 4(a) above from the date this MAO is executed until completion of the corrective actions required by the schedule in Paragraph 7.A. Requiring Permittee to meet the interim effluent limitations set forth in Paragraph 4(b) from the completion of the corrective actions required by Paragraph 7.A. until completion of the corrective actions required by Paragraph 7.B., except, during the start up period in Paragraph 7.B(7), the Permittee is not required to meet the interim limitations in Paragraph 4(b) so long as Permittee operates the facilities as effectively as practicable.

D. Requiring Permittee, upon receipt of a written Penalty Demand Notice from the Department, to pay the following civil penalties:

(1) $250 for each day of each violation of the compliance schedule set forth in Paragraphs 7A and 7.B.

(2) $100 for each violation of each daily average waste discharge limitation set forth in Paragraph 4.

(3) $500 for each violation of each monthly average waste discharge limitation set forth in Paragraph 4.

8. If any event occurs that is beyond Permittee's reasonable control and that causes or may cause a delay or deviation in performance of the requirements of this MAO, Permittee shall immediately notify the Department verbally of the cause of delay or deviation and its anticipated duration, the measures that have been or will be taken to prevent or minimize the delay or deviation, and the timetable by which Permittee proposes to carry out such measures. Permittee shall confirm in writing this information within five (5) working days of the onset of the event. It is Permittee's responsibility in the written notification to demonstrate to the Department's satisfaction that the delay or deviation has been or will be caused by circumstances beyond the control and despite due diligence of Permittee. If Permittee so demonstrates, the Department shall extend times of performance of related activities under this MAO as appropriate. Circumstances or events beyond Permittee's control include, but are not limited to, acts of nature, unforeseen strikes, work stoppages, fires, explosion, riot, sabotage, or war. Increased cost of performance or consultant's failure to provide timely reports may not be considered circumstances beyond Permittee's control.

9. Regarding the schedule set forth in Paragraphs 7A and 7B above, Permittee acknowledges that Permittee is responsible for complying with that schedule regardless of the availability of any federal or state grant monies.

10. The terms of this MAO may be amended by the mutual agreement of the Department and Permittee.

11. The Department may amend the compliance schedule and conditions in this MAO upon finding that such modification is necessary because of changed circumstances or to protect public health and the environment. The Department shall provide Permittee a minimum of thirty (30) days written notice prior to issuing an Amended Order modifying any compliance schedules or conditions. If Permittee contests the Amended Order, the applicable procedures for conduct of contested cases in such matters shall apply.

12. This MAO shall be binding on the parties and their respective successors, agents,

and assigns. The undersigned representative of each party certifies that he or she is fully authorized to execute and bind such party to this MAO. No change in ownership or corporate or partnership status relating to the facility shall in any way alter Permittee's obligations under this MAO, unless otherwise approved in writing by DEQ.

13. All reports, notices and other communications required under or relating to this MAO should be directed to Ruben Kretzschmar, DEQ Coos Bay Regional Office, 340 N. Front Street, Coos Bay, Oregon 97420, phone number (541) 269-2721, extension 23. The contact person for Permittee shall be the City Manager, 500 Central Ave., Coos Bay, OR 97420, phone number 541-269-8912.

14. Permittee acknowledges that it has actual notice of the contents and requirements of the MAO and that failure to fulfill any of the requirements hereof would constitute a violation of this MAO and subject Permittee to payment of civil penalties pursuant to Paragraph 7D above.

15. Any stipulated civil penalty imposed pursuant to Paragraph 7D shall be due upon written demand. Stipulated civil penalties shall be paid by check or money order made payable to the "Oregon State Treasurer" and sent to: Business Office, Department of Environmental Quality, 811 S.W. Sixth Avenue, Portland, Oregon 97204. Within 21 days of receipt of a "Demand for Payment of Stipulated Civil Penalty" Notice from the Department, Permittee may request a hearing to contest the Demand Notice. At any such hearing, the issue shall be limited to Permittee's compliance or non-compliance with this MAO. The amount of each stipulated civil penalty for each violation and/or day of violation is established in advance by this MAO and shall not be a contestable issue.

16. Providing Permittee has paid in full all stipulated civil penalties pursuant to Paragraph 15 above, this MAO shall terminate 60 days after Permittee demonstrates full compliance with the requirements of the schedule set forth in Paragraphs 7A and 7B above.

PERMITTEE

08/20/03
Date

City Manager, City of Coos Bay

DEPARTMENT OF ENVIRONMENTAL QUALITY

8/21/03
Date

Kerri L. Nelson, Western Region Administrator

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FINAL ORDER

IT IS SO ORDERED:

ENVIRONMENTAL QUALITY COMMISSION

8/21/03
Date

Kerri L. Nelson, Western Region Administrator
Department of Environmental Quality
Pursuant to OAR 340-11-136(1)

Appendix C

Coos Bay Biosolids Management Plan for
Coos Bay Wastewater Treatment Plants 1 & 2
(Reviewed & Revised 12/06)

Date:
Contact: Steve Simpson, Project Manager
Address: 680 Ivy Ave.
Coos Bay, OR 97420
Phone Number: (541) 267-3966
Fax Number: (541) 269-9268

File Number: Plant 1 #19802
Plant 2 #19821

NPDES Number: Plant 1 #100699
Plant 2 #100771

Introduction

The City of Coos Bay owns and operates a municipal sewage collection and Class I treatment system (Plant #1 was built in 1954 and Plant #2 was built in 1973, both were upgraded in 1991) under National Discharge Elimination system (NPDES) permit numbers (Plant #1 100699 and Plant #2 100771). The City of Coos Bay Wastewater Treatment Plants 1 & 2 receive primarily domestic wastewater from a population of approximately 18,000 people. Septage is not accepted at these wastewater treatment facilities. Treated effluent from the treatment plants is discharged to Coos Bay. Coos Bay is an estuary and mouth to the tributaries of the Coos River, in Coos County, Oregon.

OMI, Inc. (Operation Management International) operates a municipal sewage collection system and two activated sludge wastewater treatment plants for the City of Coos Bay. Plant #1, which is located at 680 Ivy Avenue, has a design (dry weather) flow of 2.9 million gallons per day (MGD) and can handle peak instantaneous flows of 15 MGD. Plant #2, which is located at 100 Fulton Avenue, has a design dry weather flow of 2.02 MGD and a peak daily flow of 4.84 MGD. No septage is received at either plant and there are no significant industrial users. Plant #1 serves the East Side District of Coos Bay and the Bunker Hill Sanitary District, while Plant #2 serves the West Side of Coos Bay and the Charleston Sanitary District. Both plants underwent a major upgrade in 1991 to meet Class I treatment parameters.

The program is conducted in accordance with a DEQ approved Biosolids Management Plan, National Pollutant Discharge Elimination System, Waste Discharge Permit requirements, 40 CFR Part 503 (Standards for the Use or Disposal of Biosolids), and the Oregon Administrative Rules (Chapter 340, Division 50) concerning land application and disposal of sewage treatment plant sludge. The Coos Bay's Sludge Management Plan received DEQ approval in 1989.

<u>Section I treatment Facility</u>

Plant #1, Liquid Flow-stream
Influent entering the treatment plant head works will go through a mechanically cleaned bar screen, aerated grit removal tank and then into the 10 MGD primary clarifier. Waste activated sludge and solids from the raw influent co-settle in the primary clarifier. From there it is pumped by two rotary lobe positive displacement pumps to the anaerobic digester. After primary clarification, the flow goes to one or two of the aeration basins, with a capacity of 0.378 million gallons (m-gal) each. These are supplied with fine bubble diffusers for aeration, with the compressed air coming from one of three Hoffman centrifugal blowers. Each blower has a capacity of 1200 standard cubic feet per minute (SCFM) at 8 pounds per square inch (psi). After aeration the mixed liquor goes to the 6-mgd secondary clarifier for settling. The clarified effluent is chlorinated and held in the chlorine contact chamber to allow disinfection time before discharge to Coos Bay.

Plant #2, Liquid Flow-stream
Influent enters a wet well at the plant and is pumped up to the head works by three variable speed centrifugal pumps. There it flows through a mechanical bar screen and then through an 80-inch gravity vortex grit remover. From there it flows to a 0.125 m-gal primary clarifier. After primary clarification it flows to one or two 0.202 m-gal aeration basins. In these basins low speed mechanical surface mixers supply air and mixing. These mixers are governed by variable speed drives that are tied to a dissolved oxygen analyzer to maintain a selected oxygen level. After aeration the mixed liquor goes to an intermediate lift station where three pumps pull the liquor up into the secondary clarifiers. There is a 52-foot and a 56-foot diameter secondary clarifier with capacities of 0.18 and 0.25 m-gal respectively. One or both of these clarifiers can be used at any time. Return activated sludge (RAS) cascades by head pressure and gravity back to the aeration basins. The clarified effluent is chlorinated and held in the chlorine contact chamber, capacity 0.116 m-gal, to allow disinfection time before discharge to Coos Bay.

Solids Processing
Plant#1
Return activated sludge (RAS) is sent back to the aeration basins by one or two 1500-gallons per minute (gpm) RAS pumps, which are controlled by variable frequency drives (VFD's) tied into the plant flow meters to provide proportional flow. Plant #1 is supplied with two anaerobic digesters, although at the present time only one is actually in use.

Plant #2
Waste activated sludge and solids from the raw influent co-settle in the primary clarifier. The solids are pumped by a piston pump to the anaerobic digester. There is a primary digester with a capacity of 0.102 MG and a secondary digester with a capacity of 0.087 MG. The primary digester is supplied with a draft tube type mixer and a hot water jacket sludge heater. A small boiler, fired by either methane gas or propane, supplies hot water.

Solids Storage Structure:
The City of Coos Bay operates a bentonite lined sludge storage lagoon. The lagoon has a 4-acre surface area. The lagoon storage capacity is 258,800 gal. (440 feet long, 440 feet wide and 10 feet deep). All biosolids are stored in the sludge storage lagoon until harvested for land disposal. During the dry weather hauling season, the biosolids are harvested using a hydraulic dredge and pipe system to transfer the sludge to a storage tank. From the storage tank they are loaded into a 2800 or a 4500 gallon tank truck for transportation to the fields. Depending on field conditions and topography, the biosolids are applied directly from the trucks using a splash plate or by using a pump and irrigation cannon setup. Once the number of loads applied matches the agronomic loading rate, the disposal is moved to another field. Both the emptying time of the truck and the area covered per load are measured to ensure proper loading rates are maintained.

Septage Receiving Facility
No septage (0 gallons per year) received at these facilities.

Pretreatment Program:
At the present time there are no significant industrial users connected to the Coos Bay system. Because of this the City requested that the pretreatment requirements be removed from their permit when it was re-issued. A modification of the NPDES permits was issued in December 2004. Part of this modification was the deletion of Schedule E, Pretreatment Activities.

Section II: Solids Storage Structure:

Anaerobically digested sludge is transferred to the lagoon for additional stabilization and storage. The chief benefit of the sludge lagoons is to provide winter storage of sludge from October through May. Land application takes place during the dry months the following year from June through September.

Section III: Solid Treatment Processes

The EPA's 40 CFR parts 503 and the DEQ, Oregon Administrative Rules (OAR) 340-50 allows permit tee to use EPA approved alternatives to satisfy Class A and B biosolids pathogen alternatives or vector attraction reduction option criteria. The permittee must notify the Department in writing and get approval prior to any process change that would utilize pathogen reduction or vector attraction reduction alternatives other than primary reduction alternative/options or others not contained in this biosolids management plan. The permittee must also certify that the alternatives and options used are EPA approved and that sampling and monitoring conforms to the 40 CFR Part 503 and OAR 340-050 regulations.

Class A or B Biosolids determination is not required for biosolids that are taken to DEQ permitted landfills.

Plant #1
Plant #1 digester has a capacity of 330,000 gallons and is supplied with a mechanical mixer and gas collection facilities. It is heated by a low-pressure steam boiler, fired by either methane or diesel, which supplies hot water to a spiral heat exchanger. Average daily sludge pumping from the primary clarifier averages 10,000 gallons, which gives around 30 days of detention time in the digester. The temperature is maintained at 36+ 1-degree C. The volatile solids reduction averages 50% (using the formula In - Out/ In – (In x Out)). The detention time, temperature and volatile solids reduction meet or exceed the requirements of 40 CFR part 503 for pathogen and vector attractions reduction for a class “B” biosolids. After digestion the sludge is transferred via an under the bay pipeline to a 4 acre facultative sludge lagoon located near the old Eastside wastewater treatment facility. It is stored in this lagoon, where it undergoes further thickening and breakdown, until it is harvested for beneficial use as fertilizer on hay crops.

Plant #2
The temperature is maintained at 36+ 1-degree C in the primary (capacity of 0.102 m-gals) and secondary (capacity of 0.087 m-gals) digesters. At average flows, there is approximately 16 days of detention time in the primary digester. Sludge is hauled as needed to the facultative sludge lagoon. It is stored in this lagoon, where it undergoes further thickening and breakdown, until it is harvested for beneficial use as fertilizer on hay crops. The detention time, temperature and volatile solids reduction meet or exceed the requirements of 40 CFR part 503 for pathogen and vector attraction reduction for a class “B” biosolids.

All waste sludge and biosolids are stored in the facultative lagoon until harvested for land disposal. The sludge storage lagoon has a 258,000-gallon capacity. Biosolids are removed with a floating dredge. Sludge from Coos Bay plant #1 and #2 undergo a year or more of detention prior to being removed and beneficially land applied on nearby farm and forestland. Supernatant from the lagoon system is pumped into the Eastside collection system of Coos Bay #1 plant.

For the past 5 years the average volatile solids reduction criteria for Class B biosolids has been achieved by Coos Bay wastewater treatment facility.

Biosolids Production:
Biosolids samples are collected using the method specified in NPDES permit numbers 100699 and 100771, Schedule B, Item 1 (c). This specifies that the City of Coos Bay shall collect a composite sample to be representative of the product land applied from the facultative sludge lagoon.

Amount of sewage sludge per (365 day period)	Frequency
Greater than zero but less than 290	Once per year.
Equal to or greater than 290 but less than 1,500.	Once per quarter (four times per year)
Equal to or greater than 1,500 but less than 15,000.	Once per 60 days (six times per year)
Equal to or greater than 15,000	Once per month (12 times per year)

*If biosolids are removed only once per year, the facility is still required to take the minimum number of samples required by the 40 CFR part 503 Frequency of Monitoring Section (503.16a). At least 2 samples are submitted during each biosolids-hauling season.

All biosolids analysis performed to comply with 40 CFR part 503 are conducted using methods Specified in Test Methods for Evaluating Solid Waste, Physical/Chemical Methods as specified in 40 CFR 503.8. The following is a list of the analysis performed and the methods used for each analysis.

Monitoring of the City of Coos Bay's biosolids quality ensures compliance with both the State of Oregon OAR 340-50-080 and Federal 40 CFR 503 requirements. The monitoring is completed at least on a semi-annual basis for the regulated inorganic pollutants (i.e. metals). In addition to the metal analysis, and because all biosolids are land applied, percent solids, phosphorus, potassium and nitrogen concentrations are monitored at least semi-annually. If a site has been used for two consecutive years, a soil sample is analyzed for Ammonia and Nitrate content before a third year of application is begun.

The results of sampling and analysis indicate that the yearly concentration of those parameters regulated in 40 CFR 503.13 (b) (3) (Table 3) are below the pollutant concentrations. Therefore those additional management practices listed in 40 CFR 503 for facilities that cannot meet that requirement are not applicable to these facilities.

Sampling:

Pathogen reduction is accomplished at the treatment plant through providing appropriate anaerobic digestion and sludge storage lagoon stabilization. Pathogen testing is conducted for biosolids that are land applied to compare with Class A or Class B pathogen requirements and restrictions.

Composite sampling from the anaerobic digesters and/or sludge storage lagoon is accomplished according to NPDES permit requirements and currently consists of blending equal volume random grab samples taken from the center of nine (9) or more like-sized units resulting from an imaginary grid of each digester or lagoon. The grab samples include the entire depth of sludge to be removed in the area sampled. The frequency of sampling is prior to removal of biosolids from the digester and/or lagoon on a quarterly or when the biosolids is removed, whichever is less*. Pathogen reduction sampling is accomplished at the time the biosolids are land applied.

1.) Anaerobic Digesters

Sample location: Sample port on discharge line of anaerobic digester recirculation pump.

Number and type of sample taken per day: Composite of discrete samples collected throughout the sampling period.

Sample storage and transport: Samples are stored at 4 degrees C in an ice chest or refrigerator. Samples are transported in an ice chest to maintain temperature during delivery to the laboratory. Pathogen samples are delivered to lab within 1 hour of sample collection.

<u>Sample analysis method:</u> EPA 9045; EPA 160.3; EPA 160.4; SM 4500-NH3B; EPA 353.2; EPA 365.3; EPA 351.3; SW-846 7060; SW-846 6010; SW-846; SW-846 7481; SW-847 7471; SW-846 7740; SM 18^{th}, 9221.E.1; SM 18:9260D.1; ASTM D 4994-89; EPA 600/1-87/014; EPA 8240; EPA 1613; EPA 8270; EPA 1613B; EPA 1668 (may include one or more of the referenced methods).

(For a list of current biosolids analysis methodologies see Appendix F).

Lagoons (Coos Bay has 1 lagoon this is approximately 4 acres)
Sample location: Center of 9 quadrants from each lagoon and/or the Discharge weir of the lagoon.

Number and type of sample taken per event: Grab from sampling points in each lagoon. Sample includes the entire sludge column.

Sample storage and transport: Composite sample is stored at 4 degrees C in ice chest or refrigerator. Samples are transported in ice chest to maintain temperature during delivery to laboratory.

Sample analysis method: EPA 9045; EPA 160.3; EPA 160.4; SM 4500-NH3B; EPA 353.2; EPA 365.3; EPA 351.3; SW-846 7060; SW-846 6010; SW-846; SW-846 7481; SW-847 7471; SW-846 7740; SM 18^{th}, 9221.E.1; SM 18:9260D.1; ASTM D 4994-89; EPA 600/1-87/014; EPA 8240; EPA 1613; EPA 8270; EPA 1613B; EPA 1668;

Pathogen Reduction:
To meet the 503 part regulatory requirements pathogen reduction must be met before vector attraction reduction or at the same time vector attraction reduction is achieved.

Class A Biosolids:
With all a Class A alternatives microbial monitoring for fecal coliform or Salmonella sp. is required. This management plan lists the primary alternatives employed by the permittee to meet class A and B biosolids criteria. Typically Class A biosolids can be met by using one of 6 EPA approved alternatives; the primary alternative used by this facility is Alt. 4) Monitor sewage sludge for fecal coliform or Salmonella sp. and densities of enteric viruses and viable helminth ova 503.32 (a) (6).

A) Monitoring for Fecal Coliform or Salmonella sp.
Monitoring for Fecal Coliform or Salmonella sp. is required to detect growth of bacterial pathogens. Because Class A biosolids may be used without site restrictions, all Class A material must be tested to show that the microbial requirements are met at the time when it is ready to be used or disposed. In addition to meeting process requirements, Class A biosolids must meet one of the following requirements:

- Either the density of the fecal coliform in the sewage sludge be less than 1,000 MPN per gram total solids (dry gram weight)
- Or the density of Salmonella sp. Bacteria in the sewage be less than 3 MPN per 4 grams of total solids (dry weight basis).

Unlike Class B biosolids, Class A requirements are not based on an average value. Sampling for Class A biosolids consists of at least 7 discrete samples taken over a 2-week period. Test results are required before Class A material can be released for use or disposal. The Class A biosolids microbial requirement must be met at either:

- The time of use or disposal, or
- At the time the biosolids are prepared for sale or given away in a bag or other container for land application, or
- At the time the biosolids or material derived from biosolids is prepared to meet the requirements in 503.10 (b), 503.10 (c), 503.10 (e) or 503.10 (f).

Class A Pathogen Reduction Alternatives:
Class A determination consists of sampling and analysis of representative quantities of the final biosolids product. Normally sampling would be conducted at three (3) locations; digester biosolids, the lagoon biosolids and stock piled biosolids. Coos Bay's biosolids are digested and the consistency of the biosolids does not change over a two-week period. For Class A biosolids determination at least 7 discrete samples are taken from biosolids treatment location at the time of use.

Alt. 3) Sewage Sludge treated in Other Processes 503.32 (a) (5)
This requirement relies on comprehensive monitoring of bacteria, enteric viruses and viable helminth ova to demonstrate adequate reduction of pathogens.

(i) Either the density of fecal coliform in the sewage sludge was determined to be less than 1000 Most Probable Number per gram of total solids (dry weight basis), or the density of salmonella sp. Bacteria in the sewage sludge was determined to be less than three Most Probable Number per four grams of total solids (dry weight basis) at the time the sewage sludge was used or disposed of; at the time the sewage sludge is prepared for sale or giveaway in a bag or other container for land application; or at the time the sewage or material derived from sewage sludge is prepared to meet the requirements in 503.10 (b), (c), (e) or (f).
(ii) (A) The sewage sludge shall be analyzed prior to pathogen treatment to determine whether the sewage sludge contains enteric viruses.
The density of enteric viruses in the sewage sludge was determined to be less than one Plaque-forming Unit per four grams of total solids (dry weight basis); the sewage sludge is Class A with respect to enteric viruses until the next monitoring episode for the sewage sludge.
(B) When the analysis prior to pathogen treatment shows the density of enteric viruses in the sewage sludge was determine to be equal or more than one Plaque-forming unit per four grams of total solids (dry weight basis), the sewage sludge is Class A with respect to enteric viruses when the density of enteric viruses in the sewage sludge after pathogen treatment is less than one Plaque-forming Unit per four grams of total solids (dry weight basis) and when the values or ranges for the operating parameters for the pathogen treatment process produces the sewage sludge that meets the enteric virus density requirement are documented.
(D) After the enteric virus reduction in paragraph (a) (5) (ii) (C) is demonstrated for the pathogen process, then the sewage sludge continues to be Class A with respect to enteric viruses when the values for the pathogen treatment proves operating parameters are consistent with values or ranges of values documented in paragraph (a) (5) (ii) (C).
(iii) (A) The sewage sludge shall be analyzed prior to pathogen treatment to determine whether the sewage sludge contains helminth ova.

(B) The density of helminth ova in the sewage sludge was determined to be less than one per four grams of total solids (dry weight basis); the sewage sludge is Class A with respect to helminth ova until the next monitoring episode for the sewage sludge.
(C) When the analysis prior to pathogen treatment shows the density of helminth ova in the sewage sludge was determined to be equal or more than one per four grams of total solids (dry weight basis), the sewage sludge is Class A with respect to helminth ova when the density of helminth ova in the sewage sludge after pathogen treatment is less than one per four grams of total solids (dry weight basis) and when the values or ranges for the operating parameters for the pathogen treatment process produces the sewage sludge that meets the helminth ova density requirement are documented.
(D) After the helminth ova reduction in paragraph (a) (5) (ii) (C) is demonstrated for the pathogen process, then the sewage sludge continues to be Class A with respect to helminth ova when the values for the pathogen treatment proves operating parameters are consistent with values or ranges of values documented in paragraph (a) (5) (ii) (C).

Alt. 4) Sewage Sludge Treated in Unknown Processes 503.32 (a) (6)
This requirement relies on comprehensive monitoring of bacteria, enteric viruses and viable helminth ova to demonstrate adequate reduction of pathogens:

- Either the density of the fecal coliform in the sewage sludge be less than 1,000 MPN per gram total solids (dry gram weight), or the density of Salmonella sp. Bacteria in the sewage be less than 3 MPN per 4 grams of total solids (dry weight basis).
- The density of enteric viruses in the sewage sludge after pathogen treatment must be less than 1 per 4 grams of total solids (dry weight basis).
- The density of viable helminth ova in the sewage sludge after pathogen treatment must be less than 1 per 4 grams of total solids (dry weight basis). (Alt. 4 is for an unknown process and must be approved by the EPA prior to its implementation. This should not be an alternative we use in Oregon).

Alt. 5) Use of Processes to Further Reduce Pathogens (PFRP) 503.32 (a) (7)
This requirement relies on the process to demonstrate adequate reduction of pathogens to meet Class A biosolids criteria:

- Sludge has been treated in one of the PFRPs listed in Appendix B of the 503 regulation, and
- Either the density of the fecal coliform in the sewage sludge is less than 1,000 MPN per gram total solids (dry gram weight), or the density of Salmonella sp. Bacteria in the sewage is less than 3 MPN per 4 grams of total solids (dry weight basis).

Class B Biosolids Pathogen Reduction:
Class B biosolids can be met by using one of the three alternatives, the two primary alternatives used by this facility are Alt. 1) Monitor sewage sludge for fecal coliform 503.32 (b) (2), and Alt. 2) Use Process to Significantly Reduce Pathogen (PSRP) 503.32 (b) (3).

Alt. 1) Monitor sewage sludge for fecal coliform 503.32 (b) (2) requires that seven samples of treated sewage sludge (biosolids) be collected and that the geometric mean fecal coliform density of these samples be less than 2 million MPN per dry gram biosolids (dry weight basis).

Alt. 2) Use Process to Significantly Reduce Pathogen (PSRP) 503.32 (b) (3) considers sludge treated in one of the PSRPs listed in Appendix B of the 40 CFR part 503 to meet Class B biosolids criteria for pathogen reduction. For this facility the following PSRPs could be used:

#3 Anaerobic digestion, sludge is treated in the absence of air for a specified residence time at a specified temperature. Values of the mean cell residence time and temperature shall be between 15 days at 35C to 55 degrees Celsius (131C) and 60 days at 20 Celsius (68F), and

#5 Lime stabilization-sufficient lime is added to the sewage to raise the pH of the sludge to 12 for two hours active mix.

Vector Attraction:

This facility primarily satisfies the 503.33 Vector Attraction Reduction criteria by generating a Class B liquid biosolids (>38% volatile solids reduction in anaerobic and sludge storage lagoon treatment processes).

This facility can also use the following as back up vector attraction reduction options:

Opt. 1) The % volatile solid reduction calculation to use for anaerobic digester that is decanted and that does not have appreciable grit accumulation would be the Van Kleeck or Approximate Mass Balance (AMB) equation depending upon the percent solids in the decant ante (Attachment B). To meet the biosolids vector attraction reduction requirements an anaerobic digester must provide a 15-day detention time at 35C in a completely mixed high rate digester in order to achieve a volatile solids reduction of 38% or more. There are alternative volatile solid reduction methods that are deemed equivalent to the 38% volatile solid reduction criteria under the EPA's and the DEQ's regulations.

Opt. 2) Less than 17% additional volatile solid loss during bench-scale anaerobic batch digestion of the sewage sludge for 40 additional days at 30C to 37C (86F to 99F).

Opt. 6) The pH of sewage sludge shall be raised to 12 or higher by alkali addition and without the addition of more alkali shall remain at 12 for two hours (batch is active mix for 2 hours), and the batch must remain at a pH of 11.5 or higher for an additional 22 hours without the addition of more alkali agent). This option requires written approval from the Department prior to land application each year.

Vector attraction determination is not required for biosolids that are land filled.

For the past five (5) years the average volatile solids reduction criteria has been achieved by Coos Bay's wastewater treatment facility.

SECTION IV: BIOSOLIDS ANALYSIS

As reported in the City's 2006 Annual Biosolids Reports, the existing Coos Bay treatment plants have produced about 290 dry tons of biosolids.

Coos Bay's treatment works utilizes the activated sludge process prior to anaerobic digestion. Annually, Coos Bay generates under 290 dry tons per year of biosolids.

<u>Biosolids Analysis:</u>
In 2006 Coos Bay has generated approximately 491,805 lb. or 223.03 dry metric tons of biosolids.

Biosolids Chemical Analysis:
The following table presents the chemical analyses of the City's biosolids for the year 2006. The metals data shows the "clean" nature of the City's biosolids as indicated by their comparison to the Part 503, table 3 "Exceptional Quality Standard" criteria.

City of Coos Bay-Biosolids Chemical Characteristics

Constituent	**Part 503 Table 3, Criteria**	**2006 sample #1**	**2006 sample #2**	**Ave.**
As, mg/kg	41	6.7	5.7	6.2
Cd, mg/kg	39	2.9	2.2	2.6
Cr, mg/kg	1200	30.9	33.4	32.2
Cu, mg/kg	1500	383	320	352
Pb, mg/kg	300	85.5	101	93
Hg, mg/kg	17	2.1	3.0	2.6
Mo, mg/kg	18	8.8	9.8	9.3
Ni, mg/kg	420	26.3	25.4	25.9
Se, mg/kg	100*	ND@5.0	ND@5.0	ND@5.0
Zn, mg/kg	2800	1,071	866	969

*From 40CFR Part 503.13 Tables 1. Ceiling Concentration for metals.
ND = none detected

2006 Biosolids Analysis (The last season the City land applied substantial amounts of biosolids to farmland).

Pounds	**(#) Metal**	**#/yr.**	**#ac/yr.**	**Site life (cumulative)**
lb.	Arsenic (As)	3.05	0.07	529
lb.	Cadmium (Cd)	1.25	0.03	1167
lb.	Chromium (Cr)	15.81	0.35	7649
lb.	Copper (Cu)	173	3.81	351
lb.	Lead (Pb)	45.86	1.01	265
lb.	Mercury (Hg)	1.25	0.03	500
lb.	Molybdenum (Mo)	4.57	0.10	160
lb.	Nickel (Ni)	12.71	0.28	1339
lb.	Selenium (Se)	2.46	0.05	1780
lb.	Zinc (Zn)	476.3	10.51	238

The site life would be limited to 160 years based on the Molybdenum (Mo) cumulative loading from the 2006 biosolids analysis (**Attachment C)**. The City of Coos Bay needs approximately 75 acres of pasture/grass land to apply on to handle their annual biosolids production.

Biosolids analysis results are entered into an Excel spreadsheet and used to calculate the amount that can be applied to a particular field. Daily lab results and application amounts are entered into this program, which calculates the number of loads remaining on a site as well as the pounds of metals and nutrients applied. This information is kept in the computer and on backup disks and is submitted before February 19 in each year's annual biosolids report. All information for a particular year is kept on record along with the report for that year.

SECTION VI: LAND APPLICATION OF BIOSOLIDS
BENEFICIAL REUSE PROGRAM

Coos Bay plans to continue the options of land application on locally DEQ approved sites. This BMP will also address the marketing/distribution of the Class A product as a soil conditioner. This facility could produce a Class A product suitable for distribution. If in the future the City so desires it would need to develop a distribution and marketing program targeted to landscaping, nursery, and agricultural operations that use soil amendment, fertilizer, liming agent, and similar products. For instance, the City's own Parks Department is a potential user of this material thus avoiding the cost of purchasing similar products. Although it is difficult to market the product before it is produced, the City would need to begin the public education process during construction of the proposed distribution network by identifying and contacting potential users.

Transportation and Land Application:
Biosolids are loaded into a city owned truck or contract haulers truck at the lagoon site. The biosolids loading area has drains that drain back into the lagoon. During the summer months one available option is to land apply biosolids on DEQ authorized sites (approximately 250 acres total).

In the event liquid biosolids are spilled between the treatment facility and the land application site, Coos Bay's sewage treatment works shall contain the spill, lime, absorb (via sand, sawdust, etc.) and remove spilled sludge solids with a front end loader or shovels and dispose of the spillage at a DEQ authorized application or disposal site. All spills into waters of the state or 42 gallons or more on the ground surface shall be reported immediately to Oregon Emergency Response System (OERS) at 1-800-452-0311 and the Department of Environmental Quality. All spills outside Coos Bay wastewater treatment facilities shall be reported to the regional biosolids coordinator at (541)440-3338.

Application Rates
The proposed application rate for the biosolids on the City's approved land application site is about 4.26 dry/tons per acre per year period. This corresponds to between 100 &120 pounds of available nitrogen per acre per year. The Oregon State Fertilizer Guide recommends a 120 - 140 lb. total Nitrogen loading per year for pasture grass in this region.

Site Approval
The biosolid land application sites are capable of assimilating Coos Bay's annual total nitrogen production of about 16,000 lbs. total available N/yr. 2006 this facility generated about 492,000 lbs or 223 metric tons biosolids for the year. The amount of nitrogen in this biosolids was equivalent to 0.0129 lb. N/lb. biosolids; or 28 lb. N/ton biosolids (see Attachment C, Biosolid Analysis 2006).

At the present time, Coos Bay is using two main biosolids disposal sites, the McCarthy site located up Coos River and the Frank Williams site near Coos Bay. The McCarthy site contains 250 usable acres and the Williams site contains 36 usable acres of agricultural land planted in perennial rye grass. The hay is harvested and cattle grazed on the remainder in a rotating cycle of solids application, harvest and grazing. During the months of June through September (depending on groundwater, precipitation, etc.) solids are harvested from the facultative lagoon with a floating dredge and trucked to the disposal site. There they are surface applied using a spreader bar off of the back of the truck. All requirements for setbacks from waters of the state and grazing restrictions are met. Piezometers have been installed at several locations to monitor the groundwater level. Records are kept of the solids TS and VS and the gallons applied per field. A spreadsheet program calculates the loads to be applied per field and calculates the pounds of solids and nutrients applied. During the harvest season a minimum of two samples are collected and sent off for laboratory analysis of metals and nutrients. This data is used to calculate the annual and cumulative loading of the site. Reports are submitted annually detailing amounts hauled, field application rates, current laboratory data, site lives, etc.

The biosolids land application sites are capable of assimilating Coos Bay's annual total nitrogen production. The biosolids land application rate for pastures and grass is 120 lb. available N per acre/yr.

Biosolids Site Management Information:

Site Name or Site Number	**Site Use Crop**	**Total Available N Loading (lb./ac./yr.)**	**Net Acres**	**Plant Available Nitrogen Application lb. N/ac.-yr.**
McCarthy Site #1 & #2	Pasture Perennial Rye Grass	120-140 lb. N/acre	14.8	1776
McCarthy Site #3	Pasture Perennial Rye Grass	120-140 lb. N/acre	10.3	1236
McCarthy Site #4	Pasture Perennial Rye Grass	120-140 lb. N/acre	21.6	2592
McCarthy Site #5	Pasture Perennial Rye Grass	120-140 lb. N/acre	13.3	1596
McCarthy Site #6	Pasture Perennial Rye Grass	120-140 lb. N/acre	17.2	2064
McCarthy Site #7	Pasture Perennial Rye Grass	120-140 lb. N/acre	13.3	1596
McCarthy Site #8	Pasture Perennial Rye Grass	120-140 lb. N/acre	23	2760
McCarthy Site #9	Pasture Perennial	120-140 lb. N/acre	12.1	1452

	Rye Grass			
McCarthy Site #10	Pasture Perennial Rye Grass	120-140 lb. N/acre	12.9	1548
McCarthy Site #11	Pasture Perennial Rye Grass	120-140 lb. N/acre	11.2	1344
McCarthy Site #12	Pasture Perennial Rye Grass	120-140 lb. N/acre	8.5	1020
Frank Williams Site #1	Pasture Perennial Rye Grass	120-140 lb. N/acre	12	1440
Frank Williams Site #2	Pasture Perennial Rye Grass	120-140 lb. N/acre	3.2	384
Frank Williams Site #3	Pasture Perennial Rye Grass	120-140 lb. N/acre	5.3	636
Frank Williams Site #4	Pasture Perennial Rye Grass	120-140 lb. N/acre	4.3	516
Frank Williams Site #5	Pasture Perennial Rye Grass	120-140 lb. N/acre	2.8	336
Total*			185.8	22296*

*Plant Available Nitrogen Application lb. N/ac.-yr. loading calculations were done using 120 lb. N/acre.

Long term biosolids application rates and site restrictions are contained in the biosolids site authorization letter. References to the OAR 34-50, The EPA 40 CFR Part 503, site setbacks, site agronomic loading rates, land application restrictions and site restrictions are also detailed out in the site authorization letter.

Distribution and Marketing

The amount of the Class A product distributed to the various users will be recorded and provided in the annual report. Proper identification of the material and its chemical analysis and suggested application rates will be provided to users.

SECTION VII: MONITORING AND REPORTING

Daily Reporting and Record Keeping:

Each year prior to land application of biosolids it is recommended the source operators check to see if contiguous property owners have changed. The operators should keep a record of contact (date, and/or written log of phone call w/name and number, and/or Xerox of postcards w/name and address, etc.) of contiguous property owners, showing they have been notified that the City land applies biosolids at these authorized sites.

Daily Site Logs shall be kept for all biosolids land application sites. Log must have a scaled map showing the site and the land application location that coincides with the daily site loading method (truck spreader, etc.). Daily records should clearly show the date, quantity, and location of biosolids land applied.

A copy of the site authorization, a current biosolids analysis, and a signed certification statement shall accompany all Class B biosolids that are to be land applied beneficially on forest, farm, or pasture lands.

Annual Report shall have a signed copy of the certification statements for pathogen reduction, vector attraction reduction and biosolids has been land applied at approved agronomic loading. Person signing statements should be the operator of record at the treatment plant. The operator shall show how the vector attraction reduction was met. i.e., volatile solids reduction was achieved by time and temperature, the Van Kleeck equation filled out with digester records (MCRT), bench scale test, sour test or any other EPA approved alternative method appropriated for biosolids generated at your facility.

Certification of pathogen reduction is required and is satisfied by submittal of test results in the Annual Biosolids Report. All the previous year's biosolids sampling and analysis that is required by the permit shall be included in City of Coos Bay's Annual Biosolids Report (in each year's annual report appendix).

Monitoring:
Composite samples are taken from the lagoon in accordance with the requirements contained in the treatment plants NPDES permit and this Biosolids Management Plan, and analyzed for pathogens, volatile solids reduction, percent solids, metals, and nutrient levels. The sample results are evaluated and compared with pollutant loading restrictions contained in both the Oregon Administrative Rules and in the Federal Biosolids Regulations. Analyses are also conducted regarding pathogen and vector attraction reduction criteria to compare with Class A or B pathogen and vector attraction reduction requirements. In addition, routine analyses are performed on the treatment plant influent and the anaerobic digester sludge.

Biosolids monitoring, record keeping and reporting are accomplished in accordance with requirements contained in the treatment plant's NPDES Permit, Oregon Administrative Rules, Chapter 340 Division 50, and the approved Biosolids Management Plan. The requirements include providing biosolids analyses and maintaining a log indicting the quantity, quality, and location of applied biosolids. Monthly reporting of all biosolids monitoring and disposal is included in the treatment plant's monthly NPDES Discharge Monitoring Report that is submitted to the DEQ. An annual report is also sent to the EPA and the DEQ at the end of the application season. The report contains specific details regarding biosolids activities and includes a program summary; NPDES permit required monitoring results, CFR 503 monitoring results, certifications, and site application rates and information.

SECTION VIII: CONTINGENCY OPTIONS

In the event of a digester breakdown, the digester contents would be gradually fed to the FSL at a rate calculated not to exceed its daily loading rate. The problem would be corrected and the digester put back in service as soon as possible. If a digester upset occurred, all steps necessary to correct the problem would b taken (i.e., changes in loading rates, chemical additions, etc.). If all of these measures failed to correct the problem, the digester contents would be transferred to the lagoon and the digester restarted.

In case of an on site sludge spill, the spilled contents would be hosed down the storm drains in the area, which have been plumbed back into the plant influent flow.

Spill During Transport:
In the event biosolids are spilled between the treatment facility and the land application site, Coos Bay's sewage treatment works shall contain the spill, absorb (via sand, sawdust, etc.) and remove spilled biosolids. Class B biosolids spilt must be removed with a front-end loader or shovels and land apply the spillage at a DEQ authorized application or disposal site. The spill would be roped off to prevent public access, dammed if necessary to prevent entry into any waterway, cleaned up with another truck or necessary equipment, and the site disinfected.

All spills into waters of the state or spills on the ground surface that are likely to enter waters of the state shall be reported immediately to Oregon Emergency Response System (OERS) at 1-800-452-0311 and your regional biosolids coordinator at (541)440-3338. All spills of 40 gallons or more on the ground surface shall be reported to the regional biosolids coordinator at (541)440-3338.

SECTION IX: CERTIFICATION STATEMENT

City of Coos Bay's facility is capable of meeting their primary alternatives for achieving Class or B biosolids pathogen and vector attraction reduction criteria. Signed Class A and/or B biosolids and vector attraction statements shall accompany all biosolids that are land applied **(Attachment D)**. For Class A or B biosolids, annual biosolids analysis must be provided upon request. Certification statements must also show conformance with nutrient and land application loading rates where applicable.

Attachment B:

Calculation of the % volatile solids reduction is to be based on comparison of a representative grab sample of total and volatile solids entering each digester (a weighted blend of the primary and secondary clarifier solids) and a representative composite sample of the solids exiting each digester withdrawal line. Composite samples of the influent shall consist of at least four samples, each collected at approximately even intervals over an eight-hour period.

Typically in the past we've used the Van Kleeck equation for digesters, the assumption being that there is no grit accumulation in the digester. This volatile solids equation assumes the fixed solids input equals the fixed solids output. The Van Kleeck equation is appropriate if the digester decant is low in total solids. The Van Kleeck equation can be used to calculate the volatile solids reduction for a digester that decants provided VSb equals VSd.

FVSR: Fractional Volatile Solids Reduction

FVSR = 1- VSb * (1-VSf) / VSf (1-VSb)

VSf Feed Sludge fractional volatile solids, (kg/kg)
VSb Digested sludge (digester bottom) fractional volatile solids, (kg/kg)
VSd Decantate fractional volatile solids

For this equation to be valid VSb must equal VSd.

For digesters with decant withdrawal (decant high in solids) and no grit accumulation, where the volatile and fixed concentrations are known for all streams as well as the volumetric flow rates for the decant and digester sludge then the Appropriate Mass Balance equation should be used.

FVSR: Fractional Volatile Solids Reduction

FVSR = Fyb – Byb – Dyd / Fyb

Fyb (F) Feed sludge volumetric flow rate (m^3/d)
(yb) Feed sludge volatile solids concentration (kg/m^3)

Byb (B) Digester sludge (bottom) volumetric flow rate (m^3/d)
(yb) Digester sludge (bottom) volatile solids concentration (kg/m^3)

Dyd (D) Decantate volumetric flow rate (m^3/d)
(yd) Decantate volumetric solids concentration (kg/m^3)

Because the anaerobic digester is cleaned on a regular basis the assumption is there is no grit accumulation in the digestive process.

CITY OF COOS BAY VOLATILE SOLIDS CALCULATION

Currently Coos Bay uses the following volatile solids calculation: % volatile solids, primary sludge (primary sludge average flow – 47,600 GPD) 86% volatile solids, thickened waste activated sludge (thickened sludge flow – 22,600 GPD) 83% volatile solids, dried biosolids (final product) 55.1%.

CALCULATION

A. % Volatile Solids In

$$\frac{VS\ (ps)\ Q\ (ps) + VS(TWAS)\ Q\ (TWAS)}{Q\ (ps) + Q\ (TWAS)}$$

$$\frac{86\ (47.6) + 83\ (22.6)}{47.6 + 22.6} = 85.0\%$$

B. % REDUCTION OF VOLATILE SOLIDS

$$\frac{\text{In} - \text{Out}}{\text{In} - (\text{In} \times \text{Out})} \times 100$$

$$\frac{0.85 - 0.551}{0.85 - (0.85 \times 0.551} \times 100$$

$$= 78.3\%$$

Attachment D:

"I certify, under penalty of law, that the pathogen requirements in 503.32 (b), the management practices in 503.14, and the vector attraction reduction requirements in 503.33 (b) (1) have been met. This determination has been made under my direction and supervision in accordance with the system designed to ensure that qualified personnel properly gather and evaluate the information used to determine that the pathogen requirements and vector attraction reduction requirements have been met. I also certify that all biosolids were land applied at the approved agronomic loading rate noted in the respective Department site authorization letter. I am aware that there are significant penalties for false certification including the possibility of fines and imprisonment.

______________________________ ______________________

Steve Simpson
Project Manager – OMI

Date

Attachment E
Biosolids Test Methods

Biosolids Physical Analysis

Parameter	EPA Method	Standard Methods
Total Solids		SM 2540 G
Volatile Solids		SM 2540 G
pH	EPA 150.1 / EPA 9040	

Biosolids Metal Analysis

Pollutant	EPA Method
Arsenic (Total)	EPA 7062
Cadmium (Total)	EPA 213.2 / EPA 7131
Chromium (Total)	EPA 218.2 / EPA 7191
Copper (Total)	EPA 220.1 / EPA 7210
Lead (Total)	EPA 239.2 / EPA 7421
Mercury (Total)	EPA 245.1 / EPA 7470
Molybdenum (Total)	EPA 246.2 / EPA 7481
Nickel (Total)	EPA 249.2 / EPA 7521
Selenium (Total)	EPA 270.2 / EPA 7740
Zinc (Total)	EPA 289.1 / EPA 7950

Biosolids Nutrient Analysis

Parameter	EPA Method
Total Nitrogen (TKN as N)	EPA 351.3
Ammonia Nitrogen	EPA 350.2
Nitrate Nitrogen	EPA 353.3
Phosphorus (Total)	EPA 365.3
Potassium (Total)	EPA 258.1 / EPA 7610