EXECUTIVE SUMMARY

This General Sewer Plan and Wastewater Facilities Plan for the City of Snohomish is the first volume in the City's three-volume *Wastewater System Plans.* It updates the *City of Snohomish 1996 General Sewer Plan* and the 1994 *Addendum to the Facilities Plan for the City of Snohomish Wastewater Treatment Plant Expansion and Upgrade.* The second volume provides a detailed analysis and recommendations for reducing system overflows to the Snohomish River The third volume assesses environmental effects of the system improvements outlined in Volumes I and II.

As part of a recent consent decree, the City of Snohomish is required to plan improvements to its sewage facilities to achieve the following:

- Reduce or eliminate ammonia discharges.
- Meet the effluent limits established in the City's National Pollutant Discharge Elimination System (NPDES) permit.
- Reduce or eliminate the use of chlorine for disinfection.
- Reduce or eliminate combined-sewer overflows (CSOs).

These three volumes meet the requirements of the consent decree, as well as Washington State requirements for comprehensive sewer plans, wastewater treatment engineering reports and CSO reduction plans and for wastewater planning to address growth.

STUDY AREA

The City of Snohomish is approximately 25 miles northeast of Seattle on the Snohomish River at its confluence with the Pilchuck River. The study area for the City's 2004 Wastewater System Plans includes the 1,850-acre area within the current city limits, the 1,150-acre portion of the urban growth area (UGA) outside the city limits, and 300 acres in the North Annexation Area north of the UGA and south of SR 2.

Most of the area within the city limits is sewered, and the unincorporated portion of the UGA and the North Annexation Area are unsewered at this time. It is anticipated that the city boundaries will expand within the UGA and North Annexation Area to accommodate anticipated growth. Of the 1,450 acres outside the current city limits, just over 1,000 acres has land use designations that would eventually require sanitary sewers.

For this report, the study area was divided into five planning areas (see Figure ES-1):

- Combined-Sewer System Planning Area
- Separated-Sewer System Planning Area
- Cemetery Creek Planning Area
- South UGA Planning Area
- North Addition Planning Area.

COLLECTION SYSTEM DESIGN CRITERIA AND FLOWS

Sewage flow estimates used to evaluate the collection system were developed as the sum of flows from homes, businesses and institutions, and "infiltration and inflow" (I/I), which is the groundwater and storm water that get into the sewer system through various defects. Table ES-1 shows the values used for these components of wastewater flow. Based on U.S. Environmental Protection Agency (EPA) criteria, the I/I is non-excessive in the City's separated sewers but it is excessive in the combined sewers.

TABLE ES-1.
COLLECTION FACILITY DESIGN CRITERIA FOR WASTEWATER FLOWS

Average Annual Wastewater Flow Rate	
Residential	69 gpcd[a]
Non-Residential	1,100 gpad[b]
School	10-16 gpcd
Infiltration and Inflow	
New Separated Sewers	
Maximum Month	400 gpad
Peak Day	900 gpad
Peak Hour	1,100 gpad
Existing Separated Sewers	
Maximum Month	850 gpad
Peak Day	2,000 gpad
Peak Hour	4,000 gpad
Existing Combined Sewers	
Maximum Month	2,400 gpad
Peak Day	17,000 gpad
Peak Hour	76,000 gpad
Peak Hour Peaking Factors[c]	
Small Service Areas	3.5
Large Service Areas	3.0

a. gpcd = gallons per capita per day
b. gpad = gallons per acre per day
c. The peaking factor is the ratio of peak-hour flow to average flow.

COLLECTION SYSTEM DESCRIPTION

The City of Snohomish's sewage system includes approximately 40,000 feet of combined sewers installed before 1950 and 125,000 feet of separated sewers installed since then. The combined system still has two overflow lines that discharge directly to the Snohomish River when the sewer system's capacity is exceeded. There are 14 wastewater pump stations and most have undergone major modifications and renovations over the years. Figure ES-1 shows the existing collection system.

COLLECTION SYSTEM ANALYSIS

The adequacy of existing trunk sewer and pump station capacity was analyzed using calculated flows in a computer model of the collection system. The model was calibrated using flow records from March 12, 2003, which was the highest-flow day available when the model was created.

In addition, collection system facilities were evaluated for their physical condition, record of problems, and compliance with current design standards. Findings of the collection system analysis are presented below for each planning area.

Separated-Sewer System Planning Area

The system in the Separated-Sewer System Planning Area includes five main gravity trunk sewers and 11 pump stations. The modeling showed many segments of the trunk sewers to be undersized for peak-hour flows, though historically there have been few reported capacity problems in these trunks. The modeling also showed that several of the pump stations have inadequate "firm capacity" (the capacity with one pump out of service) for estimated existing or future peak-hour flows. Currently all the pump stations in the separated-sewer service area appear to keep up with current flows, since there have been no overflows reported. This indicates that several pump stations likely have both pumps running and some surcharging of the sewers during peak flows. Key issues noted in this planning area are as follows:

Trunk Sewers

- Until recently, the sewer main along Pine Avenue north of Wood Street was almost completely filled with gravel. The source of the debris, which has caused several blockages and surcharging in manholes, is unknown. Although it is unconfirmed at this time, it is believed that the gravel has reached the wet well of Pump Station No. 2 (Rainier) and has damaged the impellers on the pumps.
- The sewers along Champagne Lane between 18th Street and 19th Street, are sloped very flat. This causes backups in the area, and sewage has been observed spilling into Blackmans Lake.
- The City has experienced significant problems with the Railroad Grade Trunk, which is located in railroad right-of-way that is now a jogging trail between Avenue D and Avenue A at approximately 8th Street. Solids collect in two unchanneled manholes during low flow, clogging the sewer during high flows. The sewage has backed up as far as 10th Street and Avenue D and has caused overflows through manhole lids on Avenue D.

Pump Stations

- Pump Station No. 2 (Rainier). According to recent City tests, each pump is operating at about 700 gallons per minute, half the design capacity, This may be due to impeller damage or wear, or from restrictions in the force main. With both pumps running during peak flows, wastewater backs up from the wet well into influent pipes until flows subside and the pumps can draw the wet well back down. Modeling indicates that the pumps are inadequate for peak hour flows even when operating at the full design capacity of 1,500 gallons per minute per pump. Also an unplugged overflow pipe was recently found at this station, which may have allowed overflows to the Snohomish River during peak flows. City staff plugged the overflow pipe in March 2004 to ensure that no overflows occur there. The City plans to expedite repairs to restore the full capacity of the pumps and to install a third pump to increase the capacity of the station. The City also plans to monitor neighboring sewers for excessive surcharging during future peak flows to ensure that no other overflows occur.

- Pump Station No. 5 (Pilchuck). An unplugged pipe was recently found that allowed flood waters to enter the wet well and be pumped into the collection system, increasing flows downstream, such as at Pump Station No. 2. The City plugged the overflow pipe in March 2004 to eliminate these extraneous flows.
- Pump Station No. 6 (Hill Park). Modeling indicates that one pump is barely able to keep up with peak-day flows, and both pumps are needed for estimated peak-hour flows.
- Pump Station No. 7 (Champagne). Modeling indicates that one pump is barely able to keep up with peak-day flows, and both pumps are needed for estimated peak-hour flows. According to City staff, the existing cast iron force main from this station has significant leaks and needs to be rerouted to the gravity sewer at Park and 17th Place.
- Pump Station No. 13 (Eden Farms). This station has had problems with large amounts of paper products clogging both pumps at the pump station
- Pump Station No. 14 (Casino). Modeling indicates that one pump is slightly inadequate for estimated peak-hour flows. However, with both pumps running, this station is easily able to keep up with peak flows.
- By 2024, portions of the separated-sewer area will drain to the planned Cemetery Creek Trunk rather than to the existing trunks. The City plans to build the north portion of the Cemetery Creek Trunk in August 2004 and discharge its flows to the Eden Farms Pump Station as an interim route until the southern portion of the Cemetery Creek Trunk is completed in 2006. City staff is concerned about the impacts of the additional connections during this interim, and will limit new connections to ensure that they do not cause excessive backups or overflows in the existing downstream trunk sewers and Pump Station No. 2 .
- When the Cemetery Creek Trunk is complete, four pump stations will be eliminated from the separated-sewer service area and replaced with gravity sewers that flow into the Cemetery Creek Trunk: Pump Stations No. 9 (Stoneridge), No. 10 (Bonneville), No. 13 (Eden Farms) and No. 14 (Casino).
- Currently, none of the pump stations have on-site, hardwired emergency generators. However, 10 of the 14 pump stations have an emergency power receptacle and a transfer switch. In the event of a failure of the power

supply, these pump stations are designed to receive and use power from the City's trailer-mounted generator set.

Combined-Sewer Planning Area

Two main gravity trunk sewers and three pump stations serve the combined-sewer area. The Ironworks Trunk feeds into Pump Station No. 1 (Ironworks) and receives flows from Pump Stations No. 4 (Commercial) and No. 11 (Kla-Ha-Ya). The 2nd Street Trunk conveys flows directly to the headworks at the treatment plant. The modeling showed that Pump Stations No. 4 and No. 11 and most segments of the Ironworks Trunk have adequate firm capacity for estimated peak-hour flows. Key issues noted in this planning area are as follows:

- The modeling shows that seven of the 16 pipe segments on the 2nd Street Trunk have inadequate capacity for the estimated 2004 peak-hour flow.
- The Kla-Ha-Ya Pump Station has numerous deficiencies and was installed as a temporary pump station in 1995 to serve four commercial buildings that were discharging directly to the river via a small combined side sewer. The City plans to eliminate the pump station by requiring new private sanitary side sewers to be installed from the buildings to the City's gravity sewer on 1st Street.
- By 2024, it is anticipated that the areas served by Pump Stations No. 1, No. 4 and No. 11 will be completely separated. At buildout, all areas in the combined-sewer area will be separated. Under these conditions, the model indicates that the existing pumps and wet wells at Pump Stations No. 4 and No. 11 have sufficient capacity to handle peak-hour flows, but the pumps and wet well, as they exist today, at Pump Station No. 1 will not.

Cemetery Creek Planning Area

Currently, no sewer lines service the Cemetery Creek Planning Area. Much of this planning area is undeveloped, and the existing houses and businesses are served by septic tanks. The majority of the City's population growth over the next 20 years is expected to occur in the Cemetery Creek Planning Area. Small portions of the Cemetery Creek Trunk have been constructed as part of new developments along the route.

North Addition Planning Area

The North Addition Planning Area is largely undeveloped at this time and is not sewered. Much of the area is salmon habitat and therefore is undevelopable. According to City staff, this area is expected to be annexed into the City within the next 20 years and sewer service for the developable portions will be provided by the proposed Cemetery Creek Trunk.

South UGA Planning Area

The South UGA Planning Area is heavily developed and includes Harvey Airfield and a lumber mill. This area is currently unsewered; existing occupants are served by on-site septic systems. The Area is not expected to be sewered or annexed into the City within the next 20 years.

TREATMENT PLANT DISCHARGE REGULATIONS

The wastewater treatment plant discharges effluent to the Snohomish River under the terms of a National Pollutant Discharge Elimination System (NPDES) permit issued by the Washington Department of Ecology. The permit identifies final limits that take effect at the beginning of the next permit cycle on July 1, 2004. Limits are more stringent from July through October, when the river flow level is low, than during the rest of the year. Table ES-2 summarizes the permit's final limits.

TABLE ES-2.
FINAL EFFLUENT LIMITS FROM SNOHOMISH TREATMENT PLANT NPDES PERMIT
(EFFECTIVE JULY 1, 2004)

Parameter	Low Flow in Snohomish River (July through October)	High Flow in Snohomish River (November through June)
CBOD (5-day)		
Monthly average	25 mg/L[a] 58 ppd	25 mg/L, 584 ppd
Weekly average	40 mg/L	40 mg/L, 934 ppd
Daily maximum	93 ppd	na
TSS (flow of 2 mgd or less)		
Monthly average	75 mg/L, 719 ppd	75 mg/L, 1,251 ppd
Weekly average	110 mg/L, 1,055 ppd	110 mg/L, 1,835 ppd
TSS (portion of flow greater than 2 mgd)		
Monthly average	na	30 mg/L, 200 ppd
Weekly average	na	45 mg/L, 300 ppd
Fecal Coliform Bacteria		
Monthly average	200 cfu/100 ml	same
Weekly average	400 cfu/100 ml	same
Daily pH		
minimum	6	same
maximum	9	same
Total Residual Chlorine		
Monthly average	79.8 µg/L, 0.77 ppd	79.8 µg/L, 0.77 ppd
Weekly average	209 µg/L	209 µg/L
Total Ammonia		
Monthly average	29 ppd	No limit
Daily maximum	99 ppd	No limit

a. The average monthly effluent concentration for CBOD shall not exceed 25 mg/L or 15 percent of the monthly average influent concentration, whichever is more stringent.

Abbreviations: CBOD = carbonaceous biochemical oxygen demand; cfu = colony-forming units; mg/L = milligrams per liter; mgd = million gallons per day; µg/L = micrograms per liter; na = not applicable; ppd = pounds per day; TSS = total suspended solids

The final permit establishes total maximum daily load (TMDL) limits for ammonia and carbonaceous biochemical oxygen demand (CBOD) during the river low-flow period because there have been instances when the river water's dissolved oxygen concentration dropped below water quality standards. Ecology has indicated that it is willing to reallocate the TMDL limits between ammonia and CBOD to provide effluent limits that are more readily achievable with secondary sewage treatment processes, provided the total oxygen demand remains equivalent.

The treatment plant has failed to meet the NPDES permit requirements for which it was designed, and it cannot meet the effluent limits established by the current NPDES permit. Plant records indicate the following issues related to permit limits:

- High effluent biochemical oxygen demand (BOD) during low flow periods has likely been due to algae blooms in the lagoons. Beginning in the late 1990s, a copper-sulfate additive was added to suppress algae growth. This appeared to improve effluent BOD, but it increased effluent copper concentrations above permit limits. Operators stopped using the additive in August 2003.
- The plant has violated its permit requirement for weekly-average effluent fecal coliform 10 times since ending the use of the copper-sulfate additive.
- The new permit limits for total chlorine residual are less stringent than previous limits because better dilution will be provided with a proposed new four-port outfall diffuser.
- Effluent ammonia concentration would have exceeded the 2004 permit limits for ammonia several times during the last four years.

TREATMENT PLANT FLOWS AND LOADS

Flow Projections

Projections of future flows for the design year (2024) were developed using the design criteria in Table ES-1 and assuming that the City's existing overflows will be conveyed to the treatment plant and 50 percent of the combined sewers will be converted to sanitary-only sewers. Table ES-3 shows the projected 2024 treatment plant influent flows based on these assumptions. These are unequalized flows. Based on an assessment of available storage at the plant and the volume required to equalize peak flows, the design equalized peak-hour flow is 7 mgd. This rate requires that 3.7 million gallons of storage be available in 2024.

Load Projections

Projected future loads for the design year were estimated using historical per capita loading rates and a projected design year population of 14,133. Table ES-4 summarizes the treatment plant load projections for BOD, total suspended solids (TSS), and total Kjeldahl nitrogen (TKN).

TABLE ES-3.
PROJECTED TREATMENT PLANT INFLUENT FLOWS FOR DESIGN YEAR 2024

	Maximum Month	Peak Day	Peak Hour[b]
Base Flow (mgd)	1.05	1.05	3.16
Combined Sewers (mgd)[a]	0.51	2.89	10.60
Existing Separated Sewers I/I (mgd)	0.78	1.83	3.66
New Separated Sewers I/I (mgd)	0.37	0.84	1.02
Total Influent Flows (mgd)	**2.7**	**6.6**	**18.4**

a. Includes I/I from combined sewers and CSO No. 1 and CSO No. 2 overflows.
b. Unequalized peak hour flows entering the treatment plant.

TABLE ES-4.
TREATMENT PLANT POLLUTANT LOAD PROJECTIONS FOR 2024

	BOD Load (ppd)	TSS Load (ppd)	TKN Load (ppd)
Annual Average	3,133	3,110	570
Maximum Month	3,736	3,957	679
Peak Day	7,232	7,999	1,315

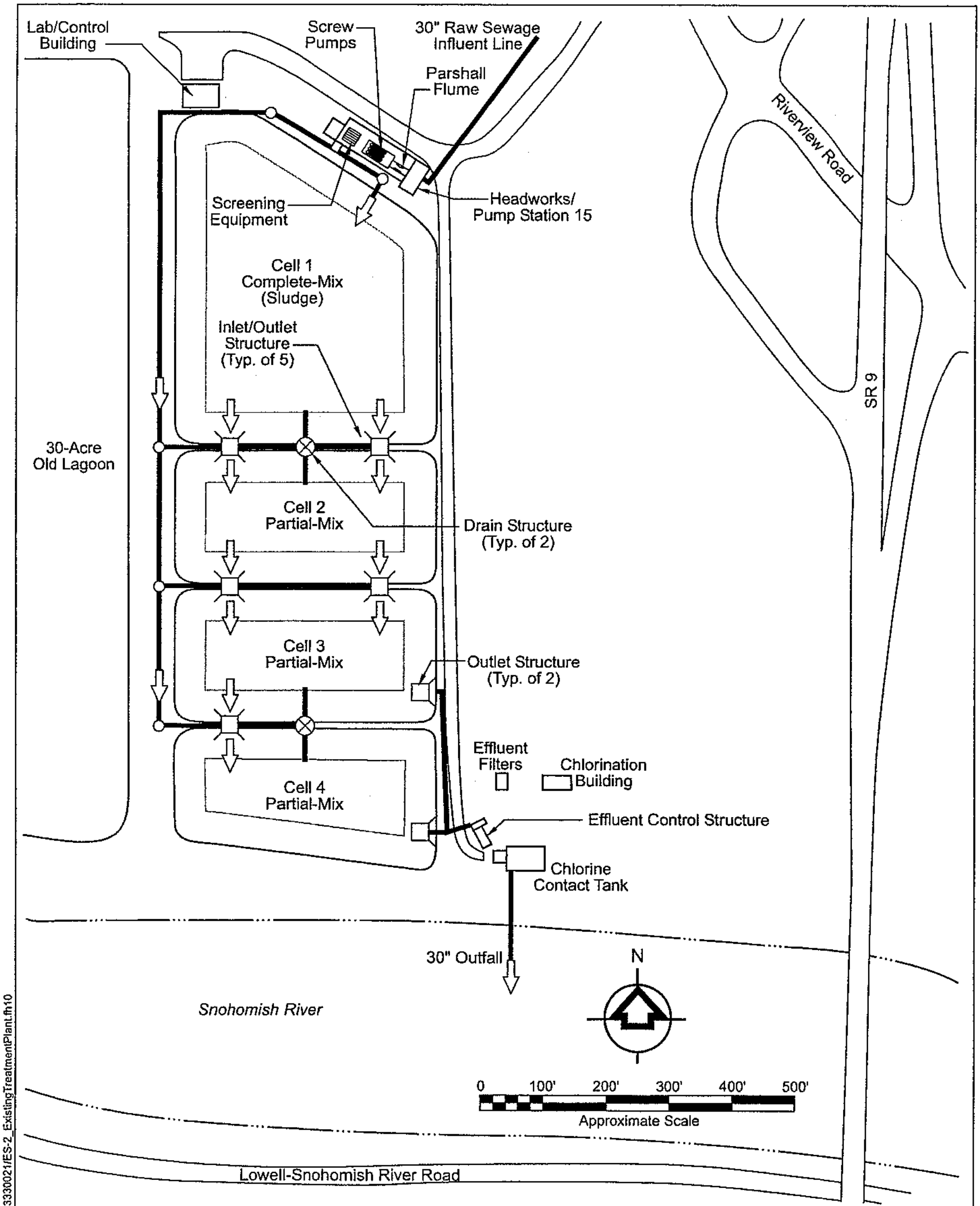
TREATMENT PLANT DESCRIPTION

The original City of Snohomish wastewater treatment facility was a 40-acre lagoon constructed in 1958. It was upgraded in 1995 to include a new headworks with influent screw pumps and a rotary screen; 10 acres of lagoons with a completely mixed aerated basin and three partially mixed basins; effluent filtration; chlorine disinfection; and dechlorination facilities. The remaining 30 acres of the old lagoon has been unused since then. Figure ES-2 shows the existing plant.

Flood levels in the Snohomish River are higher than typical operating water surface levels in the lagoons. Wastewater backs up in the lagoons during flood periods, then discharges normally when the river drops to normal levels. Effluent pumping will be required to maintain treatment plant operations by discharging to the river during flood events.

A process capacity analysis of each unit process at the treatment plant yielded the following key findings:

- The screw pumps at the headworks have a firm capacity of 19.0 mgd. Of the projected 26.8-mgd peak influent flow, only 16 mgd will pass through the screw pumps. The rest of the flow will enter the plant downstream of the screw pumps.
- The mechanically cleaned fine screen and manual bar screen have a combined capacity of 25.0 mgd. If flows exceed 25.0 mgd, a bypass channel can accommodate an additional 6.0 mgd prior to diverting flows through the headworks flow control structure.



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City of Snohomish
GENERAL SEWER PLAN AND WASTEWATER TREATMENT PLANT FACILITIES PLAN

Figure ES-2.
EXISTING TREATMENT PLANT

- The effluent filter capacity rating can likely be increased to 1.2 mgd with additional filter feed pump capacity.
- The chlorine contact tank provides the required volume for 7-mgd peak-day flows, as required by state design standards.
- The plant does not have redundant feed equipment for dechlorination as required by state design standards.
- Additional standby power will be needed with UV disinfection.

The outfall to the Snohomish River is not part of this report. A separate study proposed modifying the existing open-ended 30-inch diameter outfall with a four-port diffuser. Modification to the existing outfall is expected to be completed by 2005.

EVALUATION OF REGIONAL TREATMENT

Under state requirements for general sewer plans, the City must assess the feasibility of developing regional wastewater facilities with neighboring communities and industries within 20 miles rather than providing its own treatment facilities. Alternatives were evaluated for conveying wastewater from the existing Snohomish Wastewater Treatment Plant to Brightwater or the City of Everett. The estimated capital cost for these alternatives ranges from $23 million to $33 million, and the estimated cost of upgrading the existing Snohomish plant is about $10 million. Due to the lower capital costs, and easement and permitting considerations, it is recommended that the City upgrade its wastewater treatment plant rather than pursuing a regional treatment alternative.

EVALUATION OF TREATMENT PLANT IMPROVEMENT ALTERNATIVES

Effluent Disposal Alternatives Evaluation

The City of Snohomish currently discharges effluent through its outfall to the Snohomish River. This appears to be the most feasible and cost-effective means for disposal of treated wastewater, and continued use of the existing outfall is recommended.

In the future, the City's existing 30-acre lagoon could be part of the effluent disposal strategy by converting it to a year-round wetland. As the City's combined sewers are replaced with separate stormwater and sanitary sewer systems, the stormwater flows will be diverted to the old lagoon for treatment. Effluent from the sewage treatment plant could also be routed through the wetland. This would help sustain aquatic vegetation during dry weather when there is little stormwater flow. The wetlands would provide some polishing of the effluent and additional protection for Snohomish River water quality during critical low-flow periods. This alternative can be analyzed in the future when the lagoon is modified for stormwater treatment.

Headworks Alternatives Evaluation

Screening Equipment

It is recommended that the existing screening equipment be left as is. A screenings washer and compactor is recommended to wash organics and fecal material from the screenings and to reduce their overall volume and odor potential.

Headworks Flow Control Structure

To maintain the design peak flow of 7 mgd, a new flow structure will divert flows greater than 7 mgd to the lagoons. Flows less than 7 mgd will be sent downstream to grit removal facilities.

Grit Removal

Grit removal will be provided to prevent solids deposition in pipes and the secondary treatment process. The proposed grit system includes a vortex-type grit chamber and a washer to wash the grit and deposit it in a waste container.

Secondary Treatment Alternatives Evaluation

Seven secondary treatment alternatives were initially evaluated to determine whether they can reasonably achieve the effluent quality requirements. From these seven, three were chosen for more detailed evaluation:

- **Alternative 1, Complete Mix Extended Aeration Activated Sludge**—This alternative calls for two complete-mix aerated basins and two secondary clarifiers. One of the smaller existing lagoons would be partitioned by an earthen berm to create the two complete-mix cells. A blower building would be located adjacent to the existing chlorination building at the southeast side of the plant, and two clarifiers would be located in a portion of the 30-acre lagoon east of Cell No. 3.
- **Alternative 2, Sequencing Batch Reactor (SBR) Activated Sludge**—The SBR activated sludge alternative would consist of partitioning a smaller lagoon by constructing an earthen berm to create two parallel SBR basins. A blower building would be located adjacent to the existing chlorination building at the southeast side of the plant. Existing Cell No. 4 would be partitioned to serve as an effluent equalization cell and a sludge thickening lagoon.
- **Alternative 3, Biolac**—The Biolac alternative would consist of partitioning one lagoon by constructing an earthen berm to create two parallel Biolac basins. The blower building would be located adjacent to the existing chlorination building at the southeast side of the plant. The clarifiers would be built into the earthen berm that splits the existing smaller lagoon into two Biolac basins.

The SBR alternative is estimated to have the lowest life cycle costs of the secondary treatment alternatives. Its ease of use, minimal operator attention, and utilization of the existing lagoons, thus avoiding construction of new structural facilities are also advantages. The SBR system meets the treatment requirements for effluent discharge to the Snohomish River. For these reasons, it is the recommended secondary process.

Effluent Filtration Alternatives Evaluation

According to vendor literature, the existing effluent filters may be able to handle a higher loading rate than their current design loading rate. This would require two new filter feed pumps, each with a pumping capacity of 1,000 gallons per minute. In addition, auxiliary equipment associated with the effluent filters will need to be replaced and/or repaired.

Disinfection and Effluent Pumping Alternatives Evaluation

Two alternatives were evaluated for a combined disinfection and effluent pumping facility:

- **Alternative 1, Upgrade Existing Disinfection System and Add Effluent Pumping**—This alternative upgrades the existing chlorinator and sulfonator and provides a reaeration tank and effluent pumps downstream of the chlorine contact tank. When the river level is normal, effluent would flow to the river by gravity. When the river level rises and prevents gravity flow to the outfall, the effluent pumps would pump disinfected effluent to the outfall.
- **Alternative 2, Install Ultraviolet (UV) Disinfection and Add Effluent Pumping**—For this alternative, a low-pressure, high-intensity UV facility would be installed in the existing chlorine contact tank. An emergency generator would be required to power the disinfection system in the event of a power failure. The disinfected effluent would be sent directly to the effluent pump station wet well. The effluent pump station would operate as described in Alternative 1.

The UV alternative has a higher life cycle cost than the chlorine alternative, but it has the strong benefit of requiring no chemicals. Its ease of use, lack of dechlorination requirement, and reduced environmental concerns are also advantages. For these reasons, the recommended long-term improvement for disinfection is a low-pressure, high-intensity UV system.

Solids Handling Treatment and Disposal

The City currently stabilizes and stores waste sludge in its partially mixed lagoons. Sludge has not been removed from the lagoons since the upgraded facility began operation in 1995. It is recommended that the City maintain its existing solids handling treatment and disposal strategy. Sludge removal will be required prior to upgrades to the treatment plant in 2008, and thereafter it is estimated that the sludge will need to be dredged from the lagoons every five years.

Wastewater Treatment Facilities Recommendation

A preliminary site layout for the recommended treatment facilities is presented on Figure ES-3. The existing City laboratory is adequate to meet the needs of the recommended upgraded facility.

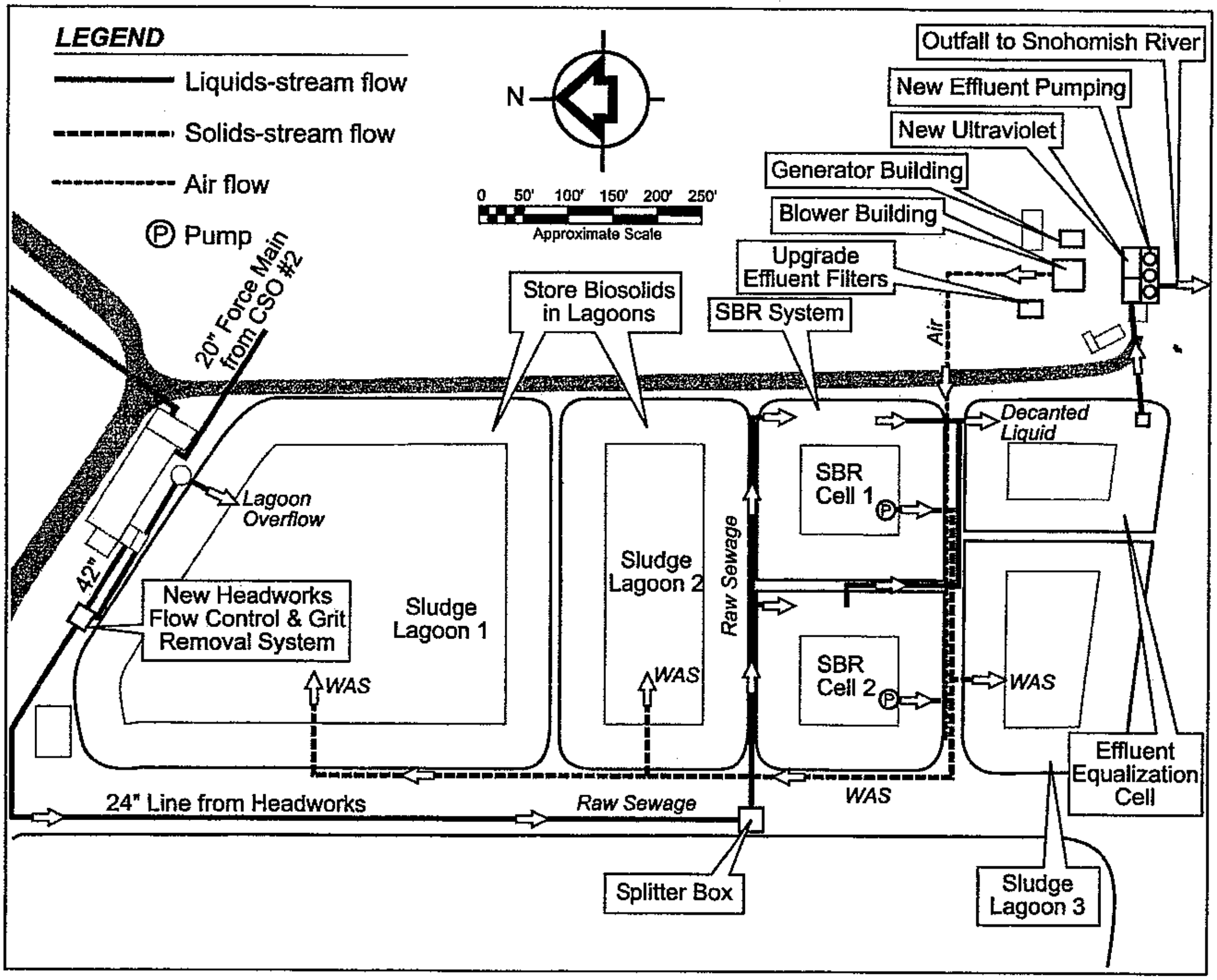

Figure ES-3. Site Layout for Recommended Treatment Plant Improvements

SUMMARY OF RECOMMENDATIONS

This section summarizes recommended upgrade projects and associated costs for the City of Snohomish wastewater collection system and treatment plant. Cost estimates assume 30 percent contingency, 8.5 percent sales tax, 15 percent engineering (when required by the project), and 10 percent project administration. Estimated costs are in 2004 dollars. Also included is a discussion of implementation schedule.

Collection System Improvements

Recommendations for reducing CSOs in the combined-sewer service area are presented in Volume II of these wastewater system plans (*Combined-Sewer Overflow Reduction Plan*

Update). Estimated costs are summarized in Table ES-5. The improvements consist of the following key elements:

- Conveyance System Upgrades—These upgrades include replacing Pump Station No. 1 with a higher-capacity combined pump station, installing a new force main routed from the new pump station directly to the treatment plant headworks, and improvements of the 2nd Street Trunk. The proposed pump station will pump combined sewage at first, providing separate wastewater and stormwater pumping after separation projects begins. The recommended conveyance system improvements will reduce the occurrence of CSOs to one per year or fewer, as required by regulations.
- Continued CSO Monitoring—Continued monitoring is necessary in order to expand upon the limited overflow data available as of the end of 2003.
- Long-Term System Separation—Separation of the combined sewers will eventually eliminate CSOs. Without replacement, as the existing sewers continue to age I/I would increase, which could result in the recurrence of CSO events. The recommended plan has sewer separation projects starting in 2012 and being completed in 2042.

TABLE ES-5.
COST SUMMARY FOR RECOMMENDED
CSO REDUCTION PROJECTS

	Estimated Cost[a]
Sanitary Sewer Conveyance Improvements	$4,527,000
Stormwater Projects	$2,700,000
Sewer Separation Projects	$26,746,000
Total CSO Reduction/Elimination Costs	**$33,974,000**

a. Estimated costs are in 2004 dollars and have not been adjusted for inflation or scheduling considerations

Collection system improvements other than those to reduce CSOs include monitoring flow in the trunk sewers, channeling manholes, replacing damaged and/or under-capacity pipes and force mains, installing telemetry improvements, upgrading deficient pump stations, and providing standby power at the pump stations. Table ES-6 summarizes the proposed improvements and provides planning level cost estimates.

TABLE ES-6.
SUMMARY OF RECOMMENDED COLLECTION SYSTEM IMPROVEMENTS

Project No.	Location	Description	Planning Level Cost
Pump Station No. 2 (Rainier) Interim Improvements			
a	Rainier Pump Station	Install a flow meter to verify pump station capacity	$22,500
b	Rainier Pump Station	Install a third pump, rebuild two existing pumps	$62,500
Telemetry Upgrades			
a	Pump Stations	Install fire and intrusion alarms, telemetry data logging and retrieval upgrades, and 2 pump running alarms. Provide level sensors with volume calculations at Lincoln, Rainier, Champagne, and Hill Park.	$80,000
Miscellaneous Repairs			
a	Separated Sewer System	Channel all unchanneled manholes. Assumes a total of six locations	$30,000
b	Pump Station No. 3 (Lincoln)	Install a drain in the valve box	$5,000
c	Pump Station No. 7 (Champagne)	Replace existing force main and reroute to the gravity sewer at Park and 17th Place.	$165,000
d	Combined Sewer Area	Channel all unchanneled manholes, Assumes a total of 6 locations	$30,000
Kla-Ha-Ya Upgrades			
a	Kla-Ha-Ya	Eliminate the pump station by requiring installation of private gravity side sewers to the City's gravity sewer on First Avenue.	$0
Standby Power Upgrades			
a	Pump Station No. 5 (Pilchuck)	Install hook-up for trailer mounted emergency generator	$6,000
b	Pump Station No. 6 (Hill Park)	Install on-site backup emergency generator	$90,000
c	Pump Station No. 7 (Champagne)	Install on-site backup emergency generator	$90,000
d	Pump Station No. 8 (Ferguson)	Install on-site backup emergency generator	$90,000
e	General	Purchase a third trailer mounted emergency generator	$70,000
Rainier Pump Station Replacement			
a	Rainier Pump Station	Budget amount to completely replace the pump station in the future.	$2,350,000

Wastewater Treatment Plant Improvements

The recommended treatment plant improvements include expanding the headworks, implementing a new secondary process using the existing lagoon system, adding UV disinfection, and using portions of the existing lagoons for flow equalization and continued solids storage. Table ES-7 summarizes capital costs for the recommended improvements.

TABLE ES-7.
COST SUMMARY FOR WASTEWATER TREATMENT PLANT UPGRADES

	Capital Cost
Screenings Washer and Compactor	$295,000
New Flow Control Structure	$200,000
Grit Removal	$600,000
SBR Process	$5,498,000
Effluent Filtration	$100,000
UV Disinfection and Effluent Pump	$2,025,000
Sludge Removal from Lagoon	$911,000
Standby Emergency Generator	$610,000
Total	**$10,239,000**

Implementation Schedule

The recommended upgrades are proposed to be implemented in phases as the City's growth takes place. Table ES-8 shows an overall schedule for activities that must be accomplished before construction can begin on the proposed improvements. Tables ES-9 through ES-11 present proposed phasing for the improvement projects.

TABLE ES-8.
PRE-CONSTRUCTION ACTIVITY SCHEDULE

	Estimated Date of Completion
Consent Decree	May 2003
Prepare and Submit Environmental Report and Draft General Sewer Plan and Wastewater Treatment Plant Facilities Plan to Ecology	March 2004
Review Environmental Report and Draft General Sewer Plan and Wastewater Treatment Plant Facilities Plan to Ecology	June 2004
State Environmental Policy Act Process	August 2004
Finalize Environmental Report and Draft General Sewer Plan and Wastewater Treatment Plant Facilities Plan to Ecology	January 2005
Agency Planning for Implementation	July 2004-2005
Permitting for Construction Activity	

TABLE ES-9.
PROPOSED PHASING FOR COLLECTION SYSTEM IMPROVEMENTS
(NOT FOR CSO REDUCTION)

Sequence	Description	Completion Date	Estimated Cost
1	Pump Station No. 2 (Rainier) Interim Improvements	2004	$85,000
2	Telemetry Upgrades	2005	$80,000
3	Miscellaneous Repairs	2006	$230,000
4	Kla-Ha-Ya Upgrades	2006	$0
5	Standby Power Upgrades	2007	$346,000
6	Rainier Pump Station Replacement	2010	$2,350,000

TABLE ES-10.
PROPOSED PHASING FOR TREATMENT FACILITY IMPROVEMENTS

Sequence	Description	Completion Date	Estimated Cost
1	Wastewater Treatment Facilities Design	2007	$1,220,000
2	Wastewater Treatment Facilities Construction	2009	$9,019,000

TABLE ES-11.
PROPOSED PHASING FOR COLLECTION SYSTEM CSO REDUCTION IMPROVEMENTS

Sequence	Description	Completion Date	Estimated Cost[a]
Phase I: CSO Reduction			
1	Construct Wastewater/Stormwater Pump Station. Install wastewater pumps & controls only. Install wastewater force main to treatment plant. Upgrade sanitary sewer along 2nd Street between treatment plant influent pipe and 2nd & H overflow.	2006	$4,526,000
Phase II: Stormwater Trunk System			
1	Stormwater Treatment Pond Improvements (Allowance)	2010	$700,000
2	Stormwater Pump Station and Force Main, 2nd Street Stormwater Trunk, Stormwater Lagoon Improvements	2011	$2,000,000
Phase III: Sewer Separation			
1	Sewer Separation Project 1	2012	$3,081,000
2	Sewer Separation Project 2	2015	$2,850,000
3	Sewer Separation Project 3	2018	$1,666,000
4	Sewer Separation Project 4	2021	$2,128,000
5	Sewer Separation Project 5	2024	$1,776,000
6	Sewer Separation Project 6	2026	$2,235,000
7	Sewer Separation Project 7	2029	$3,003,000
8	Sewer Separation Project 8	2032	$2,696,000
9	Sewer Separation Project 9	2036	$2,534,000
10	Sewer Separation Project 10	2039	$2,525,000
11	Sewer Separation Project 11	2042	$2,253,000

a. Estimated costs are in 2004 dollars and have not been adjusted for inflation.