FACT SHEET FOR NPDES PERMIT WA-0002958-1
FACILITY NAME: KING COUNTY SOUTH TREATMENT PLANT

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INTRODUCTION

The Federal Clean Water Act (FCWA, 1972, and later modifications, 1977, 1981, and 1987) established water quality goals for the navigable (surface) waters of the United States. One of the mechanisms for achieving the goals of the Clean Water Act is the National Pollutant Discharge Elimination System of permits (NPDES permits), which is administered by the Environmental Protection Agency (EPA). The EPA has authorized the State of Washington to administer the NPDES permit program. Chapter 90.48 RCW defines the Department of Ecology's authority and obligations in administering the Wastewater Discharge Permit Program.

The regulations adopted by the State include procedures for issuing permits (Chapter 173-220 WAC), technical criteria for discharges from municipal wastewater treatment facilities (Chapter 173-221 WAC), water quality criteria for surface and ground waters (Chapters 173-201A and 200 WAC), and sediment management standards (Chapter 173-204 WAC). These regulations require that a permit be issued before discharge of wastewater to waters of the state is allowed. The regulations also establish the basis for effluent limitations and other requirements which are to be included in the permit. One of the requirements (WAC 173-220-060) for issuing a permit under the NPDES permit program is the preparation of a draft permit and an accompanying fact sheet. Public notice of the availability of the draft permit is required at least thirty days before the permit is issued (WAC 173-220-050). The fact sheet and draft permit are available for review (see Appendix A--Public Involvement of the fact sheet for more detail on the Public Notice procedures).

The fact sheet and draft permit have been reviewed by the Permittee. Errors and omissions identified in this review have been corrected before going to public notice. After the public comment period has closed, the Department will summarize the substantive comments and the response to each comment. The summary and response to comments will become part of the file on the permit and parties submitting comments will receive a copy of the Department's response. The fact sheet will not be revised. Comments and the resultant changes to the permit will be summarized in Appendix C--Response to Comments.

GENERAL INFORMATION	
Applicant:	King County Department of Natural Resources Wastewater Treatment Division 210 S. Jackson Street Seattle, WA 98104-3855
Facility Name and Address:	South Treatment Plant 1200 Monster Road SW Renton, WA 98055
Type of Treatment:	Secondary Treatment, Activated Sludge
Discharge Locations:	*Puget Sound* *North Diffuser* *South Diffuser* Latitude: 47° 36' 11.47" N 47° 35' 57.44" N Longitude: 122° 25' 36.92" W 122° 25' 37.60" W *Emergency/Maintenance (Green River)* Latitude: 47° 28' 07" N Longitude: 122° 17' 37" W
Water Body ID Number:	Puget Sound, Water Body ID No. WA-PS-0240 Green River, Water Body ID No.

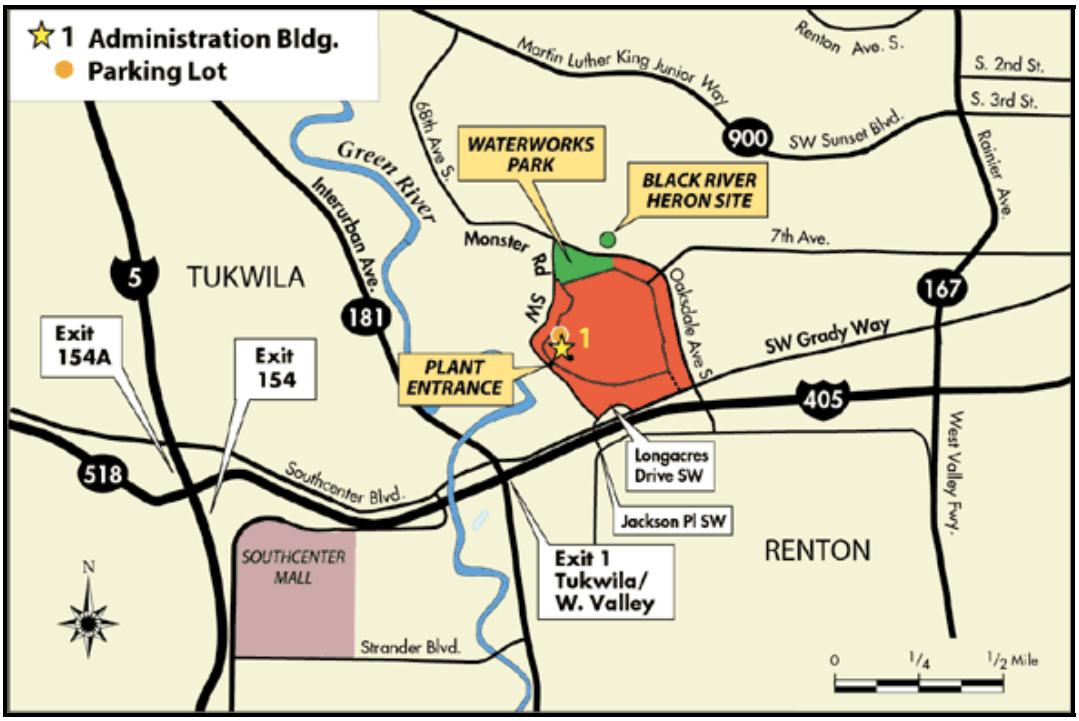

Figure 1. Vicinity Map - King County South Treatment Plant[1]

Figure 2. Aerial Photograph - King County South Treatment Plant[2]

[1] Webpage Reference http://dnr.metrokc.gov/wtd/directions/directions-south.htm
[2] Webpage Reference http://dnr.metrokc.gov/wtd/southplant/index.htm

BACKGROUND INFORMATION

DESCRIPTION OF THE FACILITY

HISTORY

In 1958, voters in Seattle and King County created Metro, an agency charged with creating a regional wastewater treatment system. The wastewater treatment plant (WWTP) located in Renton is now called the South Treatment Plant (STP). Construction of the plant was completed in 1965. The original plant had the capacity to treat 24 million gallons per day (MGD) of waste water to secondary treatment levels using an activated sludge biological process. The third, and latest, expansion of the plant began in 1991 and was considered complete in 2000. This last upgrade brings the plant design capacity to 144 MGD maximum month flow (MMF).

The South Treatment Plant is designated as an EPA major facility.

COLLECTION SYSTEM STATUS

The South Treatment Plant serves an area of 152 square miles. King County owns and operates the major sewer interceptors and pump stations that carry the waste water to the treatment plant. The component agencies individually own, operate, and maintain the pipelines and other conveyance facilities that carry waste water to the County's interceptors. Waste water is conveyed to the treatment plant via three interceptors, the Tukwila Interceptor, the South Interceptor, and the Eastside Interceptor. There are 26 pump stations in the system. The operation of the collection system is monitored and controlled using a SCADA (Supervisory Control and Data Acquisition) system located at the South Treatment Plant.

The South Treatment Plant serves 32 jurisdictions and utility districts[3]. A list of all the component agencies is as follows:

	Population Equivalents		
AGENCY	2000 Residential	2000 Commercial	2000 Industrial
ALDERWOOD SD	37104	8507	4267
ALGONA SA	3192	906	3833
AUBURN SA	49337	25381	13723
BELLEVUE SA	118317	117100	9007
BLACK DIAMOND SA	1601	514	174
BOTHELL SA	2676	3914	1299
BRYN MAWR-LAKE RIDGE WSD	10546	1747	542
CEDAR RIVER WSD	8630	1263	2
COAL CREEK UD	13466	2161	117
CROSS VALLEY WD	168	1008	480
ISSAQUAH SA	9554	8120	950
KENT SA	45518	35772	19850
KIRKLAND SA	29005	22943	2208
LAKEHAVEN UD	2599	1339	262
MERCER ISLAND SA	21092	7436	161
MIDWAY WSD	9	1	0

[3] King County Department of Natural Resources, Regional Wastewater Services Plan, December 1999.

	Population Equivalents		
AGENCY	2000 Residential	2000 Commercial	2000 Industrial
NE SAMMAMISH SWD	13351	922	45
NORTHSHORE UD	46103	15720	1280
PACIFIC SA	5177	2387	1795
REDMOND SA	42095	58485	14484
RENTON SA	44348	27507	22993
SAMMAMISH PLATEAU SD	19510	7252	221
SEATTLE SA	37693	8528	994
SILVER LAKE SD	3760	824	0
SOOS CREEK WSD	77705	18252	430
TUKWILA SA	4804	30862	4095
VAL VUE SD	15442	22248	1406
WOODINVILLE WD	11017	9168	2853
Population providing flow but collecting agency not verified.	3717	3273	626
Total	677536	443540	108097
Grand Total			**1229173**

Populations are based on Census data provided by PSRC and were calculated based on ratios of non-vacant and sewered parcels. These figures are estimates based on the best available information and GIS methodology and do not represent an actual count.

Source: Betsy Cooper to Chandler Smith, email subject: South Plant Populations, June 25, 2002.

CSO Status

All component agencies that provide flow to the South Treatment Plant are separated sanitary systems with the exception of a small portion (approximately 4%) of the Seattle system that is a combined system. A portion of the flow from the Henderson CSO and Martin Luther King (MLK) diversion structure combined systems will continue to go to the South Treatment Plant during the term of this permit. During heavy rain events, some of the flow goes to King County's West Point Treatment Plant.

According to the permit application, the Henderson/MLK/Norfolk project, which began in late 2000 and will be complete in late 2004, will provide a tunnel for the storage and primary sedimentation to flows from Henderson, Martin Luther King, and Norfolk CSOs. Normally, the tunnel will store CSO flows for transfer to the South Treatment Plant for secondary treatment. During the largest storms, and when the tunnel fills, flows will be discharged through the existing Norfolk CSO (which is included in King County's West Point Treatment Plant Permit). Upon completion of this project, it is anticipated that the MLK CSO will have achieved the required control of one untreated event per year based on a long term average.

Flow Blending

King County's South Treatment Plant is permitted to utilize flow blending to manage peak flow events. Permission is granted through Ecology's approval of the treatment plant's facility plan which specifies the need to flow blend at flow greater than 144 MGD. The South Plant has had five blending events between 1997 and 2003. There is no formally adopted policy for flow blending in Federal or State regulations at the writing of this permit.

Inflow and Infiltration

The King County Council has approved the Regional Infiltration/Inflow (I/I) Control Program as part of its Regional Wastewater Services Plan (RWSP). It is the first comprehensive investigation of I/I in the local agency service areas and is based on a cooperative partnership between King County and the 34 local agencies serving the Seattle Metropolitan area.

Waste Load

King County submitted, with the application for permit renewal and as required by the previous permit, a Flow and Waste Load Assessment. The graphs below show the hydraulic and organic loading to the South Treatment Plant from August 1997 though December 2003 as based on data submitted in the DMRs. The graphs (Figures 3 and 4) indicate that the plant will likely operate within the design criteria for hydraulic and organic loading for the duration of the permit. As shown in Appendix E-Influent Data, there have been no instances of the plant exceeding the influent design criteria for flow, TSS, or BOD over the last five (5) years.

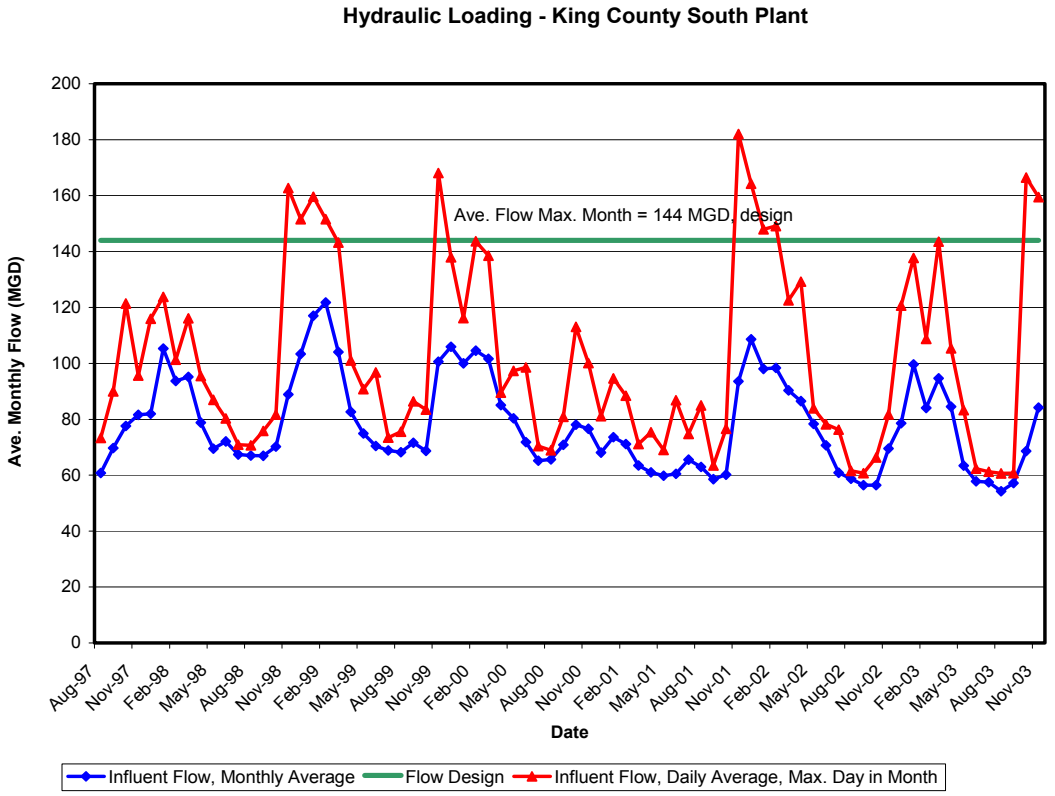

Figure 3. Hydraulic Loading, August 1997 though December 2003

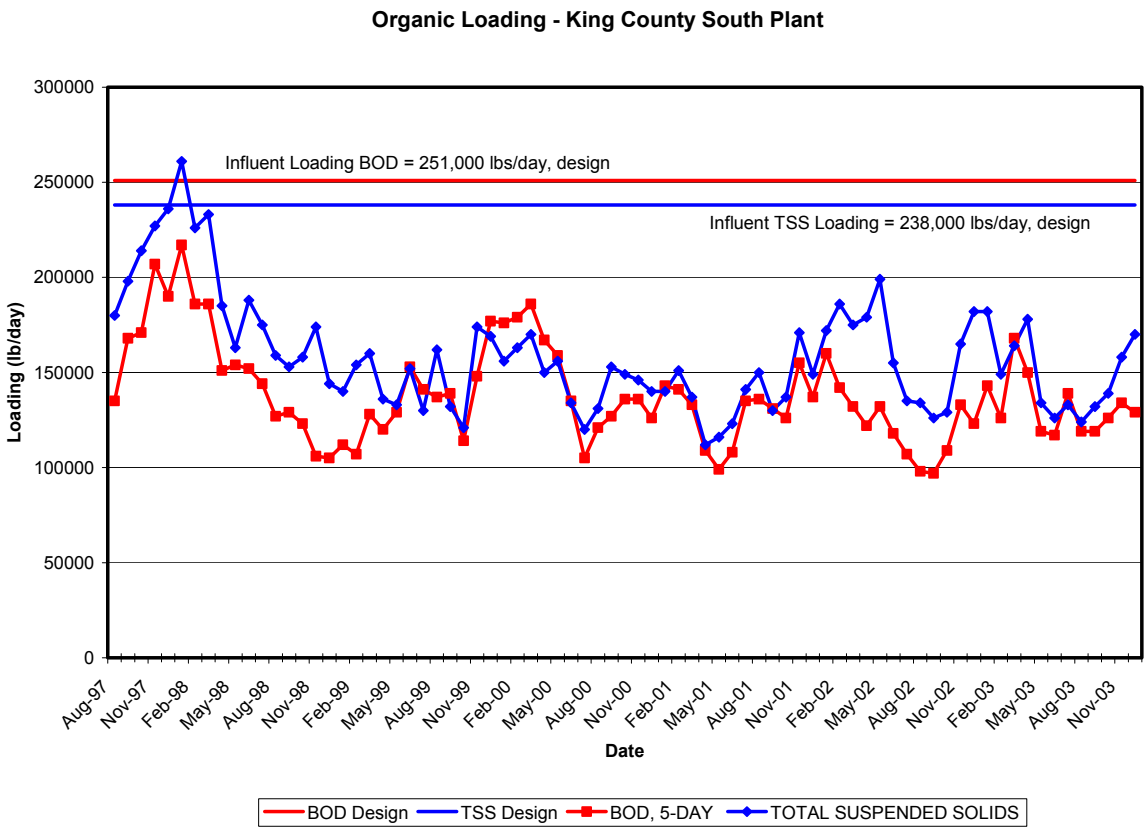

Figure 4. Organic Loading, August 1997 though December 2003

Capacity Expansion

According to the Flow and Waste Load Assessment, King County has no plans to increase capacity at the South Treatment Plant over this permit cycle. The plant will off load approximately 15% of the current influent load to King County's new north-end treatment plant by approximately the year 2010[4].

Grants and Loans

King County has been granted a $7.9 million loan for the design and engineering to expand conveyance in south King County. The Southwest Interceptor – Kent/Auburn is a new pipeline that would parallel the existing King County trunk sewers in Algona, Auburn, and Kent. Planning studies have determined that existing sewer capacity will be exceeded by 2010. Overflows or sewer backups could occur if additional capacity is not provided.

[4] King County Wastewater Treatment Division, NPDES Permit Renewal Package, December 2001.

TREATMENT PROCESSES

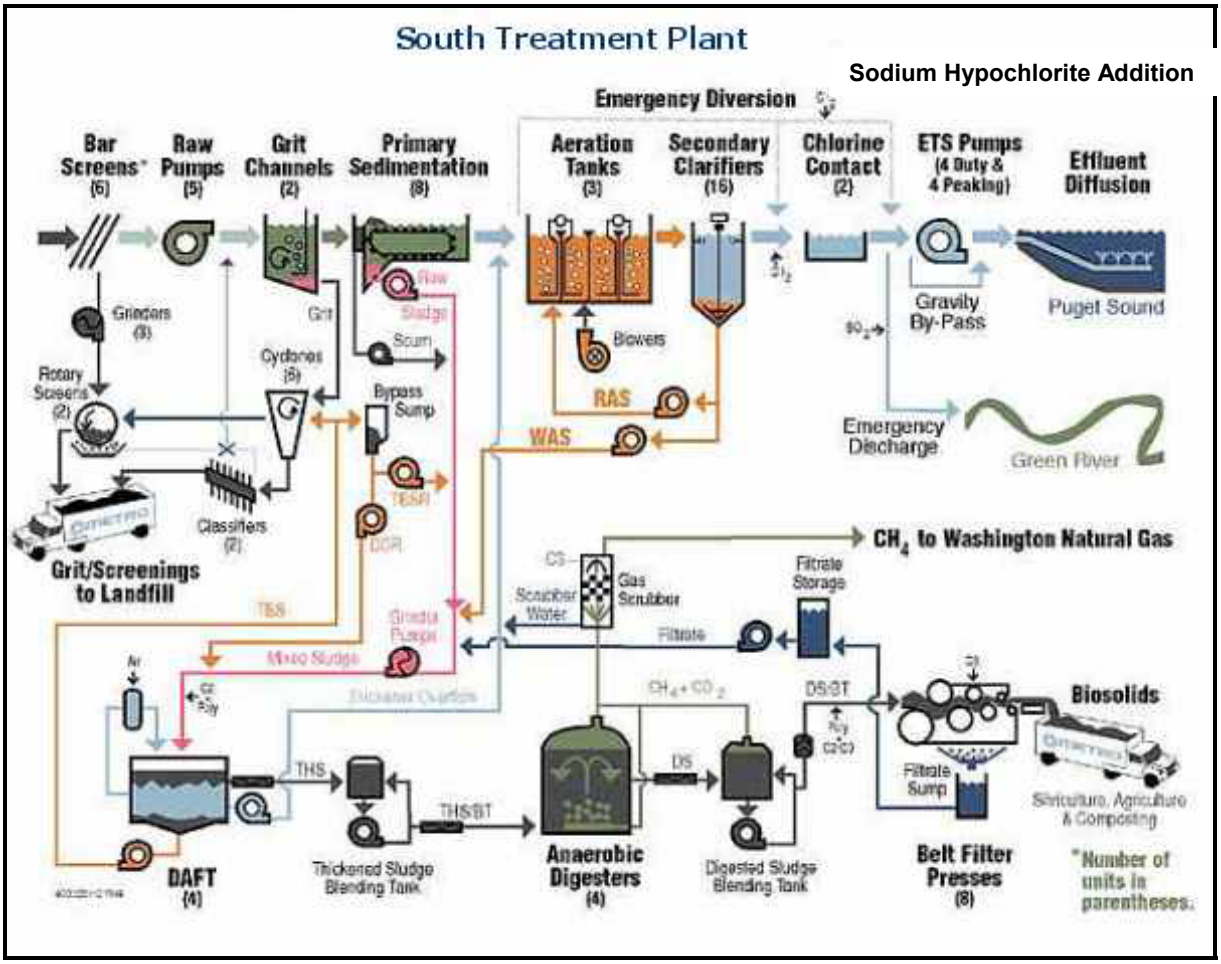

Figure 6. Simplified Flow Diagram – King County South Treatment Plant[5]

Headworks

The raw sewage flows through the eight bar screens to remove rags and plastics. The screenings are flushed down a trough to the grinder pumps. The ground screenings are cleaned and dewatered in preparation for disposal at a landfill. The raw (influent) pumps lift the wastewater 40 feet to a division channel providing for gravity flow through the remaining treatment processes. The wastewater flows through the aerated grit channels to allow for heavy material to settle out. The grit is pumped to the cyclones which discharge the grit to the classifiers and then are conveyed into dumpsters.

[5] Webpage Reference http://dnr.metrokc.gov/wtd/southplant/south02.htm

Primary Treatment

The division channel splits flow between a north set of 4 primary clarifiers and south set of 8 primary clarifiers. The north clarifiers use return flights and tipping troughs to capture and remove scum and grease. The south clarifiers use surface water spray to move scum and grease to a helical screw located at the upstream end of the tank; the return flights stay submerged on the south primaries. The primary clarifier effluent overflows via launders with submerged orifices. The launders have saw-tooth weirs on top to handle higher flows. Primary effluent flows by gravity to the aeration tanks. Primary sludge is continuously pumped from the bottom of the clarifiers to the DAFTs (dissolved air floatation tanks) for further treatment.

Secondary Treatment

Secondary treatment is accomplished using air activated sludge. There are 4 aeration basins with fine bubble diffusers used for air distribution. The performance of the aeration basin is monitored closely. The first part of the each aeration basin is anaerobic when operating in the selector mode. Dissolved oxygen and sludge age are monitored and adjusted to achieve a settable sludge. The water flows from the aeration basins to the mixed liquor channel before distribution to the secondary clarifiers. There are 6 secondary clarifier pods each with 4 clarifiers for a total of 24 secondary clarifiers. Each pod has an effluent control center (ECC) where flow and turbidity are monitored. The solids that settle out in the secondary clarifiers are pumped back to the aeration basins as return activated sludge (RAS) or pumped to solids handling as waste activated sludge (WAS).

Disinfection and Effluent

Beginning in June 2003, the facility permanently converted to the Sodium Hypochlorite for disinfection in order to eliminate the handling of chlorine. Hypochlorite is added at several locations along the chlorine contact channels. The chlorinated effluent flows through the chlorine contact channel to the forebay tank located before the effluent pumps. The effluent pumps pump the treated wastewater from the forebay to the plant's Puget Sound outfall located 12 miles away off a point of land north of Alki. The outfall terminates 10,000 feet off shore and is 600 feet deep (refer to Appendix D). Additionally, the effluent can flow by gravity to the outfall during low flow conditions.

Water Reclamation

This facility produces class A water for reuse from a small portion of the plant's flow. The chlorinated effluent water, referred to as C3 water, is used internally throughout the process in addition to feeding the water reclamation process. The class A water treatment process includes the required treatment steps of coagulation and filtration. The coagulant, Alum (Aluminum Sulfate), is added to C3 water and mixed via an inline static mixer. The water then flows through Parkson DynaSand ® continuously back flushing sand filters. The filtered effluent is disinfected with hypochlorite through a series of three contact tanks.

The control logic for the reuse facility is set up so that high turbidity (>3 NTU) or low total residual chlorine detected in the water will automatically valve the off-specification water back to the treatment plant headworks. Only water meeting the class-A specifications flows into the 500,000-gallon reuse water storage tank. In addition to the off-site customers supplied by pipeline, the facility allows customers to load reuse water in truck mounted storage tanks for off-site use. Water distribution from reclamation facilities is permitted under a separate State Waste Discharge Permit.

Solids Handling

Solids from the primary clarifiers, WAS from the secondary clarifiers, and scum are pumped to the DAFTs. These Dissolved Air Flotation Tanks (4 older tanks, 2 new larger tanks) are used to thicken the sludge. Inside these tanks, a mixture of sludge, polymer, and air form a thick layer of sludge that floats to the surface. The thickness of the floating sludge blanket is controlled by a scraper arm which moves solids out of the DAFT to the Thickened Sludge Blending Tank. The water layer below the sludge blanket in the DAFT is pumped to the aeration tanks. The thin sludge layer that forms on the bottom of the DAFT is pumped to grit cyclones for degritting and sent back to the DAFTS for reprocessing.

The contents of the Thickened Sludge Blending Tank are pumped on level control to 1 of 4 Anaerobic Digesters. The process control samples of the digester sludge are taken daily. The digested sludge is transferred to the 5th digester that is the Blended Sludge Storage Tank. Polymer is added as a coagulant to the sludge as it is pumped from the Blended Sludge Storage Tanks to the belt filter presses. The belt filter presses produce a Biosolids product that is 16 wt. % solids. The Biosolids are hauled to beneficial reuse sites in Eastern Washington (agriculture applications), and Western Washington (forest applications and commercial composting).

Odor Control

Odor control utilizes a couple different air scrubbing systems. Chemical scrubbers use caustic and hypochlorite solutions to control odors from the secondary treatment area, the primary treatment area, the sludge thickeners, and the dewatering area. Carbon scrubbers are also used in the sludge thickening and dewatering areas. In addition, the facility maintains a biofilter to control odors on the influent interceptor collection system.

Emergency Backup Power

The facility has two independent power feeders to the plant to provide redundancy. In addition, there is an emergency generator for essential services e.g., lighting, alarms, security, etc. This generator is not sufficient to power the influent pumps or other plant processes.

Industrial and Commercial Users

King County has a delegated Pretreatment Program. The South Treatment Plant's application for permit renewal lists a total of 80 industrial user discharges received by the treatment plant. There are 34 Significant Industrial Users (SIUs) and 46 Categorical Industrial Users (CIUs).

Staffing

At the writing of this permit, the South Plant had a budgeted staff level of 136 full-time employees (FTEs). The plant is staffed 24 hours per day with 12-hour shifts. All critical plant operations are monitored and/or controlled from a central control room using a supervisory control and data acquisition (SCADA) system.

Work Group	*Est. FTEs*	*Responsibilities*
Shift Crew (4 shift, 7 FTE per shift)	28	Operations
Day Operations Crew	10	Assist with plant operations, training, special projects, and backfill for shift crews
Process Control Crew	12	Permit compliance issues, sampling, lab analysis, reporting, data handling, process setpoints, etc.
Pump-run crew	11	Operation of off-site pump stations and treatment systems.
Maintenance Staff	25	Electricians and Instrument Technicians and Mechanics
Other (Administration, King County Specialized Staff)	Approx. 50	Administration, Purchasing, Building and Grounds Maintenance, Specialized Staff

Future Construction Plans

The facility is currently in construction to install centrifuge dewatering that will generate Biosolids that are approximately 25 wt. % solids. The estimated completion date for this project is December 2004. The facility is currently under construction to install a boiler to generate heat from the methane, and a co-generation facility to generate electricity and process heat. The 9-million BTU/hr boiler should be in full operation by early 2004. It will be the primary process heat source for the plant until the 8-MW co-generation (co-gen) facility starts operation.

The co-gen facility will be an 8-MW combined cycle gas turbine that will use digester gas and purchased natural gas. It will generate hot water that will be used on-site and electricity that can either be used on-site, or exported onto the electrical grid. The estimated completion date for the co-gen facility is Spring 2005. Once the co-gen unit is in operation, the boiler will become the back-up source for process heat. The South Plant currently generates enough digester gas to produce about 3.5-MW of electricity and nearly all the plant's process heat.

The South Plant is also participating in a 1-MW Fuel Cell Demonstration Project. The 1-MW Fuel Cell is a 2-year project to demonstrate the technical and economic challenges associated with using digester gas in molten carbonate fuel cells. The project is mostly funded by the USEPA and US Department of Energy. Though only a 2-year demonstration, the support facilities have been designed based on a project life closer to 20 years. The estimated time for initial start-up of the Fuel Cell is Spring 2004. The Fuel Cell is projected to generate 1-MW of electricity and 20% of the South Plant's process heat needs using 25% of the South Plant digester gas (about 2000 therms/day). King County will reassess its long-term commitment to the Fuel Cell after the 2-year demonstration project is completed and reviewed.

DISCHARGE OUTFALL

Puget Sound Outfall

Secondary treated and disinfected effluent is discharged from the facility via a 12-mile long 8-foot diameter transfer line. The outfall consists of two pipelines, each extending over 10,000 feet northwest into Elliot Bay from Duwamish Head. For nearshore protection, the initial portion is supported by legs and the remainder of the outfall rests along the seafloor in a shallow trench. An outfall junction structure is located at the end of the ETS force main just west of Luna Park in West Seattle. The structure contains a 64-inch diameter manifold connecting the 96-inch ETS to the two 64-inch outfall lines. The diffuser sections are on the final 500-ft of each leg. Each diffuser has 168-sweep radius diffuser ports, each 14 inches long and 4 inches in diameter. (This a total of 336 diffusers ports with a total diffuser opening of 336 * 0.087 ft^2/port = 29.32 ft^2.) The diffusers are staggered side to side every 3 ft. Each diffuser port is made of a copper-nickel alloy to inhibit bio-fouling. The diffusers are 600 ft. deep.

An inspection of the marine outfall was conducted in August 1999. The extensive inspection revealed all external components of the outfall to be good condition. King County submitted video footage of the inspection along with the inspection report.

Green River Outfall

The Green River outfall was the South Plant's sole discharge point prior to the construction of the marine outfall in 1987. Reference Appendix D for diagrams showing the location of the outfall and the emergency outfall. The firm capacity (total capacity with one pump out of service) of the effluent transfer system (ETS) which carries flow to the marine outfall was increased to 325 MGD with the pumping system upgrade in 1999. With all pumps running, the predicted capacity is 340-360 MDG (depending on the tide). The treatment plant continues to be permitted to discharge to the Green River during emergencies and for maintenance purposes.

An emergency discharge is an unplanned and unavoidable discharge which is necessary to prevent sewage overflows or damage to the plant. Emergency discharges may occur during heavy rain event when the flow exceeds the capacity of the ETS. In this instance, the effluent discharged to the Green River will have received secondary treatment, disinfection and dechlorination.

Maintenance discharges are performed periodically to ensure that the outfall will function normally during an emergency event. During a maintenance discharge, a sufficient flow rate of treated effluent, which has been disinfected and dechlorinated, is used to flush sediment from the diffuser ports. The permit specifically permits discharges to the Green River for maintenance purposes.

The diffuser is a 12-foot by 12-foot structure that is 44 feet long extending into the river. There are 8 discharge ports located on the downstream side of the diffuser. The top of each port is at the elevation of the river bottom.

No current records of inspection for the Green River outfall have been submitted to the Department.

RESIDUAL SOLIDS

The treatment facilities remove solids during the treatment of the waste water at the headworks (grit and screenings), and at the primary and secondary clarifiers, in addition to incidental solids (rags, scum, and other debris) removed as part of the routine maintenance of the equipment. Grit, rags, scum, and screenings are drained and disposed of as solid waste at a landfill. Primary and waste secondary sludge are co-thickened in the Dissolved Air Floatation Tanks. The thickened sludge is fed to the anaerobic mesophilic digesters. The digested sludge is combined in a common blending storage tank and then dewatered with belt filter presses to produce biosolids. The biosolids are applied to forest and agriculture lands under a permit from the King County Health Department.

The biosolids are periodically analyzed for various chemical contaminants. Regulatory and compliance issues regarding biosolids are managed by the Department of Ecology's Biosolids Program.

REUSE - SECONDARY TREATED EFFLUENT

The existing water reclamation facility and the distribution of the class A water it produces, along with any future use of treated secondary effluent that is not returned to the ETS (Effluent Transfer System), are covered under a separate State Waste Discharge Permit. All direct uses of treated secondary effluent that ultimately return the treated secondary effluent back to the ETS for discharge via the Puget Sound outfall are permitted under this NPDES permit.

The permit allows for the direct reuse of secondary treated effluent under S14. Departmental approval is required for each application of direct reuse to ensure that such use does not cause a violation of the State Water Quality Standards. The intent of the permit is to allow the Permittee flexibility to provide reuse water to customers with sufficient safeguards to ensure that the water quality standards are not violated.

At the time of the writing of the permit, King County had one customer using treated secondary effluent in this manner. The Boeing Company uses secondary treated effluent at the Boeing Training Center located in Renton, Washington. The water is used in a closed-loop chiller system primarily during the summer months. King County is permitted to enlist other customers located along the ETS corridor for noncontact use of the secondary treated effluent with return to the ETS for discharge at the Puget Sound Outfall.

PERMIT STATUS

The previous permit for this facility was issued on July 15, 1997. The previous permit placed effluent limitations on 5-day Biochemical Oxygen Demand (BOD_5), Total Suspended Solids (TSS), pH, Fecal Coliform bacteria, and Total Residual Chlorine.

An application for permit renewal was submitted to the Department on December 31, 2001 and accepted by the Department on June 25, 2002.

SUMMARY OF COMPLIANCE WITH THE PREVIOUS PERMIT

The facility received its last inspection on July 11, 2003. A compliance inspection with sampling was conducted on both March 3, 2003 and June 24, 2003. A single inspection report to include these three site visits was issued on October 22, 2003. The inspectors found the facility to be operating in accordance with the permit and found no violations.

The Permittee submits two Discharge Monitoring Reports (DMRs) each month, one for the Treatment Plant Discharge and one for the reclaimed water discharge during months during which off site use occurs. The following tables summarize the effluent DMR data (discharge No. 001) and reclaimed water DMR data (discharge No. 002) submitted from August 1997 to December 2003. Appendix E provides a complete summary of monthly DMR data submitted by the Permittee from August 1997 to December 2003.

Table 1: Summary of DMR Data (Effluent) – August 1997 through December 2003

Treatment Plant Discharge (Discharge 001)

Parameter	Units		Limit	Maximum	Minimum	Average
BOD, 5-DAY (20 DEG. C)	AVG	LBS/DAY	36000	17200	3500	**9045**
BOD, 5-DAY (20 DEG. C)	AVG	MG/L	30	23.2	6.7	**14.0**
BOD, 5-DAY (20 DEG. C)	AVW	LBS/DAY	54000	21700	4300	**11145**
BOD, 5-DAY (20 DEG. C)	AVW	MG/L	45	28.0	9.0	**17.0**
BOD, 5-DAY PERCENT REMOVAL	AVG	PERCENT	85	97.1	90.0	**93.5**
CHLORINE, TOTAL RESIDUAL	AVG	LBS/DAY	787	283.0	0.0	**17.4**
CHLORINE, TOTAL RESIDUAL	AVG	MG/L	0.66	0.080	0.000	**0.022**
CHLORINE, TOTAL RESIDUAL	MAX	MG/L	1.7	0.620	0.000	**0.078**
COLIFORM, FECAL	GEM	#/100 ML	200	200.0	3.0	**63.4**
COLIFORM, FECAL	GM7	#/100 ML	400	429.0	5.0	**129.8**
PH	MAX	S.U.	9	8.2	6.8	**7.4**
PH	MIN	S.U.	6	7.2	6.4	**6.9**
SOLIDS, SUSPENDED, % REMOVAL	AVG	PERCENT	85	98.3	89.0	**94.5**
SOLIDS, TOTAL SUSPENDED	AVG	LBS/DAY	36000	19000	1400	**8546**
SOLIDS, TOTAL SUSPENDED	AVG	MG/L	30	25.0	4.9	**13.2**
SOLIDS, TOTAL SUSPENDED	AVW	LBS/DAY	54000	25700	2900	**11265**
SOLIDS, TOTAL SUSPENDED	AVW	MG/L	45	38.0	5.4	**16.4**

The Permittee had one violation of the permit limits for outfall no. 001 (South Treatment Plant Outfall) during the permit from August 1997 through December 2003. The Permittee reported an average weekly fecal coliform of 429 colonies/100 mL in July 2003; the limit was 400 colonies/100 mL. This incident occurred at the time that the Permittee was converting the disinfection chemical from Chlorine to Sodium Hypochlorite. Adjustments to the Sodium Hypochlorite addition system resolved the problem.

The previous NPDES permit included discharge limits for the Water Reclamation Facility which is located at the South Treatment Plant. Below is a summary of the compliance history. The new issue of the NPDES permit does not include the permitting for the Water Reclamation Facility. The Water Reclamation Facility is permitted under a separate State Waste Discharge Permit.

Class A Water Reclamation Facility (Discharge 002)

Parameter	Units		Limit	Maximum	Minimum	Average
COLIFORM, TOTAL	AVW	#/100 ML	2.2	37.0	0.0	**1.8**
COLIFORM, TOTAL	MAX	#/100 ML	23	404.0	1.0	**29.8**
FLOW, IN CONDUIT OR THRU TREATMENT PLANT	AVG	GPD	na	76555.0	15917	**53469**
FLOW, IN CONDUIT OR THRU TREATMENT PLANT	AVG	MGD	na	77180.0	0	**33067**
FLOW, IN CONDUIT OR THRU TREATMENT PLANT	MAX	GPD	na	119390.0	32571	**86563**
FLOW, IN CONDUIT OR THRU TREATMENT PLANT	MAX	MGD	na	457059.0	0	**81151**
NITROGEN, NITRATE TOTAL (AS N)	MAX	MG/L	na	2.6	0.0	**0.4**
PH	MAX	S.U.	9	7.9	6.6	**7.2**
PH	MIN	S.U.	6	7.0	5.8	**6.5**
TURBIDITY	AVM	NTU	2	2.0	0.3	**1.4**
TURBIDITY	MAX	NTU	5	3.0	0.5	**2.4**

A summary of the DMR data shows that 17 of the 18 permit violations that occurred during the period from August 1997 through December 2003 were for fecal coliform exceedances. Refer to Appendix E for DMR data for Outfall #2, the Water Reclamation Facility for data related to each of these violations.

WASTEWATER CHARACTERIZATION

The South Treatment Plant completed the required analysis to remain in compliance with the monitoring section of their permit. Appendix G summarizes the expanded effluent testing data that was provided in the application for permit renewal. The Permittee provided the analytical data for additional pollutants in the effluent that included Chloropyrifos, PCB, and Toxaphene as required in the previous permit.

The concentration of pollutants in the discharge was reported in the NPDES application and in discharge monitoring reports. Table 2 summarizes those pollutants that were found in detectable quantities as reported in the NPDES form 2A application. Calculations show that none of these pollutants have the potential to exceed the State water quality standard at the edge of the chronic mixing zone based on the reasonable potential calculations provided in Appendix F.

Table 2: Wastewater Characterization

POLLUTANT	MAXIMUM DAILY DISCHARGE				AVERAGE DAILY DISCHARGE			
	Conc.	Units	Mass	Units	Conc.	Units	Mass	Units
ANTIMONY	0.0007	mg/L	0.67	lbs.	0.0006	mg/L	0.4	lbs.
ARSENIC	0.002	mg/L	1.93	lbs.	0.0015	mg/L	1	lbs.
BIS (2-ETHYLHEXYL) PHTHALATE	23	µg/L	18.4	lbs.	11	µg/L	7.3	lbs.
BUTYL BENZYL PHTHALATE	0.63	µg/L	0.5	lbs.	0.5	µg/L	0.33	lbs.
CADMIUM	0.0003	mg/L	0.19	lbs.	0.00018	mg/L	0.11	lbs.
CHLORINE	0.3	mg/L		lbs.				lbs.
CHOLOROFORM	3.44	µg/L	2.64	lbs.	1.5	µg/L	0.99	lbs.
CHLOROPYRIFOS	0.014	µg/L			0.0063	µg/L		
CHROMIUM	0.0013	mg/L	0.76	lbs.	0.0005	mg/L	0.33	lbs.
COPPER	0.021	mg/L	11.4	lbs.	0.014	mg/L	9.3	lbs.
CYANIDE	0.015	mg/L	7.77	lbs.	0.01	mg/L	6.64	lbs.
DICHLORO BENZENE 1,4-	3.22	µg/L	2.6	lbs.	0.76	µg/L	0.5	lbs.
DIETHYL PHTHALATE	103	µg/L	98.8	lbs.	7.3	µg/L	4.8	lbs.
DIMETHYL PHTHALATE	0.6	µg/L	0.6	lbs.	0.4	µg/L	0.26	lbs.
DI-N-BUTYL PHTHALATE	2.9	µg/L	1.6	lbs.	1.5	µg/L	1	lbs.
LEAD	0.0013	mg/L	0.75	lbs.	0.0007	mg/L	0.46	lbs.
METHYLENE CHLORIDE	25	µg/L	13.5	lbs.	3	µg/L	1.99	lbs.
NICKEL	0.004	mg/L	2.53	lbs.	0.003	mg/L	2.08	lbs.
PHENOL	13.9	µg/L	11	lbs.	5.6	µg/L	32.7	lbs.
SILVER	0.0011	mg/L	6.23	lbs.	0.001	mg/L	0.66	lbs.
THALLIUM	0.0003	mg/L	0.14	lbs.	0.00022	mg/L	0.13	lbs.
TOLUNE	6.93	µg/L	5.49	lbs.	2.71	µg/L	1.8	lbs.
TRICHLOROETHANE, 1,1,1-	5.8	µg/L	4.6	lbs.	2.8	µg/L	1.88	lbs.
ZINC	0.04	mg/L	32.42	lbs.	0.03	mg/L	20	lbs.

King County conducted acute whole effluent toxicity (WET) tests on the effluent from the South Treatment Plant for the period July 15, 1997 through December 31, 2001.

Acute toxicity tests for characterization of effluent from the South Treatment Plant were conducted on 8/19/97, 9/23/97, 11/18/97, 2/26/98, and 5/19/98. Additional effluent testing was performed on 8/4/99 coinciding with influent/effluent sampling for Chloropyrifos, PCBs, and Toxapaphene. Summer and winter testing required for the permit renewal application was performed 7/19/01 and 12/05/01.

Samples were tested in a geometric series of dilution from 100% to 6.25% effluent along with the Acute Critical Effluent Concentration (ACEC) of 0.76% effluent in 96-hour tests with Fathead Minnows and 48-hour tests with Daphnia Pulex.

No acute WET limit is required since there has been no regulatory significant acute toxicity during the term of the prior permit. WAC 173-205-050(f)(i) defines regulatory significance as less that 80% survival in 100% effluent.

Table 3: Acute WET Test Results as % Survival in 100 % Effluent

Test	Species	Sample Date	Test Date	Protocol	Duration	% Survival
AQTX1522	*Daphnia pulex*	8/19/1997	8/19/1997	EPAA 91	48 hours	100
AQTX003007	Fathead Minnow	9/23/1997	9/23/1997	EPAA 91	96 hours	90
AQTX1640	*Daphnia pulex*	11/18/1997	11/18/1997	EPAA 91	48 hours	100
AQTX1639	Fathead Minnow	11/18/1997	11/18/1997	EPAA 91	96 hours	87.5
AQTX1884	*Daphnia pulex*	2/26/1998	2/26/1998	EPAA 91	48 hours	95
AQTX1883	Fathead Minnow	2/26/1998	2/26/1998	EPAA 91	96 hours	95
AQTX1888	*Daphnia pulex*	5/19/1998	5/19/1998	EPAA 91	48 hours	100
AQTX1887	Fathead Minnow	5/19/1998	5/19/1998	EPAA 91	96 hours	100
AQTX002998	*Daphnia pulex*	8/4/1999	8/4/1999	EPAA 91	48 hours	100
AQTX002997	Fathead Minnow	8/4/1999	8/4/1999	EPAA 91	96 hours	100
AQTX002994	Fathead Minnow	7/19/2001	7/19/2001	EPAA 91	96 hours	92.5
AQTX002993	*Daphnia pulex*	7/19/2001	7/19/2001	EPAA 91	48 hours	100
AQTX002989	*Daphnia pulex*	12/5/2001	12/5/2001	EPAA 91	48 hours	100
AQTX002990	Fathead Minnow	12/5/2001	12/5/2001	EPAA 91	96 hours	100

Chronic toxicity tests for characterization of effluent from the South Treatment Plant were conducted on 9/12/97, 12/3/97, 3/4/98, and 6/3/98. Additional effluent testing was performed on 8/11/99; coinciding with influent/effluent sampling for Chloropyrifos, PCBs, and Toxaphene. Summer and winter testing required for the permit renewal application was performed 7/11/01 and 11/28/01.

Samples were tested in a geometric series of dilutions from 100% to 6.25% effluent along with the Acute Critical Effluent Concentration (ACEC) of 0.76% effluent in 7-day tests with Menidia beryllina and Mysidopsis bahia.

Results show no chronic WET at the ACEC of 0.76% effluent. Therefore, no chronic WET limit is required.

Table 4: Chronic WET Test Results as NOEC/LOEC in % Effluent

Test	Species	Sample Date	Test Date	Protocol	End Point	NOEC	LOEC
AQTX1262	*Ceriodaphnia dubia*	2/7/1997	2/7/1997	EPAF 94	7d Proportion Survived	.68	> .68
					Reproduction	.68	> .68
AQTX1252	Fathead Minnow	4/11/1997	4/11/1997	EPAF 94	7d Proportion Survived	.68	> .68
					Mean Biomass	.68	> .68
					Mean Weight	.68	> .68
RMAR141	Atlantic Mysid	9/12/1997	9/12/1997	EPAM 94	7d Proportion Survived	25	50
					Mean Biomass	12.5	25
					Mean Weight	12.5	25
RMAR142	Inland Silverside	9/12/1997	9/12/1997	EPAM 94	7d Proportion Survived	50	100
					Mean Biomass	25	50
					Mean Weight	25	50
AQTX1651	Atlantic Mysid	12/3/1997	12/3/1997	EPAM 94	7d Proportion Survived	50	100

Test	Species	Sample Date	Test Date	Protocol	End Point	NOEC	LOEC
					Mean Biomass	6.25	12.5
					Mean Weight	.76	6.25
AQTX1652	Inland Silverside	12/3/1997	12/3/1997	EPAM 94	7d Proportion Survived	50	100
					Mean Biomass	25	50
					Mean Weight	25	50
AQTX1886	Atlantic Mysid	3/4/1998	3/4/1998	EPAM 94	7d Proportion Survived	50	100
					Mean Biomass	25	50
					Mean Weight	100	> 100
AQTX1885	Inland Silverside	3/4/1998	3/4/1998	EPAM 94	7d Proportion Survived	50	100
					Mean Biomass	25	50
					Mean Weight	25	50
AQTX1890	Atlantic Mysid	6/3/1998	6/3/1998	EPAM 94	7d Proportion Survived	25	50
					Mean Biomass	25	50
					Mean Weight	25	50
AQTX1889	Inland Silverside	6/3/1998	6/3/1998	EPAM 94	7d Proportion Survived	50	100
					Mean Biomass	50	> 50
					Mean Weight	50	> 50
AQTX002995	Inland Silverside	8/11/1999	8/11/1999	EPAM 94	7d Proportion Survived	50	100
					Mean Biomass	12.5	25
					Mean Weight	12.5	25
AQTX002996	Atlantic Mysid	8/11/1999	8/11/1999	EPAM 94	7d Proportion Survived	50	100
					Mean Biomass	50	100
					Mean Weight	100	> 100
AQTX002992	Inland Silverside	7/11/2001	7/11/2001	EPAM 94	7d Proportion Survived	25	50
					Mean Biomass	25	50
					Mean Weight	50	> 50
AQTX002991	Atlantic Mysid	7/11/2001	7/11/2001	EPAM 94	7d Proportion Survived	50	100
					Mean Biomass	50	100
					Mean Weight	12.5	25
AQTX002987	Inland Silverside	11/28/2001	11/28/2001	EPAM 94	7d Proportion Survived	50	100
					Mean Biomass	50	100
					Mean Weight	50	100
AQTX002988	Atlantic Mysid	11/28/2001	11/28/2001	EPAM 94	7d Proportion Survived	50	100
					Mean Biomass	50	100
					Mean Weight	50	100

PROPOSED PERMIT LIMITATIONS

Federal and State regulations require that effluent limitations set forth in an NPDES permit must be either technology- or water quality-based. Technology-based limitations for municipal discharges are set by regulation (40 CFR 133, and Chapters 173-220 and 173-221 WAC). Water quality-based limitations are based upon compliance with the Surface Water Quality Standards (Chapter 173-201A WAC), Ground Water Standards (Chapter 173-200 WAC), Sediment Quality Standards (Chapter 173-204 WAC), or the National Toxics Rule (Federal Register, Volume 57, No. 246, Tuesday, December 22, 1992.) The most stringent of these types of limits must be chosen for each of the parameters of concern. Each of these types of limits is described in more detail below.

The limits in this permit are based in part on information received in the application. The effluent constituents in the application were evaluated on a technology- and water quality-basis. The limits necessary to meet the rules and regulations of the State of Washington were determined and included in this permit. Ecology does not develop effluent limits for all pollutants that may be reported on the application as present in the effluent**.** Some pollutants are not treatable at the concentrations reported, are not controllable at the source, are not listed in regulation, and do not have a reasonable potential to cause a water quality violation**.** Effluent limits are not always developed for pollutants that may be in the discharge but not reported as present in the application. In those circumstances the permit does not authorize discharge of the non-reported pollutants. Effluent discharge conditions may change from the conditions reported in the permit application. If significant changes occur in any constituent, as described in 40 CFR 122.42(a), the Permittee is required to notify the Department of Ecology. The Permittee may be in violation of the permit until the permit is modified to reflect additional discharge of pollutants.

DESIGN CRITERIA

In accordance with WAC 173-220-150 (1)(g), flows or waste loadings shall not exceed approved design criteria.

The design criteria for this treatment facility are taken from the August 1991 Facilities Plan (Metro's Regional Treatment Plant in Renton, Enlargement III Program) and the October 1997 East Division Reclamation Plant Stage 2 Liquid Stream Improvements – III2B.1. Both documents were prepared by Brown and Caldwell Consultants and associated firms.

Table 5: Design Standards for King County South Treatment Plant

Parameter	Design Quantity
Monthly average flow (max. month)	144 MGD
Monthly average dry weather flow (AWDF)	96 MGD
Monthly average wet weather flow (AWWF)	115 MGD
Instantaneous peak flow	325 MGD
Maximum Month BOD_5 influent loading	251,000 lb/day
Maximum Month TSS influent loading	235,000 lb/day
Design population equivalent	1,298,000

TECHNOLOGY-BASED EFFLUENT LIMITATIONS

Municipal wastewater treatment plants are a category of discharger for which technology-based effluent limits have been promulgated by federal and state regulations. These effluent limitations are given in the Code of Federal Regulations (CFR) 40 CFR Part 133 (federal) and in Chapter 173-221 WAC (state). These regulations are performance standards that constitute all known available and reasonable methods of prevention, control, and treatment for municipal wastewater.

The following technology-based limits for pH, fecal coliform, BOD_5, and TSS are taken from Chapter 173-221 WAC are:

Table 6: Technology-based Limits

Parameter	Limit
pH:	shall be within the range of 6 to 9 standard units.
Fecal Coliform Bacteria	Monthly Geometric Mean = 200 organisms/100 mL Weekly Geometric Mean = 400 organisms/100 mL
BOD_5 (concentration)	Average Monthly Limit is the most stringent of the following: - 30 mg/L - may not exceed fifteen percent (15%) of the average influent concentration Average Weekly Limit = 45 mg/L
TSS (concentration)	Average Monthly Limit is the most stringent of the following: - 30 mg/L - may not exceed fifteen percent (15%) of the average influent concentration Average Weekly Limit = 45 mg/L
Chlorine	Average Monthly Limit = 0.5 mg/L Average Weekly Limit = 0.75 mg/L

The technology-based monthly average limitation for chlorine is derived from standard operating practices. The Water Pollution Control Federation's Chlorination of Wastewater (1976) states that a properly designed and maintained wastewater treatment plant can achieve adequate disinfection if a 0.5 mg/liter chlorine residual is maintained after fifteen minutes of contact time. See also Metcalf and Eddy, Wastewater Engineering, Treatment, Disposal and Reuse, Third Edition, 1991. A treatment plant that provides adequate chlorination contact time can meet the 0.5 mg/liter chlorine limit on a monthly average basis. According to WAC 173-221-030(11)(b), the corresponding weekly average is 0.75 mg/liter.

The following technology-based mass limits are based on WAC 173-220-130(3)(b) and 173-221-030(11)(b).

Monthly effluent mass loadings (lbs/day) for TSS and BOD_5 were calculated as the maximum monthly design flow (144 MGD) x Concentration limit (30 mg/L) x 8.34 (conversion factor) = mass limit 36,028 lb./day. The monthly effluent limit rounded to 3 significant figures is **36,000 lb/day**.

The weekly average effluent mass loading is calculated as 1.5 x monthly loading = 54,043 lbs/day. The weekly average limit rounded to 3 significant figures is **54,000 lb/day**.

Monthly effluent mass loadings (lbs/day) for Chlorine were calculated as the maximum monthly design flow (144 MGD) x Concentration limit (0.5 mg/L) x 8.34 (conversion factor) = mass limit **600 lb/day**.

SURFACE WATER QUALITY-BASED EFFLUENT LIMITATIONS

In order to protect existing water quality and preserve the designated beneficial uses of Washington's surface waters, WAC 173-201A-060 states that waste discharge permits shall be conditioned such that the discharge will meet established surface water quality standards. The Washington State Surface Water Quality Standards (Chapter 173-201A WAC) is a state regulation designed to protect the beneficial uses of the surface waters of the state. Water quality-based effluent limitations may be based on an individual waste load allocation (WLA) or on a WLA developed during a basin-wide total maximum daily loading study (TMDL).

NUMERICAL CRITERIA FOR THE PROTECTION OF AQUATIC LIFE

"Numerical" water quality criteria are numerical values set forth in the State of Washington's Water Quality Standards for Surface Waters (Chapter 173-201A WAC). They specify the levels of pollutants allowed in receiving water while remaining protective of aquatic life. Numerical criteria set forth in the water quality standards are used along with chemical and physical data for the wastewater and receiving water to derive the effluent limits in the discharge permit. When surface water quality-based limits are more stringent or potentially more stringent than technology-based limitations, they must be used in a permit.

NUMERICAL CRITERIA FOR THE PROTECTION OF HUMAN HEALTH

The state was issued 91 numeric water quality criteria for the protection of human health by the U.S. EPA (EPA 1992). These criteria are designed to protect humans from cancer and other disease and are primarily applicable to fish and shellfish consumption and drinking water from surface waters.

NARRATIVE CRITERIA

In addition to numerical criteria, "narrative" water quality criteria (WAC 173-201A-030) limit toxic, radioactive, or deleterious material concentrations below those which have the potential to adversely affect characteristic water uses, cause acute or chronic toxicity to biota, impair aesthetic values, or adversely affect human health. Narrative criteria protect the specific beneficial uses of all fresh (WAC 173-201A-130) and marine (WAC 173-201A-140) waters in the state of Washington.

ANTIDEGRADATION

The State of Washington's Antidegradation Policy requires that discharges into a receiving water shall not further degrade the existing water quality of the water body. In cases where the natural conditions of a receiving water are of lower quality than the criteria assigned, the natural conditions shall constitute the water quality criteria. Similarly, when receiving waters are of higher quality than the criteria assigned, the existing water quality shall be protected. More information on the State Antidegradation Policy can be obtained by referring to WAC 173-201A-070.

The Department has reviewed existing records and is unable to determine if ambient water quality is either higher or lower than the designated classification criteria given in Chapter 173-201A WAC; therefore, the Department will use the designated classification criteria for this water body in the proposed permit. The discharges authorized by this proposed permit should not cause a loss of beneficial uses.

CRITICAL CONDITIONS

Surface water quality-based limits are derived for the waterbody's critical condition, which represents the receiving water and waste discharge condition with the highest potential for adverse impact on the aquatic biota, human health, and existing or characteristic waterbody uses.

MIXING ZONES

The water quality standards allow the Department of Ecology to authorize mixing zones around a point of discharge in establishing surface water quality-based effluent limits. Both "acute" and "chronic" mixing zones may be authorized for pollutants that can have a toxic effect on the aquatic environment near the point of discharge. The concentration of pollutants at the boundary of these mixing zones may not exceed the numerical criteria for that type of zone. Mixing zones can only be authorized for discharges that are receiving all known, available, and reasonable methods of prevention, control and treatment (AKART) and in accordance with other mixing zone requirements of WAC 173-201A-100.

The National Toxics Rule (EPA, 1992) allows the chronic mixing zone to be used to meet human health criteria.

DESCRIPTION OF THE RECEIVING WATER

The facility discharges to Puget Sound which is designated as a Class AA receiving water in the vicinity of the outfall. Characteristic uses include the following:

> Water supply (domestic, industrial, agricultural); stock watering; fish migration; fish and shellfish rearing, spawning and harvesting; wildlife habitat; primary contact recreation; sport fishing; boating and aesthetic enjoyment; commerce and navigation.

Water quality of this class shall markedly and uniformly exceed the requirements for all or substantially all uses.

Water quality of this class shall meet or exceed the requirements of selected and essential uses.

SURFACE WATER QUALITY CRITERIA

Applicable criteria are defined in Chapter 173-201A-030 WAC for aquatic biota. In addition, U.S. EPA has promulgated human health criteria for toxic pollutants (EPA 1992). Criteria for this discharge are summarized below:

Parameter	Marine (Class AA) – Puget Sound	Fresh (Class A) – Green River
Fecal Coliforms	14 organisms/100 mL maximum geometric mean	100 organisms/100 mL maximum geometric mean
Dissolved Oxygen	7.0 mg/L minimum	8 mg/L minimum
Temperature	15 degrees Celsius maximum or incremental increases above background	18 degrees Celsius maximum or incremental increases above background
pH	7.0 to 8.5 standard units	6.5 to 8.5 standard units
Turbidity	less than 5 NTUs above background	less than 5 NTUs above background
Toxics	No toxics in toxic amounts (see Appendix C for numeric criteria for toxics of concern for this discharge)	No toxics in toxic amounts (see Appendix C for numeric criteria for toxics of concern for this discharge)

CONSIDERATION OF SURFACE WATER QUALITY-BASED LIMITS FOR NUMERIC CRITERIA

Puget Sound Outfall No. 001

Pollutant concentrations in the proposed discharge exceed water quality criteria with technology-based controls which the Department has determined to be AKART. A mixing zone is authorized in accordance with the geometric configuration, flow restriction, and other restrictions for mixing zones in Chapter 173-201A WAC and are defined as follows:

The dilution factors of effluent to receiving water that occur within these zones have been determined at the critical condition by the use of the UM model of PLUMES. The dilution factors have been determined to be[6]:

	Acute	Chronic
Aquatic Life	233:1	429:1
Human Health, Carcinogen		660
Human Health, Non-carcinogen		660

Pollutants in an effluent may affect the aquatic environment near the point of discharge (near-field) or at a considerable distance from the point of discharge (far-field). Toxic pollutants, for example, are near-field pollutants--their adverse effects diminish rapidly with mixing in the receiving water. Conversely, a pollutant such as BOD is a far-field pollutant whose adverse effect occurs away from the discharge even after dilution has occurred. Thus, the method of calculating water quality-based effluent limits varies with the point at which the pollutant has its maximum effect.

[6] King County Department of Natural Resources, Effluent Dilution Modeling – EDRP Outfall, November 30, 2001. p.5.

The derivation of water quality-based limits also takes into account the variability of the pollutant concentrations in both the effluent and the receiving water. Ambient data in the vicinity of the South Plant outfall was taken from marine water quality monitoring station ELB015 as described in Table 7. The ambient background data used for this permit includes the following:

Table 7: Long Term Marine Water Quality Data 1991-2000

Station No.	ELB015
Station Description:	E. of Duwamish Head
Latitude	47.5967
Longitude	-122.3683

Parameter	Units	Average	Value in Percentile	Percentile Used
Temperature	**deg. C**	10.9	13.29	90%
Salinity	**PSU = parts per thousand**	28.6	26.26	10%
Dissolved Oxygen	**mg/L**	8.1	6.2	10%
pH	**pH**	7.8	7.8	Average
Fecal Coliform	**#/100mL**	15.6	41.2	90%
Ammonium-Ammonia (dissolved)	**mg/L**	0.016	0.028	90%

BOD_5--Under critical conditions there is no predicted violation of the water quality standards for surface waters. Therefore, the technology-based effluent limitation for BOD_5 was placed in the permit. The impact of BOD on the receiving water was modeled using bulk dilution and assuming that the BOD was exerted fully. This would result in a maximum dissolved oxygen reduction of 0.07 mg/L. This discharge with technology-based limitations results in a small amount of BOD loading relative to the large amount of dilution occurring in the receiving water at critical conditions. Technology-based limitations will be protective of dissolved oxygen criteria in the receiving water.

Temperature--The impact of the discharge on the temperature of the receiving water was modeled by simple mixing analysis at critical condition. The receiving water temperature at the critical condition is 13.3º C and the estimated effluent temperature is 20º C[7]. The predicted resultant temperature at the boundary of the chronic mixing zone is 13.31º C, a negligible incremental rise.

Under critical conditions there is no predicted violation of the water quality standards for surface waters. Therefore, no effluent limitation for temperature was placed in the proposed permit.

pH--Because of the high buffering capacity of marine water, compliance with the technology-based limits of 6 to 9 will assure compliance with the water quality standards for surface waters.

[7] King County NPDES Renewal Application Package for Permit No. WA-002958-1. December 2001.

Fecal coliform--The numbers of fecal coliform were modeled by simple mixing analysis using the technology-based limit of 400 organisms per 100 mL and an acute dilution factor of 233 results in 1.7 organisms per 100 mL at the edge of the acute zone. The technology-based limit of 200 organisms per 100 mL and a chronic dilution factor of 429 results in 0.47 organisms per 100 mL at the edge of the chronic zone. Ambient fecal coliform data were obtained from water quality monitoring station ELB015.

Under critical conditions there is no predicted violation of the water quality standards for surface waters with the technology-based limit. Therefore, the technology-based effluent limitation for fecal coliform bacteria was placed in the proposed permit.

Toxic Pollutants--Federal regulations (40 CFR 122.44) require NPDES permits to contain effluent limits for toxic chemicals in an effluent whenever there is a reasonable potential for those chemicals to exceed the surface water quality criteria. This process occurs concurrently with the derivation of technology-based effluent limits. Facilities with technology-based effluent limits defined in regulation are not exempted from meeting the water quality standards for surface waters or from having surface water quality-based effluent limits.

The following toxics were determined to be present in the discharge:

Table 8: Detectable Pollutants

METALS (TOTAL RECOVERABLE), CYANIDE, PHENOLS, AND HARDNESS.
ANTIMONY
ARSENIC
CADMIUM
CHROMIUM
COPPER
LEAD
NICKEL
SILVER
THALLIUM
ZINC
CYANIDE
TOTAL PHENOLIC COMPOUNDS
HARDNESS (AS CaCO3)
VOLATILE ORGANIC COMPOUNDS
CHOLOROFORM
METHYLENE CHLORIDE
TOLUNE
1,1,1-TRICHLOROETHANE
ACID-EXTRACTABLE COMPOUNDS
PHENOL
BASE-NEUTRAL COMPOUNDS
BIS (2-ETHYLHEXYL) PHTHALATE
BUTYL BENZYL PHTHALATE
DI-N-BUTYL PHTHALATE
1,4-DICHLORO BENZENE
DIETHYL PHTHALATE
DIMETHYL PHTHALATE
OTHER POLLUTANTS
CHLOROPYRIFOS

A reasonable potential analysis (See Appendix F) was conducted on these parameters to determine whether or not effluent limitations would be required in this permit.

The determination of the reasonable potential for pollutants listed in Table 4 to exceed the water quality criteria was evaluated with procedures given in EPA, 1991 (Appendix F) at the critical condition. A determination of reasonable potential using zero for background resulted in no reasonable potential.

Green River Outfall No. 002

Pollutant concentrations in the proposed discharge exceed water quality criteria with technology-based controls which the Department has determined to be AKART. A mixing zone is authorized in accordance with the geometric configuration, flow restriction, and other restrictions for mixing zones in Chapter 173-201A WAC and are defined as follows.

The dilution factors of effluent to receiving water that occur within these zones have been determined based on bulk dilution. The dilution factors have been determined to be:

Green River Outfall	Acute	Chronic
Aquatic Life – Maintenance	9:1	Not Applicable[8]
Aquatic Life – Emergency	Permitted Under S5.F	Not Applicable

The acute dilution ratio was determined based on bulk dilution achieved under the conditions expected during use of the outfall for maintenance purposes. It is required that the river flow must be at least 1000 cfs (cubic feet per second) at the time of discharge. The rate of discharge anticipated during a maintenance event is limited to no more than an average of 28 cfs. These assumptions were used for a previous permit and verified for this permit.[9] Based on these assumptions, the bulk dilution using the entire river is 36:1 (1000/28=36). The regulation permits only 25% of the river width to be utilized; therefore, the effective acute dilution ratio is 9:1 during a maintenance event.

A mixing zone was not determined for the emergency use of the Green River outfall. The Green River outfall is implicitly permitted under special condition S5.F. and explicitly permitted under special condition S1.B. for emergency use. Effluent limits were not imposed for emergency use because it is assumed that such use will occur under extreme and unpredictable circumstances.

BOD_5--Under critical conditions there is the potential to exceed the dissolved oxygen receiving water criteria with the technology-based limit. The impact of BOD on the receiving water was determined based on a discharge limit of 15 mg/L and a dilution of 9:1. This discharge limit could produce a drop in dissolved oxygen in the river by as much as 1.67 mg/L based on worst case assumptions. Based on the short duration of this discharge, this limit is protective of the receiving water.

[8] Maintenance and emergency discharges would be of short duration and thus would not invoke chronic Water Quality Standards.
[9] King County, East Division, NPDES Permit March 31, 1993. Fact Sheet p. 11.

Temperature and pH--The impact of pH and temperature were modeled using the calculations from EPA, 1988. The input variables were dilution factor 9, upstream temperature 17.2°C, upstream pH 7.5, upstream alkalinity 50(as mg $CaCO_3$/L), effluent temperature 20°C, effluent pH of 6, effluent pH of 9, and effluent alkalinity 68.8 (as mg $CaCO_3$/L). (Refer to Appendix F.)

Under critical conditions there is no predicted violation of the Water Quality Standards for Surface Waters. Therefore, the technology-based effluent limitations for pH was placed in the permit and temperature was not limited.

Fecal coliform--The numbers of fecal coliform were modeled by simple mixing analysis using the technology-based limit of 200 organisms per 100 ml and a dilution factor of 9. The resulting fecal coliform at the edge of the dilution zone would be 22.1 organisms per 100 ml.

Under critical conditions there is no predicted violation of the Water Quality Standards for Surface Waters with the technology-based limit. Therefore, the technology-based effluent limitation for fecal coliform bacteria was placed in the proposed permit.

Toxic Pollutants--Federal regulations (40 CFR 122.44) require NPDES permits to contain effluent limits for toxic chemicals in an effluent whenever there is a reasonable potential for those chemicals to exceed the surface water quality criteria. This process occurs concurrently with the derivation of technology-based effluent limits. Facilities with technology-based effluent limits defined in regulation are not exempted from meeting the Water Quality Standards for Surface Waters or from having surface water quality-based effluent limits.

The following toxics were determined to be present in the discharge, reference Table 8. Detectable Pollutants. Due to the infrequency and short duration of discharges to the Green River, the only toxicant considered was chlorine. A reasonable potential analysis (See Appendix F) was conducted on chlorine to determine whether or not effluent limitations would be required in this permit.

Effluent limits were derived for chlorine, which were determined to have a reasonable potential to cause a violation of the Water Quality Standards. Effluent limits were calculated using methods from EPA, 1991 as shown in Appendix F.

The resultant effluent limits are as follows:

Parameter	**Outfall**	**Maximum**
Chlorine	Green River	171 µg/L

WHOLE EFFLUENT TOXICITY

The Water Quality Standards for Surface Waters require that the effluent not cause toxic effects in the receiving waters. Many toxic pollutants cannot be detected by commonly available detection methods. However, toxicity can be measured directly by exposing living organisms to the wastewater in laboratory tests and measuring the response of the organisms. Toxicity tests measure the aggregate toxicity of the whole effluent, and therefore this approach is called whole effluent toxicity (WET) testing. Some WET tests measure acute toxicity and other WET tests measure chronic toxicity.

Acute toxicity tests measure mortality as the significant response to the toxicity of the effluent. Dischargers who monitor their wastewater with acute toxicity tests are providing an indication of the potential lethal effect of the effluent to organisms in the receiving environment.

Chronic toxicity tests measure various sublethal toxic responses such as retarded growth or reduced reproduction. Chronic toxicity tests often involve either a complete life cycle test of an organism with an extremely short life cycle or a partial life cycle test on a critical stage of one of a test organism's life cycles. Organism survival is also measured in some chronic toxicity tests.

Accredited WET testing laboratories have the proper WET testing protocols, data requirements, and reporting format. Accredited laboratories are knowledgeable about WET testing and capable of calculating an NOEC, LC_{50}, $EC_{50,}$ IC_{25}, etc. All accredited labs have been provided the most recent version of the Department of Ecology Publication # WQ-R-95-80, *Laboratory Guidance and Whole Effluent Toxicity Test Review Criteria* which is referenced in the permit. Any Permittee interested in receiving a copy of this publication may call the Ecology Publications Distribution Center 360-407-7472 for a copy. Ecology recommends that Permittees send a copy of the acute or chronic toxicity sections(s) of their permits to their laboratory of choice.

An effluent characterization for acute and chronic toxicity was conducted during the previous permit term. In accordance with WAC 173-205-060, the Permittee must repeat this effluent characterization for the following reason:

> The Department's "Permit Writer's Manual" requires a facility of the size and characteristics of the South Plant facility to conduct chronic and acute WET testing characterization at a frequency of four (4) tests/year. Additionally, the current EPA permit reapplication form requires facilities with a design flow of 1.0 MGD or greater to perform WET testing prior to application. It is proposed that this permit require WET testing to be accomplished during the last year of the permit prior to reapplication.

When the WET tests during effluent characterization indicate that no reasonable potential exists to cause receiving water toxicity, the Permittee will not be given WET limits and will only be required to retest the effluent prior to application for permit renewal in order to demonstrate that toxicity has not increased in the effluent.

If the Permittee makes process or material changes which, in the Department's opinion, results in an increased potential for effluent toxicity, then the Department may require additional effluent characterization in a regulatory order, by permit modification, or in the permit renewal. Toxicity is assumed to have increased if WET testing conducted for submission with a permit application fails to meet the performance standards in WAC 173-205-020, "whole effluent toxicity performance standard." The Permittee may demonstrate to the Department that changes have not increased effluent toxicity by performing additional WET testing after the time the process or material changes have been made.

HUMAN HEALTH

Washington's water quality standards now include 91 numeric health-based criteria that must be considered in NPDES permits. These criteria were promulgated for the state by the U.S. EPA in its National Toxics Rule (Federal Register, Volume 57, No. 246, Tuesday, December 22, 1992).

The Department has determined that the effluent is likely to have chemicals of concern for human health. The discharger's high priority status is based on (1) the discharger's status as a major discharger, (2) knowledge of data or process information indicating regulated chemicals occur in the discharge.

A determination of the discharge's potential to cause an exceedance of the water quality standards was conducted as required by 40 CFR 122.44(d). The reasonable potential determination was evaluated with procedures given in the Technical Support Document for Water Quality-Based Toxics Control (EPA/505/2-90-001) and the Department's Permit Writer's Manual (Ecology Publication 92-109, July, 1994). The determination indicated that the discharge has no reasonable potential to cause a violation of water quality standards, thus an effluent limit is not warranted.

SEDIMENT QUALITY

The Department has promulgated aquatic sediment standards (Chapter 173-204 WAC) to protect aquatic biota and human health. These standards state that the Department may require Permittees to evaluate the potential for the discharge to cause a violation of applicable standards (WAC 173-204-400).

The Department's Sediment Management Unit (SMU) has reviewed the chemistry data for various sediment sampling event in the vicinity of the South Plant's marine outfall. The SMU concluded that the data indicates that the sediment does not exceed the Sediment Management Standards (SMS). No further sediment testing is required during the permit cycle.[10]

The SMS requests that King County submit any data they collect regarding sediment analysis and that the data is submitted to the SMU in the SEDQUAL template format.

Table 9. COMPARISON OF EFFLUENT LIMITS WITH THE EXISTING PERMIT ISSUED July 15, 1997

Parameter	Existing Permit Limits	Proposed Permit Limits
Puget Sound (Outfall 001)		
BOD_5, monthly ave. conc.	30 mg/L	30 mg/L
BOD_5, monthly ave. load.	36,000 lbs/day	36,000 lbs/day
TSS, monthly ave. conc.	30 mg/L	30 mg/L
TSS, monthly avg. load	36,000 lbs/day	36,000 lbs/day
BOD_5, weekly avg. conc.	45 mg/L	45 mg/L
BOD_5, weekly avg. load	54,000 lbs/day	54,000 lbs/day
TSS, weekly avg. conc.	45 mg/L	45 mg/L
TSS, weekly avg. load	54,000 lbs/day	54,000 lbs/day
Fecal Coliform, monthly	200/100 mL	200/100 mL
Fecal Coliform, weekly	400/100 mL	400/100 mL
pH	6-9	6-9
Chlorine, monthly ave	0.66 mg/L	**0.5 mg/L**

[10] Ecology 2004, Sharon R. Brown to Karen Burgess (NWRO-WQP) memo: *Renton East Division Reclamation Plant – Sediment Review*. March 29, 2004

Parameter	Existing Permit Limits	Proposed Permit Limits
Chlorine, max. day	1.7 mg/L	**0.75 mg/L**
Green River Outfall - Emergency		
BOD_5 daily maximum	40 mg/L	None
TSS, daily maximum	40 mg/L	None
Fecal Coliform Bacteria, daily max.	200/100 mL	None
pH	6.0-9.0	None
Temperature	80ºF	None
Total Residual Chlorine	147 µg/L	None
Green River Outfall - Maintenance		
BOD_5 daily maximum	40 mg/L	**20 mg/L**
TSS, daily maximum	40 mg/L	**20 mg/L**
Fecal Coliform Bacteria, daily max.	200/100 mL	200/100 mL
pH	6.0-9.0	6.0-9.0
Temperature	80ºF	**None**
Total Residual Chlorine	147 µg/L	**171 µg/L**
Water Reuse Facility (Outfall 002)		**Not include in NPDES Permit (Ref. ST-7445)**
BOD (5 day) (Daily Max)	40 mg/L	
TSS, (Daily Max)	60 mg/L	
Fecal Coliform Bacteria	200/100 mL	
pH	6.0-9.0	
Temperature	80 F	
Total Residual Chorine	147 ug/L	

MONITORING REQUIREMENTS

Monitoring, recording, and reporting are required (WAC 173-220-210 and 40 CFR 122.41) to verify that the treatment process is functioning correctly and the effluent limitations are being achieved.

Monitoring of biosolids quantity and quality is necessary to determine the appropriate uses of the biosolids. Biosolids monitoring is required by the current state and local solid waste management program and also by EPA under 40 CFR 503.

The monitoring schedule is detailed in the proposed permit under Condition S.2. Specified monitoring frequencies take into account the quantity and variability of discharge, the treatment method, past compliance, significance of pollutants, and cost of monitoring. The required monitoring frequency is consistent with agency guidance given in the current version of Ecology's *Permit Writer's Manual* (July 2002) for activated sludge treatment plant.

Ecology's *Permit Writer's Manual* (July 2002) allows for **a reduction in monitoring frequency** on the basis of performance. The reduced frequency is determined by the ratio of the long term average (LTA) to the average monthly limit (AML). The results of the analysis as shown are based on the DMR data submitted for the 2-year period preceding renewal from January 2002 to December 2003 for BOD, TSS and fecal coliform.

Pollutant	LTA (mg/L)	AML (mg/L)	Ratio (LTA/AML)	Allowable Minimum Monitoring Frequency for ratio 50%-65%[11]
BOD_5	14.6	30	49%	4/week
TSS	15.8	30	53%	4/week
Fecal Coliform	64.3	200	32%	4/week

Based on this analysis, the permittee is eligible for a reduction in the monitor frequency for both TSS, BOD and Fecal Coliform from 7 times per week to 4 times per week. As a pretreatment POTW, the King County is required to have influent, primary clarifier effluent, final effluent, and biosolids sampled for toxic pollutants in order to characterize the industrial input. Sampling is also done to determine if pollutants interfere with the treatment process or pass through the plant to the biosolids or the receiving water. The monitoring data will be used by King County to develop local limits which commercial and industrial users must meet.

LAB ACCREDITATION

With the exception of certain parameters the permit requires all monitoring data to be prepared by a laboratory registered or accredited under the provisions of Chapter 173-50 WAC, *Accreditation of Environmental Laboratories.* The laboratory at this facility is accredited for General Chemistry and Microbiology. The Permittee's environmental lab at W. Ewing Street is additionally accredited for trace metals by ICP-OES and ICP-MS, mercury, inorganics, organics by GC and GC-MS, bioassays, and microbiology in matrices including liquids, sediments and tissues.

OTHER PERMIT CONDITIONS

REPORTING AND RECORDKEEPING

The conditions of S3. are based on the authority to specify any appropriate reporting and recordkeeping requirements to prevent and control waste discharges (WAC 173-220-210).

PREVENTION OF FACILITY OVERLOADING

Overloading of the treatment plant is a violation of the terms and conditions of the permit. To prevent this from occurring, RCW 90.48.110 and WAC 173-220-150 require the Permittee to take the actions detailed in proposed permit requirement S.4. to plan expansions or modifications before existing capacity is reached and to report and correct conditions that could result in new or increased discharges of pollutants. Condition S.4. restricts the amount of flow.

[11] Ecology *Permit Writer's Manual*, p. XIII-15.

OPERATION AND MAINTENANCE (O&M)

The proposed permit contains condition S.5. as authorized under RCW 90.48.110, WAC 173-220-150, Chapter 173-230 WAC, and WAC 173-240-080. It is included to ensure proper operation and regular maintenance of equipment, and to ensure that adequate safeguards are taken so that constructed facilities are used to their optimum potential in terms of pollutant capture and treatment.

RESIDUAL SOLIDS HANDLING

To prevent water quality problems the Permittee is required in permit condition S7. to store and handle all residual solids (grit, screenings, scum, sludge, and other solid waste) in accordance with the requirements of RCW 90.48.080 and State Water Quality Standards.

Since the Permittee has a Biosolids Program, the final use and disposal of biosolids from this facility is regulated by U.S. EPA under 40 CFR 503. The disposal of other solid waste is under the jurisdiction of the King County Health Department. Sludge and biosolids monitoring requirements included in Specific Condition 2A of the Permit are included to affect the Pretreatment Program.

PRETREATMENT

To provide more direct and effective control of pollutants discharged, King County has been delegated permitting, monitoring and enforcement authority for industrial users discharging to their treatment system. The Department oversees the delegated Industrial Pretreatment Program to assure compliance with federal pretreatment regulations (40 CFR Part 403) and categorical standards and state regulations (Chapter 90.48 RCW and Chapter 173-216 WAC).

OUTFALL EVALUATION

Proposed permit condition S.12 requires the Permittee to conduct an outfall inspection and submit a report detailing the findings of that inspection. The purpose of the inspection is to determine the condition of the discharge pipe and diffusers and to determine if sediment is accumulating in the vicinity of the outfall.

GENERAL CONDITIONS

General Conditions are based directly on state and federal law and regulations and have been standardized for all individual municipal NPDES permits issued by the Department.

PERMIT ISSUANCE PROCEDURES

PERMIT MODIFICATIONS

The Department may modify this permit to impose numerical limitations, if necessary, to meet water quality standards, sediment quality standards, or ground water standards, based on new information obtained from sources such as inspections, effluent monitoring, outfall studies, and effluent mixing studies.

The Department may also modify this permit as a result of new or amended state or federal regulations.

RECOMMENDATION FOR PERMIT ISSUANCE

This proposed permit meets all statutory requirements for authorizing a wastewater discharge, including those limitations and conditions believed necessary to protect human health, aquatic life, and the beneficial uses of waters of the State of Washington. The Department proposes that this permit be issued for five (5) years.

REFERENCES FOR TEXT AND APPENDICES

Environmental Protection Agency (EPA)

1992. National Toxics Rule. Federal Register, V. 57, No. 246, Tuesday, December 22, 1992.

1991. Technical Support Document for Water Quality-based Toxics Control. EPA/505/2-90-001.

1988. Technical Guidance on Supplementary Stream Design Conditions for Steady State Modeling. USEPA Office of Water, Washington, D.C.

1985. Water Quality Assessment: A Screening Procedure for Toxic and Conventional Pollutants in Surface and Ground Water. EPA/600/6-85/002a.

1983. Water Quality Standards Handbook. USEPA Office of Water, Washington, D.C.

Metcalf and Eddy.

1991. Wastewater Engineering, Treatment, Disposal, and Reuse. Third Edition.

Tsivoglou, E.C., and J.R. Wallace.

1972. Characterization of Stream Reaeration Capacity. EPA-R3-72-012. (Cited in EPA 1985 op.cit.)

Washington State Department of Ecology.

Laws and Regulations(http://www.ecy.wa.gov/laws-rules/index.html)

Permit and Wastewater Related Information (http://www.ecy.wa.gov/programs/wq/wastewater/index.html)

Washington State Department of Ecology.

July 2002. Permit Writer's Manual. Publication Number 92-109

Water Pollution Control Federation.

1976. Chlorination of Wastewater.

Wright, R.M., and A.J. McDonnell.

1979. In-stream Deoxygenation Rate Prediction. Journal Environmental Engineering Division, ASCE. 105(EE2). (Cited in EPA 1985 op.cit.)

APPENDIX A--PUBLIC INVOLVEMENT INFORMATION

The Department has tentatively determined to reissue a permit to the applicant listed on page 1 of this fact sheet. The permit contains conditions and effluent limitations which are described in the rest of this fact sheet.

Public notice of application was published on September 3, 2002 and September 10, 2002 in *Seattle Times* to inform the public that an application had been submitted and to invite comment on the reissuance of this permit.

The Department will publish a Public Notice of Draft (PNOD) on August 16, 2004 in *Settle Times and Seattle Post Intelligencer* to inform the public that a draft permit and fact sheet are available for review. Interested persons are invited to submit written comments regarding the draft permit. The draft permit, fact sheet, and related documents are available for inspection and copying between the hours of 8:00 a.m. and 5:00 p.m. weekdays, by appointment, at the regional office listed below. Written comments should be mailed to:

Water Quality Permit Coordinator
Department of Ecology
Northwest Regional Office
3190 – 160th Avenue SE
Bellevue, WA 98008

Any interested party may comment on the draft permit or request a public hearing on this draft permit within the thirty (30) day comment period to the address above. The request for a hearing shall indicate the interest of the party and the reasons why the hearing is warranted. The Department will hold a hearing if it determines there is a significant public interest in the draft permit (WAC 173-220-090). Public notice regarding any hearing will be circulated at least thirty (30) days in advance of the hearing. People expressing an interest in this permit will be mailed an individual notice of hearing (WAC 173-220-100).

Comments should reference specific text followed by proposed modification or concern when possible. Comments may address technical issues, accuracy and completeness of information, the scope of the facility's proposed coverage, adequacy of environmental protection, permit conditions, or any other concern that would result from issuance of this permit.

The Department will consider all comments received within thirty (30) days from the date of public notice of draft indicated above, in formulating a final determination to issue, revise, or deny the permit. The Department's response to all significant comments is available upon request and will be mailed directly to people expressing an interest in this permit.

Further information may be obtained from the Department by telephone, 425-649-7201, or by writing to the address listed above.

This permit and fact sheet were written by Karen Burgess.

APPENDIX B--GLOSSARY

Acute Toxicity--The lethal effect of a pollutant on an organism that occurs within a short period of time, usually 48 to 96 hours.

AKART-- An acronym for "all known, available, and reasonable methods of prevention, control, and treatment".

Ambient Water Quality--The existing environmental condition of the water in a receiving water body.

Ammonia--Ammonia is produced by the breakdown of nitrogenous materials in wastewater. Ammonia is toxic to aquatic organisms, exerts an oxygen demand, and contributes to eutrophication. It also increases the amount of chlorine needed to disinfect wastewater.

Average Monthly Discharge Limitation --The highest allowable average of daily discharges over a calendar month, calculated as the sum of all daily discharges measured during a calendar month divided by the number of daily discharges measured during that month (except in the case of fecal coliform). The daily discharge is calculated as the average measurement of the pollutant over the day.

Average Weekly Discharge Limitation -- The highest allowable average of daily discharges over a calendar week, calculated as the sum of all daily discharges measured during a calendar week divided by the number of daily discharges measured during that week. The daily discharge is calculated as the average measurement of the pollutant over the day.

Best Management Practices (BMPs)--Schedules of activities, prohibitions of practices, maintenance procedures, and other physical, structural and/or managerial practices to prevent or reduce the pollution of waters of the State. BMPs include treatment systems, operating procedures, and practices to control: plant site runoff, spillage or leaks, sludge or waste disposal, or drainage from raw material storage. BMPs may be further categorized as operational, source control, erosion and sediment control, and treatment BMPs.

BOD_5--Determining the Biochemical Oxygen Demand of an effluent is an indirect way of measuring the quantity of organic material present in an effluent that is utilized by bacteria. The BOD_5 is used in modeling to measure the reduction of dissolved oxygen in a receiving water after effluent is discharged. Stress caused by reduced dissolved oxygen levels makes organisms less competitive and less able to sustain their species in the aquatic environment. Although BOD is not a specific compound, it is defined as a conventional pollutant under the federal Clean Water Act.

Bypass--The intentional diversion of waste streams from any portion of a treatment facility.

CBOD5 – The quantity of oxygen utilized by a mixed population of microorganisms acting on the nutrients in the sample in an aerobic oxidation for five days at a controlled temperature of 20 degrees Celcius, with an inhibitory agent added to prevent the oxidation of nitrogen compounds. The method for determining CBOD5 is given in 40 CFR Part 136.

Chlorine--Chlorine is used to disinfect wastewaters of pathogens harmful to human health. It is also extremely toxic to aquatic life.

Chronic Toxicity--The effect of a pollutant on an organism over a relatively long time, often 1/10 of an organism's lifespan or more. Chronic toxicity can measure survival, reproduction or growth rates, or other parameters to measure the toxic effects of a compound or combination of compounds.

Clean Water Act (CWA)--The Federal Water Pollution Control Act enacted by Public Law 92-500, as amended by Public Laws 95-217, 95-576, 96-483, 97-117; USC 1251 et seq.

Combined Sewer Overflow (CSO)--The event during which excess combined sewage flow caused by inflow is discharged from a combined sewer, rather than conveyed to the sewage treatment plant because either the capacity of the treatment plant or the combined sewer is exceeded.

Compliance Inspection - Without Sampling--A site visit for the purpose of determining the compliance of a facility with the terms and conditions of its permit or with applicable statutes and regulations.

Compliance Inspection - With Sampling--A site visit to accomplish the purpose of a Compliance Inspection - Without Sampling and as a minimum, sampling and analysis for all parameters with limits in the permit to ascertain compliance with those limits; and, for municipal facilities, sampling of influent to ascertain compliance with the percent removal requirement. Additional sampling may be conducted.

Composite Sample--A mixture of grab samples collected at the same sampling point at different times, formed either by continuous sampling or by mixing a minimum of four discrete samples. May be "time-composite"(collected at constant time intervals) or "flow-proportional" (collected either as a constant sample volume at time intervals proportional to stream flow, or collected by increasing the volume of each aliquot as the flow increased while maintaining a constant time interval between the aliquots).

Construction Activity--Clearing, grading, excavation and any other activity which disturbs the surface of the land. Such activities may include road building, construction of residential houses, office buildings, or industrial buildings, and demolition activity.

Continuous Monitoring –Uninterrupted, unless otherwise noted in the permit.

Critical Condition--The time during which the combination of receiving water and waste discharge conditions have the highest potential for causing toxicity in the receiving water environment. This situation usually occurs when the flow within a water body is low, thus, its ability to dilute effluent is reduced.

Dilution Factor--A measure of the amount of mixing of effluent and receiving water that occurs at the boundary of the mixing zone. Expressed as the inverse of the effluent fraction e.g., a dilution factor of 10 means the effluent comprises 10% by volume and the receiving water 90%.

Engineering Report--A document which thoroughly examines the engineering and administrative aspects of a particular domestic or industrial wastewater facility. The report shall contain the appropriate information required in WAC 173-240-060 or 173-240-130.

Fecal Coliform Bacteria--Fecal coliform bacteria are used as indicators of pathogenic bacteria in the effluent that are harmful to humans. Pathogenic bacteria in wastewater discharges are controlled by disinfecting the wastewater. The presence of high numbers of fecal coliform bacteria in a water body can indicate the recent release of untreated wastewater and/or the presence of animal feces.

Grab Sample--A single sample or measurement taken at a specific time or over as short period of time as is feasible.

Industrial User-- A discharger of wastewater to the sanitary sewer which is not sanitary wastewater or is not equivalent to sanitary wastewater in character.

Industrial Wastewater--Water or liquid-carried waste from industrial or commercial processes, as distinct from domestic wastewater. These wastes may result from any process or activity of industry, manufacture, trade or business, from the development of any natural resource, or from animal operations such as feed lots, poultry houses, or dairies. The term includes contaminated storm water and, also, leachate from solid waste facilities.

Infiltration and Inflow (I/I)--"Infiltration" means the addition of ground water into a sewer through joints, the sewer pipe material, cracks, and other defects. "Inflow" means the addition of precipitation-caused drainage from roof drains, yard drains, basement drains, street catch basins, etc., into a sewer.

Interference -- A discharge which, alone or in conjunction with a discharge or discharges from other sources, both:

Inhibits or disrupts the POTW, its treatment processes or operations, or its sludge processes, use or disposal and;

Therefore is a cause of a violation of any requirement of the POTW's NPDES permit (including an increase in the magnitude or duration of a violation) or of the prevention of sewage sludge use or disposal in compliance with the following statutory provisions and regulations or permits issued thereunder (or more stringent State or local regulations): Section 405 of the Clean Water Act, the Solid Waste Disposal Act (SWDA) (including title II, more commonly referred to as the Resource Conservation and Recovery Act (RCRA), and including State regulations contained in any State sludge management plan prepared pursuant to subtitle D of the SWDA), sludge regulations appearing in 40 CFR Part 507, the Clean Air Act, the Toxic Substances Control Act, and the Marine Protection, Research and Sanctuaries Act.

Major Facility--A facility discharging to surface water with an EPA rating score of > 80 points based on such factors as flow volume, toxic pollutant potential, and public health impact.

Maximum Daily Discharge Limitation--The highest allowable daily discharge of a pollutant measured during a calendar day or any 24-hour period that reasonably represents the calendar day for purposes of sampling. The daily discharge is calculated as the average measurement of the pollutant over the day.

Method Detection Level (MDL)--The minimum concentration of a substance that can be measured and reported with 99% confidence that the analyte concentration is above zero and is determined from analysis of a sample in a given matrix containing the analyte.

Minor Facility--A facility discharging to surface water with an EPA rating score of < 80 points based on such factors as flow volume, toxic pollutant potential, and public health impact.

Mixing Zone--A volume that surrounds an effluent discharge within which water quality criteria may be exceeded. The area of the authorized mixing zone is specified in a facility's permit and follows procedures outlined in State regulations (Chapter 173-201A WAC).

National Pollutant Discharge Elimination System (NPDES)--The NPDES (Section 402 of the Clean Water Act) is the Federal wastewater permitting system for discharges to navigable waters of the United States. Many states, including the State of Washington, have been delegated the authority to issue these permits. NPDES permits issued by Washington State permit writers are joint NPDES/State permits issued under both State and Federal laws.

Pass through -- A discharge which exits the POTW into waters of the-State in quantities or concentrations which, alone or in conjunction with a discharge or discharges from other sources, is a cause of a violation of any requirement of the POTW's NPDES permit (including an increase in the magnitude or duration of a violation), or which is a cause of a violation of State water quality standards.

pH--The pH of a liquid measures its acidity or alkalinity. A pH of 7 is defined as neutral, and large variations above or below this value are considered harmful to most aquatic life.

Potential Significant Industrial User--A potential significant industrial user is defined as an Industrial User which does not meet the criteria for a Significant Industrial User, but which discharges wastewater meeting one or more of the following criteria:

a. Exceeds 0.5 % of treatment plant design capacity criteria and discharges <25,000 gallons per day or;

b. Is a member of a group of similar industrial users which, taken together, have the potential to cause pass through or interference at the POTW (e.g. facilities which develop photographic film or paper, and car washes).

King County, with a delegated pretreatment program, may determine that a discharger initially classified as a potential significant industrial user should be managed as a significant industrial user.

Quantitation Level (QL)-- A calculated value five times the MDL (method detection level).

Significant Industrial User (SIU)--

1) All industrial users subject to Categorical Pretreatment Standards under 40 CFR 403.6 and 40 CFR Chapter I, Subchapter N and;

2) Any other industrial user that: discharges an average of 25,000 gallons per day or more of process wastewater to the POTW (excluding sanitary, noncontact cooling, and boiler blow-down wastewater); contributes a process wastestream that makes up 5 percent or more of the average dry weather hydraulic or organic capacity of the POTW treatment plant; or is designated as such by the Control Authority* on the basis that the industrial user has a reasonable potential for adversely affecting the POTW's operation or for violating any pretreatment standard or requirement (in accordance with 40 CFR 403.8(f)(6)).

Upon finding that the industrial user meeting the criteria in paragraph 2, above, has no reasonable potential for adversely affecting the POTW's operation or for violating any pretreatment standard or requirement, the Control Authority* may at any time, on its own initiative or in response to a petition received from an industrial user or POTW, and in accordance with 40 CFR 403.8(f)(6), determine that such industrial user is not a significant industrial user.

*The term "Control Authority" refers to the Washington State Department of Ecology in the case of non-delegated POTWs or to the POTW in the case of delegated POTWs.

State Waters--Lakes, rivers, ponds, streams, inland waters, underground waters, salt waters, wetlands, and all other surface waters and watercourses within the jurisdiction of the state of Washington.

Stormwater--That portion of precipitation that does not naturally percolate into the ground or evaporate, but flows via overland flow, interflow, pipes, and other features of a storm water drainage system into a defined surface water body, or a constructed infiltration facility.

Technology-based Effluent Limit--A permit limit that is based on the ability of a treatment method to reduce the pollutant.

Total Suspended Solids (TSS)--Total suspended solids are the particulate materials in an effluent. Large quantities of TSS discharged to a receiving water may result in solids accumulation. Apart from any toxic effects attributable to substances leached out by water, suspended solids may kill fish, shellfish, and other aquatic organisms by causing abrasive injuries and by clogging the gills and respiratory passages of various aquatic fauna. Indirectly, suspended solids can screen out light and can promote and maintain the development of noxious conditions through oxygen depletion.

Upset--An exceptional incident in which there is unintentional and temporary noncompliance with technology-based permit effluent limitations because of factors beyond the reasonable control of the Permittee. An upset does not include noncompliance to the extent caused by operational error, improperly designed treatment facilities, lack of preventative maintenance, or careless or improper operation.

Water Quality-based Effluent Limit--A limit on the concentration or mass of an effluent parameter that is intended to prevent the concentration of that parameter from exceeding its water quality criterion after it is discharged into a receiving water.

APPENDIX C--RESPONSE TO COMMENTS

Comment 1:
From King County, Betsy Cooper.

As per your announcement of public review of the proposed renewal of the South Plant Permit No. WA-002958-1, we have three comments we would like to submit.

1) In S6. Pretreatment – section A.1(j) now include a sentence that was taken out of the identical section in the West Point permit renewal completed in December 03. We request that these sections of the South and West Point permit be identical to avoid any confusion. Therefore please delete the last sentence in the section that reads "In addition, the Permittee shall be required to develop a Memorandum of Understanding (or Interlocal Agreement) that outlines the specific roles, responsibilities, and pretreatment activities of each jurisdiction."

2) Since the Section 10 was removed from this permit, can Section 11-14 be renumbered to be sequential?

3) Attached to the Fact sheet is Appendix E with data from DMRs. The fourth table in that appendix appears to be reclaimed water data but it is not labeled as such and further identifies the data as being from outfall #2. This is confusing since in the rest of the permit Outfall #2 refers to the Green River. It is suggested that this table be removed or renamed to identify it as reclaimed water.

Ecology Response 1:

1. The permit was modified to exclude the sentence as requested.
2. This correction was made to the permit
3. The DMR data for the Water Reclamation Plant will remain in the fact sheet since it was permitted under the NPDES permit during the previous permit cycle. The discharge from the Water Reclamation Plant is identified as monitoring point #2 in the WPLCS database. This is the database which is used to storage the DMR data that is submitted by Permittee. The table was changed to clearly indicate that the data include on the table is for monitoring point #2, the Water Reclamation Plant discharge.

Comment 2:
From Gale Cool, Bainbridge Island Property Owner

My company, Lovell Associates, Inc., and our family, own a number of Bainbridge Island waterfront and beach parcels that front on Rich Passage. In the past few years, we have suffered property damage from a massive increase in the amount of Ulva (sea lettuce) covering our beach (please see the attached recent photograph taken from our beach). It is very likely that this Ulva growth is fueled by excess anthropogenic nutrients being deposited in Puget Sound from, among other sources, sewer outfalls like that of the King County South Wastewater Plant.

It is apparent, from communications I have had with various experts that King County's South Plant does very little to monitor, or effectively limit, these nutrients in its effluent. The Brightwater Plant may be designed to be similarly ineffective at removing nutrients, too. From recent studies done at Hood Canal (and from studies conducted at many other locations around the world, as well) it is widely recognized that the cumulative effect of anthropogenic nutrients from sewage (known as Total Nitrogen Pollution) directly contributes to a host of severe water-quality and environmental problems including the feeding of seasonal algal blooms, reduced dissolved oxygen levels in nearshore marine waters, and the shading and destruction of eelgrass beds--to name just a few well documented negative effects of anthropogenic nutrients.

Based upon data that I have received, it appears that approximately 18,500 pounds of nutrients (Total Nitrogen Pollution) PER DAY (6,750,000 pounds per year!) are currently being discharged directly into Puget Sound by the King County South Wastewater Plant alone. For comparison, this amount is approximately 33 times the mean annual estimated quantity of sewage nutrients that are now thought to be "killing" Hood Canal. This discharge of nutrients from the South Wastewater Plant is currently not monitored by Ecology, nor is any attempt being made to limit this discharge.

Therefore, I request that the renewal of the NPDES permit for the South Wastewater Plant, and other plants (like Brightwater) requesting NPDES permits for the discharge of effluent to mid-Puget Sound, be conditioned upon a requirement to immediately monitor for nutrients in their influent and effluent. Furthermore, I request that The Department of Ecology require that King County Wastewater immediately undertake comprehensive studies of outfall-nutrient disbursement patterns, and their effects, from the South Plant (and other outfalls, like Brightwater, as those permits are due for renewal, or for new issuance)--with a special look at effects upon shallow and semi-enclosed mid-Sound embayments like Pleasant Cove (off Rich Passage). Furthermore, if the cumulative contribution of nutrients from these outfalls (among others) are revealed to be deleterious to the water quality and the biota of Puget Sound, that your agency immediately require the limitation of such effluent nutrients reaching Puget Sound. If studies of nutrients' distribution and/or effects, or monitoring of nutrients, have already been done by King County Wastewater, I also request that DOE require the release of the results of all King County Wastewater's previous studies, disbursement models, data, reports and investigations as a condition of any pending, or future, NPDES permits.

Please inform me of the dates of hearings and comment-periods for this, and similar NPDES sewer outfall permits in the vicinity of Bainbridge Island.

Sincerely yours,

Gale Cool
4411 Point White Drive
Bainbridge Island, WA 98110
(206) 842-0070

Ecology Response 2:

Mr. Cool requests that the renewal of the NPDES permit for the South Wastewater Plant, and other plants (like Brightwater) requesting NPDES permits for the discharge of effluent to mid-Puget Sound, be conditioned upon a requirement to immediately monitor for nutrients in their influent and effluent.

Ecology Response: King County extensively monitors for nutrients in the effluent, in the vicinity of the outfall, and at Puget Sound stations distant from the outfall. Specifically, the King County South Treatment Plant currently monitors for various nitrogen compounds in specific process streams for process control purposes. The table below specifically details the current monitoring schedule for nitrogen compounds present in the plant influent and effluent.

Monitoring Point	Ammonia (NH_3 as N)	Organic Nitrogen	Nitrate (NO_3^-)	Nitrite (NO_2^-)	TKN (Total Kjeldahl Nitrogen)	Total N
Influent	Daily	Calculated = TKN-Ammonia	Weekly	Weekly	Daily	Calculated = TKN +Nitrate +Nitrite
Effluent	Daily	Calculated = TKN-Ammonia	Weekly	Weekly	Daily	Calculated = TKN +Nitrate +Nitrite

The above data has been reported to the Department on a monthly basis along with the Discharge Monitoring Report (DMR). King County must provide this information to other governmental agencies and to the public upon request.

While the Department does not currently require nutrient monitoring in the South Treatment Plant NPDES permit, King County has monitored and plans to continue to monitor for nitrogen compounds in their discharge. In addition, the extensive monitoring that has already been done provides an accurate characterization of nitrogen compounds discharged by the plant.

Mr. Cool requests that The Department of Ecology require that King County Wastewater immediately undertake comprehensive studies of outfall-nutrient disbursement patterns, and their effects, from the South Plant (and other outfalls, like Brightwater, as those permits are due for renewal, or for new issuance)--with a special look at effects upon shallow and semi-enclosed mid-Sound embayments like Pleasant Cove (off Rich Passage).

Ecology Response: Ecology requested King County respond to this comment. Their response is provided below.

<u>King County Studies Related to Nitrogen Inputs to Puget Sound.</u>

King County extensively monitors for nutrients in the wastewater effluent, in the vicinity of the outfall, and at Puget Sound stations distant from the South Plant outfall. KC has done, and continues to do extensive modeling on the circulation and nutrient conditions of Puget Sound, both related to the future Brightwater Treatment Plant and the Puget Sound in general. These studies are being done in partnership with DOE, UW and others.

Below is a listing of various King County studies related to nitrogen inputs to Puget Sound. Some of the information and data can be obtained via King County Websites. All the data and information can be obtained by contacting the **King County Dept. of Natural Resources and Parks, 201 S. Jackson Street, Suite 700, Seattle, WA 98104. Phone: (206) 296-6500. Fax: (206) 296-3749. TTY: (800) 833-6388**

1. **Puget Sound "Ambient" Sampling Program:** King County routinely and extensively samples for nutrients both in effluent and in Puget Sound in the immediate vicinity of the treatment plant outfalls and at "baseline" stations not directly affected by discharge. This data is analyzed to determine if the outfall is increasing ambient nutrient concentrations. Initial analysis suggests that there is no significant increase in N in the vicinity of the South Plant outfall.

A study by US and Canadian scientists addressed the relative contribution of wastewater nutrients to Puget Sound. This paper shows that the nutrient input from KC outfalls is <1% of the oceanic input.

"An Assessment of Nutrients, Plankton and Some Pollutants in the Water Column of Juan de Fuca Strait, Strait of Georgia and Puget Sound, and their Transboundary Transport." Harrison, Mackas, Frost, MacDonald and Crecelius, 1994, Canadian Technical Report of Fisheries and Aquatic Sciences, No. 1948.

2. Outfall Plume Modeling for NPDES Permits: Mathematical modeling and measurements of physical parameters such as temperature and salinity allow KC and DOE scientists to estimate the location and degree of dilution of the discharge plume. This work indicates that the plume rarely/never brings the nutrients from the South Plant into the lighted upper layers of PS where the nutrients could contribute to plant growth.

3. Puget Sound Marine Environmental Monitoring (PSMEM) Program: King County is a founding member of this group, along with the WA. Dept. of Ecology, UW, and US Navy. This group is developing a Sound-wide physical model and biogeochemistry model that could be used to estimate the effects of nutrients on the Sound. In the Aquatic Biogeochemistry (ABC) Modeling effort, KC, DOE and UW staffs are developing a large-scale model of nutrients, phytoplankton and zooplankton that is tied to the UW PRISM model of Puget Sound. More information can be found at:

http://www.psmem.org/index.html

4. Studies for Siting the Brightwater Outfall: In conjunction with the siting studies for the Brightwater plant, a large program of oceanographic studies was undertaken in the main basin of Puget Sound. This included measurements and modeling of currents, modeling of outfall plume

behavior, and studies on the effect of nutrients on plant production. These studies can be obtained from King County via the following website:

http://dnr.metrokc.gov/wtd/brightwater/library.htm

5. Study of Ulva blooms in nearshore PS waters: King County sampled nearshore areas of PS to better understand the nutrient contributions that led to large Ulva blooms (green seaweed). The sampling showed that nearshore areas with restricted circulation and/or freshwater inputs had notably higher nutrient levels than the open Sound. Thus, the most probable routes for adding the increased nutrients were via freshwater streams and groundwater (i.e., not the Sound). Sources of the nutrients in these areas include septic tanks, stormwater runoff, fertilizers, etc.

Prepared by
Randy Shuman and Rick Butler, King County DNRP
Sept. 28, 2004.

Mr. Cool requests that if the cumulative contribution of nutrients from these outfalls (among others) are revealed to be deleterious to the water quality and the biota of Puget Sound, that your agency immediately require the limitation of such effluent nutrients reaching Puget Sound.

Ecology Response: There is no specific water quality standard (WQS) for nutrients discharged to the central region of Puget Sound. Protection of aesthetic values is included in narrative form in State Water Quality Standards, thus nutrients can be limited in discharge permits if a link with aesthetic problems in the receiving waters can be demonstrated. However, studies to this point have shown little evidence that nutrients from wastewater treatment plants are having a significant impact on aesthetic values, such as algal blooms, in central Puget Sound. The Department will continue to closely monitor the effects of nutrients in permitted discharges to Puget Sound, and if future scientific studies indicate a more direct correlation with algal blooms the Department will use its authority to regulate nutrients in NPDES effluent limits. At this time, however, the Department believes that requiring expensive nutrient control at wastewater treatment plants is not warranted and would not result in measurable improvements to problem algal blooms.

In addition to indirect aesthetic impacts, there is a toxicity water quality standard under WAC 173-201A for Ammonia (un-ionized NH3) for marine waters. Ecology calculates the probability to exceed the WQS in order to determine if it is necessary to place a limit on the discharge of a pollutant. The following calculations show that the South Treatment Plant does not have a reasonable potential of exceeding the WQS for Ammonia outside the applicable mixing zone. Using the limit spreadsheet, an Ammonia limit can be calculated based on the fraction of un-ionized Ammonia that is assumed to be present at the stated conditions and at the edge of the applicable mixing zone. The limit would be in 346.2 mg/L ammonia on monthly average basis and 906 mg/L on a daily maximum basis. The limit for ammonia based on the South Treatment Plant's applicable dilution would be approximately 10 times greater than the average ammonia currently discharge by the plant on a monthly basis.

Refer to the attached Excel spreadsheets.
Appendix C, Table1, Calculation for Un-ionized Ammonia
Appendix C, Table 2, Calculation for Reasonable Potential
Appendix C, Table 3, Calculation for Limit Ammonia
Appendix C, Figure 4, Effluent Ammonia Concentration, provide by King County

Mr. Cool requests that DOE require the release of the results of all King County Wastewater's previous studies, disbursement models, data, reports and investigations as a condition of any pending, or future, NPDES permits.

The results of all studies done by King County must be made available to the public upon request as King County is subject to the State Public Disclosure Act.

APPENDIX D--OUTFALL DIAGRAMS

APPENDIX E--DISCHARGE MONITORING REPORT DATA

APPENDIX F--TECHNICAL CALCULATIONS

Several of the Excel® spreadsheet tools used to evaluate a discharger's ability to meet Washington State water quality standards can be found on the Department's homepage at (http://www.ecy.wa.gov/programs/wq/wastewater/index.html

Table A: *Water Quality Criteria for Marine Outfall*

Table B: *Reasonable Potential for Marine Outfall*

Table C: *Limit Calculation for Marine Outfall*

Table D: *Reasonable Potential for Health – Marine Outfall*

Table E: *Water Quality Criteria for Green River Outfall*

Table F: *Reasonable Potential for Green River Outfall*

Table G: *Limit Calculation for Green River Outfall*

Table H: *Reasonable Potential for Health – Green River Outfall*

Table I: *pH mixture for Green River Outfall*

APPENDIX G--EXPANDED EFFLUENT TESTING DATA

APPENDIX H-- EPA "PART D" NPDES APPLICATION TESTING REQUIREMENTS