SUPPLEMENTAL SECTION B-3

WATER RESOURCES REPORT

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SUPPLEMENTAL SECTION B-3
WATER RESOURCES REPORT

B-3.1 EXISTING CONDITIONS

This section summarizes existing information on surface water and groundwater resources in the vicinity of the proposed plant site.

B-3.1.1 Surface Water

The Satsop CT Project site is located in the lower Chehalis River Valley near Elma, Washington (Figure B-3-1). The site is situated along the southern bank of the Chehalis River with Fuller Creek approximately 0.5 miles to the east and Workman Creek 2 miles to the east. Both Fuller and Workman creeks drain into the southern side of the Chehalis River. Fuller Creek's drainage basin faces northeast and covers approximately 2 square miles. The Workman Creek drainage basin, which drains into the Chehalis River east of the plant site, faces northeast and covers approximately 16 square miles. The Satsop River basin, approximately 2.5 miles from the site, faces south and covers an area of 299 square miles (PNRBC 1970). A small drainage basin between Workman Creek and Fuller Creek is drained by Purgatory Creek.

Mean annual precipitation near Satsop is approximately 70 inches (Western Regional Climate Center 2001). The Chehalis River system is principally fed by rainfall. Approximately 85 percent of the annual precipitation occurs between October and April, whereas water resource demand is greatest during July and August (WSDOE 1975). Annual precipitation quantities recorded at Elma, Washington, and at the Satsop site are listed in Table B-3-1.

Table B-3-1
Chehalis River Temperature Data from Porter Station

Date	Temperature (°C)	Date	Temperature (°C)	Date	Temperature (°C)
10/5/70	14	5/21/75	14.4	11/23/92	7.4
10/20/70	10.5	5/26/75	14.1	12/22/92	5.6
11/5/70	7.0s	6/9/75	16.6	1/27/93	7.8
11/20/70	7	6/23/75	14.8	2/24/93	3.2
12/5/70	5	7/14/75	18.3	3/24/93	8.2
12/20/70	9.5	7/16/75	17.6	4/28/93	9.9
1/5/71	3	7/28/75	20.6	5/26/93	15.8
1/20/71	5.5	8/12/75	18.4	6/30/93	10.5

Table B-3-1 (Continued)
Chehalis River Temperature Data from Porter Station

Date	Temperature (°C)	Date	Temperature (°C)	Date	Temperature (°C)
2/5/71	5.5	8/14/75	18.2	7/28/93	17.2
2/20/71	4.5	8/25/75	15.7	8/25/93	15.8
3/5/71	4.5	9/2/75	15.4	9/29/93	14.7
3/20/71	8.5	9/15/75	16.6	10/26/93	11.1
4/5/71	11	9/16/75	15.9	11/22/93	5.5
4/20/71	10	10/19/77	11.2	12/20/93	4.6
5/5/71	13.5	11/14/77	10.2	1/25/94	7.4
5/20/71	13	1/17/78	7.2	2/22/94	5.4
6/5/71	17	2/6/78	8	3/29/94	9.6
6/20/71	15	3/7/78	7.5	4/26/94	10.5
7/5/71	15.5	4/10/78	10.2	5/24/94	18.1
7/20/71	24	5/9/78	14.2	6/28/94	20.5
8/5/71	22	6/5/78	10.3	7/26/94	22.1
8/20/71	20	7/5/78	6.6	8/23/94	19.8
95/71	15.5	8/7/78	21	9/27/94	18.4
9/20/71	15	10/16/79	12.2	10/23/94	10.4
10/4/71	13.5	11/20/79	5.5	11/27/94	5.3
10/26/71	9	12/19/79	8.9	12/27/94	7.9
11/2/71	6.3	1/21/80	6.3	1/23/95	4.9
11/29/71	8	2/28/80	9.6	2/26/95	8.1
12/6/71	5.9	3/27/80	8.2	3/27/95	7.3
12/20/71	5.8	4/22/80	11.4	4/24/95	11
1/3/72	3.8	5/28/80	13.8	5/21/95	15.4
1/7/72	5.5	6/24/80	16.8	6/26/95	18.8
2/1/72	2.2	7/15/80	18.2	7/24/95	19.6
2/14/72	5.6	8/13/80	17.8	8/28/95	17.8
3/6/72	6.7	11/9/81	8	9/25/95	16.3
3/20/72	8.7	1/5/82	3.5	10/23/95	10.3
3/28/72	--	3/8/82	8.5	11/27/95	9.1
4/3/72	8.7	5/11/82	10	12/18/95	7.4
4/17/72	7.4	7/13/82	19.5	1/29/96	4.3
5/1/72	9.5	9/23/82	14.5	2/26/96	4.9
5/15/72	15.5	11/15/82	4	3/25/96	7.9

Table B-3-1 (Continued)
Chehalis River Temperature Data from Porter Station

Date	Temperature (°C)	Date	Temperature (°C)	Date	Temperature (°C)
6/5/72	16.9	1/10/83	9	4/28/96	10.1
6/19/72	18.1	3/15/83	10	5/27/96	14.1
7/5/72	21	5/24/83	19	6/23/96	15.6
7/17/72	21	7/22/83	19	7/29/96	21.2
7/31/72	21	9/22/83	14.5	8/26/96	19.2
8/14/72	17.8	11/18/83	8.5	9/23/96	12
9/5/72	18.4	1/10/84	7.5	10/28/96	8.3
9/18/72	15	3/1/84	8	11/24/96	4.8
10/3/72	--	5/24/84	9.5	12/15/96	5.2
10/16/72	10.2	7/18/84	20.5	1/27/97	2.5
10/30/72	6.2	9/20/84	15	2/25/97	5.6
11/13/72	7.2	11/16/84	7	3/25/97	8.9
11/27/72	5.8	1/28/85	4	4/29/97	10.1
12/19/72	6.4	3/18/85	8.5	5/27/97	14.1
12/26/72	7.6	5/20/85	15.5	6/23/97	14.9
1/8/73	0.6	7/22/85	22.6	7/29/97	18.7
1/22/73	4.5	9/23/85	15	8/26/97	17.9
2/5/73	4.4	11/12/85	4.5	9/29/97	13.9
2/20/73	5.4	1/23/86	6.5	10/27/97	8.3
3/5/73	7.7	3/24/86	8	11/23/97	7.6
3/19/73	6.2	5/30/86	18.5	12/28/97	4.8
4/2/73	7.7	7/22/86	19	1/26/98	6.7
4/16/73	11.5	9/23/86	13	2/23/98	5.7
5/17/73	8.2	11/18/86	7	3/23/98	8.8
5/14/73	16.6	1/27/87	6	4/27/98	10.9
6/5/73	16.7	3/25/87	8.5	5/25/98	11.9
6/18/73	15.5	5/6/87	14.5	6/28/98	16
7/10/73	18.7	7/8/87	17	7/27/98	21.8
7/23/73	17.5	9/10/87	18	8/24/98	16.3
8/13/73	19.6	11/18/87	4.5	9/28/98	13.9
8/27/73	15.4	1/28/88	6	10/26/98	10.2
9/10/73	17.5	3/30/88	7.5	11/16/98	8.3
9/24/73	14.6	5/25/88	14	12/20/98	2.7

Table B-3-1 (Continued)
Chehalis River Temperature Data from Porter Station

Date	Temperature (°C)	Date	Temperature (°C)	Date	Temperature (°C)
10/15/74	13.2	7/21/88	20.5	1/25/99	4.5
10/28/74	10.3	9/27/88	12.5	2/22/99	5.3
10/30/74	10.2	11/17/88	7.5	3/29/99	5.5
11/12/74	9.9	1/13/89	4.5	4/26/99	10.7
11/18/74	9.2	3/24/89	7.5	5/17/99	10
11/19/74	8.4	6/7/89	12	6/27/99	14
12/9/74	7.8	7/18/89	18	7/26/99	16.2
12/16/74	7.9	9/20/89	10.5	8/23/99	17.7
12/20/74	10.8	11/30/89	6.5	9/27/99	12.3
1/13/75	5.4	11/30/89	6.5	10/25/99	9
1/22/75	6.4	4/4/90	11	11/15/99	8.4
1/27/75	4.5	5/24/90	10.5	12/13/99	6
2/18/75	5.9	7/25/90	17.5	1/24/00	5.7
2/20/75	5.5	8/20/90	20.5	2/21/00	4.3
2/24/75	6	12/12/90	6.5	3/27/00	6.9
3/10/75	6.3	1/23/91	4	4/24/00	9.7
3/12/75	7.3	3/21/91	8	5/22/00	12.3
3/24/75	6.2	6/6/91	13	6/26/00	15.5
4/9/75	8.9	7/18/91	17	7/24/00	16.4
4/14/75	9.1	9/19/91	17.5	8/28/00	17.2
4/28/75	9.4	10/28/92	11	9/25/00	13.2
5/12/75	14.2				

Source: USGS 1970-1991

B-3.1.1.1 Stream Flow

In accordance with Chapter 173-522, Washington Administrative Code (WAC), and general rules of the Department of Ecology (Ecology), the base flows for the Satsop CT Project were established at monitoring station 12.0350.02, and are presented in Table B-3-2. On those days not specifically identified in the table, Ecology plots a straight-line graph between the dates and flows shown in the table to determine base flow. This monitoring station, located at the outfall for the Satsop CT Project, has not been in operation since the early 1980s; however the USGS is in the process of re-establishing the station.

Table B-3-2
Annual Precipitation

Year	Elma, Washington (inches)	Satsop Site (inches)
2000	45.11	55.83
1999	86.33	95.68
1998	77.43	82.12
1997	93.24	92.63
1996	87.83	90.05
1995	75.23	79.38
1994	74.37	86.64
1993	48.12	55.11
1992	52.20	57.05
1991	75.03	70.65
1990	80.91	96.86
1989	57.60	64.49
1988	63.86	69.26
1987	53.12	59.32

Data from NOAA 1987-2000; Energy Northwest 2001

Table B-3-3
Base Flow for Monitoring Station 12.0350.02
(Chehalis River at Outfall)

Month	Day	Base flow (cfs)	Month	Day	Base flow (cfs)
January	1	3800	July	1	1085
January	15	3800	July	15	860
February	1	3800	August	1	680
February	15	3800	August	15	550
March	1	3800	September	1	550
March	15	3800	September	15	550
April	1	3800	October	1	640
April	15	3800	October	15	750
May	1	2910	November	1	1305
May	15	2300	November	15	2220
June	1	1750	December	1	3800
June	15	1360	December	15	3800

Source: Chapter 173-522, Washington Administrative Code

In the meantime, Ecology estimates flow at this monitoring station by taking the flow in the Satsop River near Satsop and adding the flow of the Chehalis River as measured at Porter, approximately 10 miles upstream of the confluence of the Satsop, and a calculated flow for Cloquallem Creek based on historical data. Figures B-3-2, B-3-3, and B-3-4 are Ecology's exceedance hydrographs for the Chehalis River at Porter, the Satsop River at Satsop, and Cloquallem Creek, respectively.

A review of the exceedance data shows that low flow conditions in the Chehalis River at Satsop typically occur from July to September, but also may occur at any time of the year. Annual peak discharge typically occurs November through March. This annual peak discharge is a result of winter storms, which produce excess rainfalls. During periods when flows are below the base flow requirement, some withdrawals may be restricted by Ecology. However, water rights issued prior to 1973 are not subject to flow restrictions.

B-3.1.1.2 Water Quality in the Site Vicinity

General water quality and flow data for the Chehalis River at the Porter station upstream from the site are presented in Table B-3-3. This station is the closest station to the site to have analytical water quality testing for general chemistry parameters and study of water flow. Most of the parameters vary seasonally; concentrations of suspended solids, turbidity, and dissolved oxygen levels are highest during high flow events and lowest during low flow periods. Seasonal water temperature data for the Porter station are presented in Table B-3-4. River water temperature ranged between 0.6°C on January 8, 1973, to slightly greater than 24°C on July 20, 1971. Average seasonal river water temperature ranged between 4.0°C to 22°C annually.

River water quality in the Chehalis River is considered Class A in the vicinity of the site (Chapter 173-201A WAC). Water quality of this class must meet requirements for many uses, including water supply, stock watering, fish and shellfish existence, wildlife habitat, recreation, commerce, and navigation. Water quality requirements for Class A waters include limits on fecal coliform organisms, dissolved oxygen, total dissolved gas, temperature, pH, toxic substances, and impacts to aesthetic values.

Table B-3-4
Chehalis River Water Quality Data and Flow Rate

	1997			1998			1999		
	Mean	Range	n[b]	Mean	Range	n[b]	Mean	Range	n[b]
Flow (cfs)	3593	450 - 9460	12	1970	439 - 6050	12	4406	344 - 14100	9
Specific Conductivity (µmhos/cm)	84	60 - 132	12	87.3	56 - 109	12	81	50 - 108	12
pH (S.U.)	7.4	6.9 - 7.9	12	7.5	7.0 – 7.7	12	7.3	7.0 - 7.6	12
Temperature (°C)	10.6	2.5 – 18.7	12	11.1	2.7 – 21.8	12	10.0	4.5 – 17.7	12
Turbidity (NTU)	6.8	1.9 - 19	12	7.5	1.3 - 23	12	9.7	1.3 - 32	11
Dissolved Oxygen (mg/l)	9.9	8.0 - 11.7	12	9.7	7.1 – 11.3	12	10.1	8.0 - 11.2	12
Ammonia Nitrogen (mg/l)	0.019	0.010 – 0.033	12	0.016	0.010 – 0.031	12	0.027	0.010 – 0.04	11
Total Phosphorus (mg/l)	0.062	0.039 – 0.104	12	0.043	0.016 – 0.08	12	0.056	0.036 – 0.101	11
Total Suspended Solids (mg/l)	10.6	4 - 28	12	13.1	3 - 44	12	19.6	3 - 77	11
Nitrites and Nitrates (mg/l)	0.6	0.4 - 0.8	12	0.7	0.4 – 1.4	12	0.6	0.4 – 0.8	11
Fecal Coliform (colonies/100 ml)	53	11 - 140	12	58	10 - 170	12	61	3 - 360	11

[a] Data are for Porter Station (Washington Department of Ecology)
[b] n = Total number of data values

B-3.1.2 Groundwater

B-3.1.2.1 Groundwater Occurrence

Significant groundwater aquifers in the plant site vicinity occur in the alluvial valleys of the Chehalis, Satsop and tributary rivers and in smaller perched aquifers in the marginal terrace deposits. Little useable water occurs in the underlying Tertiary bedrock (WPPSS 1982). The alluvial deposits are approximately 100 feet thick north of the site vicinity, and extend to depths of as much as 200 feet in the lower Chehalis River valley (See Figure B-3-5). The alluvial aquifer under the Satsop Power Plant property consists of alluvial sediments including sand, gravel, and silt and is confined by a thin layer of silt flood deposits, approximately 11 feet thick. Groundwater flow in the alluvial aquifer is likely to generally parallel the flow of the Chehalis River, toward the west. During periods of low river flow, the flow direction in the aquifer would likely be skewed toward the river, where it would discharge; during high river flow periods, flow direction would be skewed toward the valley walls due to aquifer recharge from the river. According to aquifer tests performed prior to installation of the Ranney collector system, the gradient of the potentiometric surface is estimated to be approximately 15 foot per mile in a down-valley direction, (WPPSS 1974). The alluvial aquifer extends north approximately 2 miles across the Chehalis River Valley, about 14 miles downstream to Grays Harbor, and about 15 miles upstream to the eastern limit of Grays Harbor County. The northern, southern, and basal boundaries of the alluvial aquifer are formed by a Tertiary sandstone formation that occurs at the southern portion of the site, and contains little groundwater.

Groundwater depths in the alluvium may range from near-surface in slough and wetland areas to greater than 20 feet below ground surface. Reported groundwater withdrawal rates from wells in the eastern Grays Harbor County area range from 5 gallons per minute (gpm) for domestic supplies to over 900 gpm for irrigation purposes (WSDOE 2001). Wells screened at depths of less than 100 feet typically yield lower quantities whereas those screened below 100 feet potentially yield up to 3,000 gpm. The interconnection between shallow and deep groundwater in the alluvial aquifer and surface water sources such as the Chehalis River is known to be high. Groundwater wells screened in the alluvium typically draw upon both groundwater and surface water sources. Recharge to the alluvial aquifer is from direct precipitation as well as from surface water sources (e.g., Chehalis River).

As a part of investigations related to the nuclear projects, a pumping test of the aquifer was performed in anticipation of installing the Ranney wells in alluvial deposits at the confluence of the Satsop and Chehalis Rivers (current raw water well location). Test results indicated that average transmissivity of the aquifer is 1,242,000 gallons per day per foot (gpd/ft) and the aquifer is hydraulically connected with the Satsop River (WPPSS 1974). Pumping tests after the Ranney wells' installation in 1980 yielded an aquifer transmissivity of approximately 560,000 gpd/foot. Natural groundwater flow conditions are governed by the transmissivity and gradient of the aquifer. Based on the pumping test data from the Ranney collector system, the calculated natural underflow in the alluvial aquifer is approximately 8 to 18 million gallons per day per one mile of aquifer width. More accurate calculation of this value is difficult due to the Ranney wells' interaction with both the aquifer and surface water systems and limitations in separating the ground and surface water components of the flow.

Smaller, discontinuous perched aquifers, which occur in the unconsolidated terrace deposits on Satsop CT Project and Satsop Development Park property, lie above the alluvial valley (WPPSS 1982). The groundwater level in the terrace deposits beneath the property varies from 15 to 50 feet below ground surface. The flow of water through the perched aquifers is locally controlled by topography. Flow will likely tend toward the Chehalis river valley, where it will join the regional groundwater system (See Figure B-3-5). Recharge to the terrace deposits is by direct infiltration.

A comparison between groundwater and surface water quality is discussed below.

B-3.1.2.2 Groundwater Wells in the Site Vicinity

No groundwater wells exist on the Satsop CT property. Groundwater wells on Satsop Development Park property include a groundwater collection system referred to as the Ranney collector system (makeup water well), the raw (potable and construction) water well, and a small domestic well. Other domestic wells occur in the area (within several miles of the site), and are generally located to the west of the site or on the north side of the river. Three domestic wells are known to be screened in the terrace deposits.

The Ranney wells consist of two vertically placed caissons that penetrate beneath the Chehalis River bed within the alluvial gravel beneath the river. The caissons are connected to a tier of horizontal collector laterals that extend in a radial pattern from the caisson. Each caisson potentially yields 26 million gallons per day (mgd) (40 cfs) (WPPSS 1984). Pump tests completed in the collector system indicate the wells draw surface water from the Chehalis River as well as groundwater in the alluvium. It was determined that the Ranney wells derive up to 88 percent of their supply from the Chehalis River via infiltration, with the remaining 12 percent drawn from the surrounding alluvial aquifer (WPPSS 1982). Drawdown effects resultant from pumping 20,833 gpm were estimated to lower water levels in surrounding farm and irrigation wells 1 to 2.5 feet.

B-3.1.3 Comparison Between Surface and Groundwater Quality

WPPSS initiated a 1-year sampling program (November 1980 to October 1981) to determine metal concentrations in the Chehalis River at an intake area, a discharge area, at the South Elma Bridge area, and at a well at the plant intake area (Well APW) (Envirosphere 1982). Water quality data provided by WPPSS are available for the Chehalis River, the Ranney collector system (Ranney wells, also referred to as Wells #1 and #3, Makeup Well, and Well APW), the raw water well, and regional groundwater wells. Descriptions and comparisons of surface and groundwater quality as identified by the 1-year sampling program are provided below according to water quality categories.

B-3.1.3.1 Metals

Metal concentrations in Well APW were very low for the majority of measured constituents (barium, cadmium, chromium, copper, iron, lead, manganese, mercury, nickel, selenium, and zinc) except calcium, magnesium, potassium, and sodium (Envirosphere 1982). Metal concentrations in the Chehalis River were low except for iron and mercury. Total and dissolved metal concentrations in Well APW were generally similar, with the exception of iron which showed higher total concentration compared to dissolved. The higher total concentration likely represents particulate iron or iron associated with sediment that would settle out in the cooling tower basin prior to use at the facility. In river water, total metal concentrations were often greater than dissolved concentrations. Generally, metal concentrations were lower in groundwater than surface water, except for concentrations of calcium, magnesium, potassium, and sodium which were somewhat higher in groundwater than surface water. Metals concentrations in the Chehalis River did not appear affected by streamflow rates or turbidity levels and groundwater quality did not appear to be affected seasonally.

B-3.1.3.2 Hardness

Average hardness levels at Porter ranged between 24.3 to 31 milligrams per liter (mg/l) as $CaCO_3$ whereas in groundwater, maximum hardness levels were measured at 92 mg/l as $CaCO_3$ (groundwater well number 17/7-7P1). Hardness levels in the Ranney wells (Wells #1 and #3) were 32 and 77 mg/l as $CaCO_3$, respectively.

B-3.1.3.3 Conductivity

Average values of specific conductance in the Chehalis River at Porter ranged from 77 to 96.6 micromhos per centimeter (umho/cm) whereas groundwater concentrations ranged from nondetectable levels to 140 umho/cm in the raw water well and from 112 to 225 umho/cm in the domestic well. Conductivity levels in the Ranney wells ranged from 110 to 160 umhos/cm.

B-3.1.3.4 Nitrate/Nitrite

Nitrate/nitrite concentrations in groundwater and surface water sources in the site vicinity were generally less than 1 mg/l. Detectable nitrate in both Well #1 and #3 was 0.9 mg/l, whereas nitrate/nitrite levels in the Chehalis River at Porter ranged from 0.50 to 0.68 mg/l, as reported by Envirosphere (1982).

B-3.1.3.5 Turbidity

Chehalis River at Porter had relatively low turbidity levels. Average turbidity levels ranged from 1.9 to 10 nephelometric turbidity units (NTU) whereas levels in the domestic well ranged from 1.2 to 46 NTU. The turbidity level in Well #1 (Ranney well) was 1 NTU (sampled September 13, 1993).

B-3.1.3.6 pH

Groundwater pH was slightly higher than in the river. Average pH in Well APW was 7.2, whereas average pH in the Chehalis River ranged from 7.0 to 7.1 (Envirosphere 1982).

B-3.1.3.7 Temperature

Water temperature data (Envirosphere 1982) for the Ranney wells collected during the period November 1980 to October 1981 (49 samples total) are summarized below:

- Mean temperature = 10.6 °C (51°F)
- Range = 10.4 - 10.8 °C (50 to 51.4°F)

Groundwater temperatures were relatively constant, whereas surface water temperatures fluctuated seasonally. Water temperatures in the Ranney wells were similar to the mean water temperature in the Chehalis River. The difference between the high and low temperatures in the wells was less than in the Chehalis River. Changes in water temperature in the wells apparently lags approximately 2 months behind river water temperature (Schinnell 1994) and the high and low temperatures are significantly attenuated in magnitude. The difference in temperature is probably due to the lag time and thermal storage within the aquifer beneath the river.

B-3.1.3.8 Existing Water Appropriations

Existing surface water right appropriations in the Chehalis Basin include water for domestic, municipal, irrigation/agricultural, power, commercial, and fish propagation purposes. Critical periods for potential impacts of water withdrawals to the environment and to existing surface water rights occur during low flow periods, typically from July through October.

A water right provides legal authorization to use a certain amount of surface water or groundwater for specific beneficial purposes. Diversion of surface or groundwater requires a water right except for minimal diversions. The proposed water use must satisfy statutory requirements in order for Ecology to issue a water right permit. Statutes require beneficial use of the water, the use must not cause impairment of existing rights, there must be water available for appropriation, and issuance of the water right must not be deemed detrimental to the public's interest.

A review of current surface and groundwater appropriations filed with Ecology indicates that industry is the largest appropriator in the basin (42 percent of the total consumptive use appropriations) followed by municipal (44 percent), irrigation (1.2 percent), and domestic use (1.1 percent). Municipal supply uses both surface and groundwater resources. In-stream flows are necessary to maintain anadromous fish populations that attract sport and commercial fishing interests. In-stream flow appropriations are also pursued for subsistence fishing and aesthetic concerns.

Ecology has established a water resources program for the Chehalis River basin in order to establish base flow, provide protection for future allocations, establish a priority scheme for future rights during water shortage periods, and identify streams closed to further consumptive appropriations (WAC 173-522). No streams in the near-site vicinity are closed to appropriations. Base flow requirements for the Chehalis River below the confluence with the Satsop River (Station Number 12.0350.02) have been developed by Ecology for maintenance of instream flows (see Table B-3-2).

The Chehalis River basin is divided into two Water Resources Inventory Areas (WRIA) which divide the drainage area into an upper basin (WRIA-23) and lower basin (WRIA-22). The site is located in the upper portion of the lower basin. Specific water resource management goals are assigned to each separate WRIA including base flow regulations. Base flows are in-stream flow limits which allow "preservation of wildlife, fish, scenic, aesthetic, and other environmental values, and navigational values" (WSDOE 1975). While existing water right permits are not affected by base flow restrictions, future water right permits and certificates will not allow appropriation of surface water from the Chehalis River and its tributaries below the base flow levels specified by regulation. In addition, future groundwater appropriations will be affected by base flow provisions if the groundwater in question is determined to be in hydraulic continuity with the affected stream section.

Several surface water and groundwater users have been identified in the area of the Ranney wells. The intended use for is for domestic, stockwater, and irrigation purposes. Ecology's listing of water right permits for the Ranney well area include withdrawal quantities ranging from 300 gpm to 800 gpm.

B-3.2 ENVIRONMENTAL IMPACTS OF PROPOSED PROJECT

This section describes the proposed water supply sources for the proposed project, and addresses potential impacts to surface water and groundwater due to construction and operation of the Phase II project. Surface water runoff controls during operation are presented below and in the approved Erosion Control Plan.

B-3.2.1 Surface Water

Runoff from the site will be routed to the C-1 erosion control pond, located on Satsop Development Park property to the west of the site. The C-1 pond is designed and maintained to store runoff from the 100-year rainfall event. If necessary, surface water runoff from the site can be pumped through a series of ditches and culverts to the Satsop Development Park's existing Equalization Pond. This pond would provide additional storage capacity during construction if surface water runoff is unusually high. As a result of implementation of this plan, surface water impacts due to construction of the plant will be temporary and minor.

B-3.2.2 Groundwater

The Phase II project is situated on terrace deposits with smaller, discontinuous perched aquifers which may contribute little recharge to adjacent surface water bodies. In addition, the gravel fill currently on the site is underlain by a liner which restricts water infiltration. As a result, plant construction will not have a significant impact on groundwater resources.

B-3.2.3 Process Water Withdrawal

Process water will be supplied from the existing Ranney wells and transported through the existing supply (make-up) water line to the Satsop Development Park (see Figure B-3-6). The make-up water line was originally designed and constructed for the nuclear plants, and is capable of carrying 80 cfs of water. Phase I is authorized to use 9.5 cfs from the Ranney wells, and the Grays Harbor Public Development Authority (PDA) has a permitted water right to withdraw an additional 20 cfs from the Ranney wells. The Certificate Holder is proposing to use 9.5 cfs of the PDA's permitted water right and has negotiated an agreement with the PDA to purchase this water. Therefore, the capacity of the Ranney wells and make-up water line are more than sufficient for the permitted uses. In the vicinity of WNP-5, water for the Satsop CT Project (both phases) will be diverted to the existing blowdown line, which will carry the water to the Satsop CT site, where a valve will allow diversion of the water to Phase II.

The estimated maximum instantaneous water requirement for Phase II is 9.5 cfs (4,264 gpm). This maximum includes process water and water to cool the temperature of the discharge to a temperature below that specified in the existing NPDES permit. However, the amount of process water used by Phase II annually will average 3,901 gpm with full duct firing and the chiller on. The lowest anticipated process water use is 2,543 gpm, which assumes typical summer conditions with no duct firing and the chillers off.

The Ranney wells are located on the southern bank of the Chehalis River, approximately 4 miles downriver of the plant site near the river's confluence with Elizabeth Creek. The wells penetrate to a depth of approximately 120 feet into the alluvial aquifer associated with the Chehalis River. The estimated radius of groundwater influence for the Ranney wells is 2,000 feet after 30 days of pumping. Ecology well records do not show groundwater wells within 2,000 feet of either Ranney well. However, if a groundwater well screened in the alluvial deposits were within 2,000 feet of the Ranney wells, it would experience some drawdown in water level due to the pumping at the Ranney wells. Because Phase II is intended to operate using an existing permitted water right, Phase II will not draw additional ground water from the alluvial aquifer system. Therefore, change to the local and regional water levels due to pumping is not expected.

Groundwater withdrawals for Phase I and Phase II (4,264 gpm each, or a total of 8,528 gpm for both phases) will be substantially less than those projected for the nuclear plants, and therefore the impact to surrounding farm and irrigation wells is expected to be negligible.

B-3.2.4 Potable Water Supply Withdrawal

Water for potable uses at the Satsop CT Project site will be supplied by the Satsop Development Park's raw water well. The raw water well is located at the confluence of the Satsop and Chehalis Rivers, and the distribution pipeline extends to a water storage tank located adjacent to the northeastern corner of the plant site. The Certificate Holder will construct pipeline connections from this distribution system to the power plants. The PDA chlorinates the water prior to use. The raw water well extends to a depth of 80 feet in the shallow sand and gravel aquifer in the area extending north of the Chehalis River and east of the Satsop River. The PDA presently withdraws water from their raw water well at a rate of 300 gpm on an as-needed basis. The maximum anticipated demand for water from this source for Phase I and Phase II is expected to be 100 gpm, and the average use will be less than 40 gpm. A maximum of approximately 50 gpm and an average of less than 20 gpm would be attributable to Phase II.

Due to the low potable water requirements for the project, withdrawals for potable uses are not expected to impact surface water or groundwater availability. A WPPSS study of the affected aquifer concluded that the aquifer could produce approximately 21,000 gpm with minimal reduction in streamflow in the Satsop River during low flow periods and a slight drop in water levels in wells within the pumping range of influence (WPPSS 1974).

B-3.2.5 Process Water Discharge

The proposed Satsop CT Project has been designed to minimize wastewater discharges. The design for each Phase includes waste streams that will be treated as necessary and co-mingled prior to discharge. These waste streams (one from each phase) consist of cooling tower blowdown and oil/water separator decant. The co-mingled waste streams from each phase will be discharged to the Satsop Development Park's blowdown line in accordance with the NPDES permit (Permit No. WA-002496-1) for the Satsop CT Project. The NPDES permit will be modified to allow the additional discharge from Phase II. For each Phase, discharge of process water to the river will be at a maximum rate of approximately 640 gpm when operating with duct firing and the chillers on. As shown on Figure B-3-6, the outfall discharges to the Chehalis River. Figures B-3-7, B-3-8, B-3-9 illustrate maximum, minimum, and average daily composition of waste streams.

B-3.2.6 Cooling Tower Blowdown

The cooling towers will continuously receive the heated cooling water from the plants. Heated water will enter the tower near the top and will be sprayed downward through each tower. Evaporation in the cooling towers will result in a loss of cooling water, and the constituents of the cooling water will be concentrated due to evaporation. At high concentrations, some of these constituents could cause scaling in the heat exchanger surfaces. Therefore, after cooling water has repeatedly circulated through the cooling cycle, a small portion will be removed from each cooling tower basin and discharged in accordance with the NPDES permit. (This discharge is termed cooling tower "blowdown".)

Since the cooling water will be repeatedly circulated before being discharged, several of the constituents of the cooling water will be concentrated to a point that could result in corrosion. Therefore, an alkaline phosphate treatment is necessary. Chemicals proposed for use in the cooling tower include an acrylic polymer (dispersant), tolytriazole (copper corrosion inhibitor), phosphonocarboxylate (iron corrosion inhibitor), phosphonate (iron corrosion inhibitor), and sulfuric acid (alkalinity control). Because the circulating water is exposed to atmospheric microbiological contaminants, sodium hypochlorite will be used as a biocide to minimize microbiological growth. During treatment with sodium hypochlorite, the blowdown discharge valve will remain closed to prevent the release of chlorine. The majority of chlorine will dissipate from the cooling tower basin while the blowdown valve is closed. The retained wastewater will be sampled and analyzed prior to discharge as blowdown. If chlorine is detectable, sodium bisulfite will be added to dechlorinate the residual chlorine. As a result, chlorine will be at or below the detection level. However, if the Certificate Holder can demonstrate to EFSEC that the facility can not operate without a residual discharge, the monthly average free available residual chlorine may be 0.2 mg/l and the daily maximum may be 0.5 mg/l (see NPDES permit).

The types of chemicals used for treatment are listed in Table B-3-5. The constituents of these chemicals used for treatment of the cooling tower water system are not on the list of toxic substances regulated under WAC 173-201A-040 (Water Quality Standards for Surface Waters in Washington State). The chemicals used for treatment of the cooling water will either be precipitated out of the effluent stream or will be at undetectable concentrations.

Table B-3-5
Chemicals Used in Cooling Water System

Chemical	Description and Use
Scale inhibitor	Liquid phosphate-based corrosion inhibitor used in circulating water treatment system
Sodium hypochlorite	Liquid water treatment chemical for the cooling tower
Hydrochloric acid	Liquid water treatment chemical
Oxygen scavenger	Liquid water treatment chemical

The cooling tower blowdown water from each phase will be co-mingled with the waste stream from each phase's oil water separator and discharged to the blowdown line to the Chehalis River. The expected flow will be a maximum of 640 gpm for each phase.

Discharges through the blowdown line and outflow structure are regulated by the NPDES permit, which will be amended to include Phase II. As described below, the cooling tower discharge will meet the limitations of the NPDES permit and will be in compliance with applicable state water quality criteria (WAC 173-201A). The temperature of the discharge will be below the 18^{o}C specified in the NPDES permit, using either heat exchangers and/or quench water.

Based on preliminary water balances for the project with both phases operating, evaporative losses and other flow reduction losses from the combustion turbine process range from 2,104 to 3,230 gpm for each plant.

The impact analysis presented below regarding process water discharges includes an assessment of impacts in relation to regulatory guidelines for operation and the NPDES permit. In addition to the discharge requirements of the NPDES permit, each phase of the CT Project must comply with the state's nondegradation standards specific to Class A water bodies and state standards for discharges of toxic substances. These later standards specify maximum acute and chronic levels permitted.

Concerns regarding water quality of the Chehalis River are most pronounced during the dry season, particularly the months of July, August, and September, when on average, the lowest flows in the river occur. During low-flow periods, instream flows are the most critical because of water appropriations from the river for irrigation (although most appropriations are upstream of the discharge point) and to maintain habitat for migrating anadromous fish as well as for resident aquatic species. In addition, due to the lower flows during the dry months, potential water quality impacts can be greater because of less attenuation in the river.

Habitat conditions in the Chehalis River are sensitive to regulated water quality parameters which may exhibit acute or chronic toxicity to aquatic species. The habitat, particularly with regard to migrating anadromous fish, is also sensitive to water temperature. The Total Maximum Daily Load (TMDL) study for the Chehalis River, prepared in 1994 by Ecology, provides baseline information on current water quality problems in the river (WSDOE 1994). The TMDL study includes recommendations that address problems relating to flow, temperature, dissolved oxygen, fecal coliform, and other compounds.

B-3.2.7 Wastewater Analyses

Wastewater modeling and analyses were conducted to determine the expected concentration of constituents of the discharge from the Satsop CT Project and to evaluate potential impacts to the receiving water (Chehalis River) from the Satsop CT Project process water discharge. Discharges to the river were evaluated in comparison to the water quality criteria specified in WAC 173-201A (Water Quality Standards for Surface Waters of the State of Washington). The discharges for Phase II would be the same.

Two approaches were used to evaluate impacts to the river. The first approach used a simple mixing equation applied to 25 percent of the flow rate, assuming the base low flow in the Chehalis River of 550 cfs, and a 7-day, 10-year low flow of 416 cfs. This flow rate includes the low flow from the Satsop River Station at Satsop and the Chehalis River Station at Porter to estimate low flows in the vicinity of the outfall, which is downstream of the confluence of the two rivers. The results of these calculations, along with discharge characteristics, are presented in Table B-3-6.

The second approach applied a plume model to the discharge using the existing diffuser designed for the nuclear plants. This approach enabled evaluation of mixing and resultant concentrations of water quality parameters of concern (identified in the initial approach) within a specified mixing zone.

Table B-3-6
Water Quality Standards and Analyses

	WAC 173-201A Standards [a]						Receiving Water Concentration		
Parameters	Acute Criteria (mg/L)	Chronic Criteria (mg/L)	NPDES[b] Permit	Influent Concentration (Ranney Wells) (mg/L)	Chehalis River Concentration[c] 550 cfs (mg/L)	CT Project Discharge Concentration[d] (mg/L)	Minimum Flow Concentration[e] (mg/L)	Low Flow Concentration[f] (mg/L)	Plume Analysis Results (mg/L)
Arsenic	0.36	0.19	NA	0.0025[g,h]	0.0005[g]	0.016	0.00066	0.00071	0.001751
Cadmium	0.00084	0.00037	NA	0.00005[g,i]	0.00005[g]	0.00032	0.00005	0.00005	3.5E-05
Chromium^{+3}	0.63	0.075	0.1[j]	0.0005[i]	0.0006	0.00635	0.00066	0.00068	0.000695
Copper	0.00476	0.00354	0.03	0.0005[g,i]	0.0005	0.00635	0.00056	0.00058	0.000695
Iron	NA	NA	1	0.008[i]	0.107	0.1016	0.10694	0.10693	0.011121
Mercury	0.0024	0.000012	NA	0.0001[g,i]	0.0004	0.00064	0.00040	0.00040	7.01E-05
Nickel	0.473	0.052	0.065	0.0005[g,i]	0.0005[g]	0.00635	0.00056	0.00058	0.000695
Lead	0.0116	0.00045	NA	0.00005[g,i]	0.0005[g]	0.00032	0.00050	0.00050	3.5E-05
Selenium	0.02	0.005	NA	0.001[g,i]	0.001[g]	0.0064	0.00106	0.00107	0.000701
Temp (°F)	NA	64.4	68	51[i]	52.3	68[k]	52.5	52.5	NA
Zinc	0.0365	0.0331	0.0025	0.0025[g,i]	0.0025[g]	0.03175	0.00280	0.00290	0.003475

Table B-3-6 (Continued)
Water Quality Standards and Analyses

(a) Acute: In general, refers to a 1-hour average concentration not to be exceeded more than once every three years on the average.
Chronic: In general, refers to a 4-hour average concentration not to be exceeded more than once every three years on the average.
(b) NPDES permit (effluent limitations, recalculating cooling water blowdown).
(c) Chehalis River at intake area (Envirosphere 1982)
(d) For constituents stipulated in the NPDES permit only, CT Project discharge concentration - assume 12.7 increase at point of discharge into blowdown line. CT Project discharge of 1.43 cfs (640 gpm) based on preliminary water balance assumptions.
For constituents not stipulated in the NPDES permit, a concentration factor of 6.4 was used.
(e) Receiving water minimum flow rate is the minimum base flow rate specified by WAC 173-522-020 in Chehalis River at Satsop

$$\text{Receiving water concentration} = \frac{(\text{CT Project Discharge x } 1.43 \text{ cfs}) + (\text{river concentration x } 550/4 \text{ cfs})}{1.43 \text{ cfs} + 550/4 \text{ cfs}}$$

(f) Receiving water low flow rate is the combined 7-day 10-year low flow in Chehalis River at Porter and Satsop River at Satsop (416 cfs).

$$\text{Receiving water concentration} = \frac{(\text{CT Project Discharge x } 1.43 \text{ cfs}) + (\text{river concentration x } 416/4 \text{ cfs})}{1.43 \text{ cfs} + 416/4 \text{ cfs}}$$

(g) Based on estimated values calculated to equal 1/2 non-detectable analytical limit.
(h) Ranney Well water data (WPPSS).
(i) Well APW (5 Nov, 1980 - 29 Oct 1981) mean annual dissolved concentration (all ND = 1/2 detection limit) (Envirosphere 1982)
(j) NPDES permit limitation for chromium.
(k) The temperature at the point of discharge will be maintained at or below 18°C (68°F) by the addition of quench water, as required by the existing NPDES permit which states the following: "The discharge temperature shall be such that the applicable Water Quality Standards for temperature shall be complied with at the edge of the dilution zone. Temperature shall not exceed 18.0 degrees Centigrade. The temperature increases shall not, at any time, exceed t=28/(T+7), as described in WAC 173-201A-030 for Class A waters. For purposes hereof, "t" represents the maximum permissible temperature increase measured at a mixing zone boundary and "T" represents the background temperature as measured at a point unaffected by the discharge and representative of the highest water temperature in the vicinity of the discharge. When natural conditions exceed 18.0 degrees Centigrade, no temperature increase will be allowed which will raise the receiving water temperature by greater than 0.3 degrees Centigrade."

The second approach applied a plume model to the discharge using the existing diffuser designed for the Washington Public Power Supply System (WPPSS) WNP-3 facility. This approach enabled evaluation of mixing and resultant concentrations of water quality parameters of concern (identified in the initial approach) within a specified mixing zone.

The following sections present the methods used in the mixing analysis and the methods used in the plume model analysis.

B-3.2.8 Mixing Equation Analysis

Concentrations of selected water quality parameters which would occur after mixing the discharge water with Chehalis River water were calculated. Constituents of the influent process water (concentrations of chemical constituents of Ranney well water), receiving water concentrations (Chehalis River water concentrations), discharge concentrations (concentrations in water to be discharged from the plants), and resultant water quality concentrations are presented in Table B-3-6.

Table B-3-6 also presents acute and chronic criteria for toxic substances introduced above background levels into state waters (WAC 173-201A, Water Quality Standards for Surface Waters of the State of Washington). Assumptions made to calculate acute and chronic concentrations were as follows: (1) a river water hardness concentration of 29 mg/l, (2) a temperature of 11.3°C, and (3) a pH level of 7.0, which are average annual levels for these parameters measured weekly by Envirosphere (1982) at the Chehalis River "intake" area. If natural levels of a toxic compound in the receiving stream exceed the criteria, the natural level serves as the standard.

Water quality data for Well APW (part of the Ranney well collector system) were assumed to represent influent water quality. Metal constituents and other water quality parameters were measured weekly by Envirosphere (1982) in Well APW. For chemical constituents not measured in Well APW, the analytical data from Ranney well sampling conducted by the WPPSS were used. Concentrations of selected constituents in the receiving water (Chehalis River) were assumed to be those concentrations measured at the "intake" area in the Chehalis River (Envirosphere 1982).

Preliminary water estimates for process water include an inflow of 2,543 gpm to 4,118 gpm and an outflow rate of 426 to 640 gpm. Using the maximum summer conditions with inflow of 4,118 gpm and outflow of 640 gpm, and dividing influent flow by outflow and assuming no loss of naturally occurring chemical constituents through scaling or other means, the naturally occurring chemical constituent concentration of the outflow was estimated to be approximately 6.4 times greater than that of the inflow.

To calculate the concentration factor for the discharge from Phase II to the blowdown line, the cycles of operation (6.25) in the cooling tower is added to the concentration factor of the naturally occurring chemical constituent concentration. At the point of discharge to the blowdown line, the concentration factor is therefore 12.7.

The 6.4 concentration factor was used in the analysis to estimate the resultant concentrations of regulated inorganic constituents (including trace metals) discharged to the river. The 12.7 factor was used to estimate constituent concentrations regulated by the NPDES permit at the point of discharge to the blowdown line. As required by WAC 173-201A-100, the mixing analysis assumed the flowrate in the receiving water was 25 percent of the 550 cfs (247,000 gpm) minimum base flow in the Chehalis River. Similarly, receiving water concentrations during a low-flow event in the Chehalis River were estimated using 25 percent of the 7-day, 10-year low flow rate of 416 cfs (187,000 gpm) in the Chehalis River below the confluence of the Satsop River, where the existing discharge is located. This mixing analysis did not consider dimensions of the mixing zone.

Resultant constituent concentrations in the Chehalis River (at the point of discharge) after mixing with effluent from the project were calculated using the mixing equation below:

$$[C] = \frac{[C_R]\ x\ Q_R + [C_D]\ x\ Q_D}{Q_R + Q_D} \qquad (1)$$

where,

- C = resultant concentration in the river after mixing
- C_R = concentration in receiving water (river)
- C_D = concentration in discharge
- Q_R = flow in receiving water
- Q_D = flow in discharge

Values for each variable are presented in Table B-3-6.

B-3.2.9 Plume Model Analysis

A plume model was used to evaluate the efficiency of mixing and dilution within a specified mixing zone. This model used the diffuser dimensions of the existing WNP-3 outfall structure and river data previously described.

Water discharged from the project is estimated to contribute 426 to 640 gpm per phase to the Chehalis River. Average annual discharge in the Chehalis River at a point 2.2 miles downstream of its confluence with the Satsop River was 5,109 cfs (2,293,000 gpm) from 1980 to 1982. The anticipated discharge amount for the project will add minimally to the streamflow quantity in the Chehalis River and will not measurably affect average streamflow rates. During low flow periods, streamflow in the Chehalis River may be minimally supplemented by discharge from the project. Mean low flows in the Chehalis River downstream of the Satsop River for 1-, 7-, 30-, 60-, and 90-day return periods range from 538 to 805 cfs (241,500 gpm to 361,300 gpm). Maximum estimated discharge from Phase II will increase low flows in the Chehalis River by approximately 0.27 percent.

The diffuser at the outfall in the Chehalis River (see Figure B-3-1 for the proposed discharge location) is designed with a 30-foot diffusion manifold with 46, 2-inch ports on risers spaced every 8 inches. An estimate was made of the dispersion capabilities of this diffuser arrangement by modeling the turbulent mixing capability of the Chehalis River at the location of the diffuser. This type of analysis is preferable to the more commonly used plume modeling method because of the relatively shallow depth of the diffuser. In this case, the turbulent characteristics of the river dominate the mixing process.

Using a transverse mixing coefficient developed by Fischer (1979), the dilution factor was estimated at a point 100 feet downstream of the diffuser. This location represents the regulatory limits for the mixing zone as defined in the existing NPDES permit. The regulation also requires that the dilution meet the regulated standard at a point not to exceed 25 percent of the river width transversely. The dilution calculation depended on certain assumptions concerning the river morphology in this area. Specifically, it was assumed that the depth, average velocity, bottom slope, and width of the river were constant over the 100-foot zone. In addition, it was assumed that the diffuser acted as a point source. These assumptions are conservative in nature due to the added turbulence typical of changing river morphology and the dispersed discharge of the existing diffuser. Both of these characteristics tend to increase mixing potential.

B-3.2.10 Regulatory Compliance

As shown in Table B-3-6, at the point of the Satsop CT Project's discharge, the dissolved chemical constituents are below the concentrations in the permit. Chemical parameters presented in Table B-3-6 address WAC 173-201A and NPDES chemical parameter monitoring requirements that govern the facility application for discharge to the Chehalis River. The eleven water quality parameters contained in Table B-3-6 are those that will be present in the discharge and which are regulated by WAC 173-201A and/or the NPDES permit. Other regulated parameters will either be controlled by the facility prior to discharge, including temperature control by flow augmentation and pH adjustment, or will not be affected by the Satsop CT Project operation. The water discharge temperature will be maintained below 18°C at the point of discharge to the river.

The NPDES permit does not specify limits for many elements that are present in the Ranney well water and which will be concentrated due to evaporation during operation of the Satsop CT Project. All constituents not specified in the NPDES permit must be compared to the state's acute and chronic criteria levels. However, the NPDES permit allows a dilution zone for effluent constituents of toxic compounds specified in WAC 173-201 but not specified in the permit.

Discharges from the project will be below the state acute toxicity criteria at the point of discharge to the 001 blowdown pipeline, and therefore, will not exceed the state acute criteria in the river. These conclusions hold even if the constituents are concentrated by a factor of 10 (rather than 6.4), indicating that the proposed operating scenario for discharge includes flexibility to meet acute toxicity requirements at the point of discharge.

The results of the plume model analysis indicate that under the worst conditions for mixing, a dilution factor of 50-fold for the effluent concentrations is reached 100 feet downstream from the diffuser. This analysis was based on assumed values for river depth and velocity at the point of discharge and the permitted mixing distance. The depth and velocity estimates have not been field-verified but are within the range typical for low-flow conditions in the portion of the river receiving the discharge.

The concentrations of effluent constituents after transverse mixing are also presented in Table B-3-6. The plume model results indicate that trace metals concentrated by evaporative losses during the cooling process, and then discharged, will be adequately diluted within the mixing zone. This is evidenced by the fact that the dilution factor is larger than the concentrating factor.

In conducting the comparison of project discharges to the state's chronic water quality criteria, existing data for the Chehalis River were used. Reported concentrations of trace metals in the Chehalis River (receiving water) are listed as non-detectable, and were therefore assumed to be half of the lowest potential detection value. Using this assumption, concentrations of two toxic constituents in the river, mercury and lead, are above the applicable chronic criteria during periods of minimum and low flow conditions in the river. However, the Department of Ecology (Pickett 1994) indicated that the sampling and analysis methods used for the Chehalis River data are in some cases questionable and that reported background concentrations of metals in the Chehalis River may not be accurate.

The plume model analysis of concentrations of mercury and lead in the effluent indicates that the concentrations of these constituents will be essentially the same or lower than the reported background concentrations in the Chehalis River. As noted above, the background levels in the river are above chronic toxicity levels, and since the discharge from either phase of the Satsop CT Project will not alter the concentrations of these constituents in the river, the discharge of the Satsop CT Project will not affect toxicity in the river.

The results also indicate that the diffuser and mixing conditions in the river, within the revised NPDES specified mixing zone, will be adequate to dilute regulated water quality parameters in the Phase II discharge such that all Class A water quality criteria for toxic substances will be met.

B-3.2.11 Oil/Water Separator

The oil/water separator will be designed to produce an effluent concentration of less than or equal to 15 ppm of oil.

The oil/water separator will be provided for waste streams that potentially may contain oily water such as the steam turbine oil purification system and floor and equipment drains. The oil/water separator will receive and separate water and oil mixtures. Water from the separator will be co-mingled with the cooling tower blowdown prior to discharge to the Satsop Development Park's blowdown line, while the oil is retained for eventual removal and disposal. The oil/water separator will be a prefabricated modular fiberglass reinforced plastic, cast-in-place concrete structure, or a packaged steel tank type system. The discharge piping will be designed with a leg extending below the maximum design oil depth, which will allow only oil-free water to be discharged. A reservoir included with the oil/water separator will collect the waste oil for off-site recycling or disposal by a licensed contractor.

Large tanks containing oil will be diked and valved to "retain-in-place" any large oil spills for mitigation and cleanup in place.

B-3.2.12 HRSG Blowdown (Internal Stream)

A small stream (90 gpm) from the HRSG of each phase will be drained to remove the constituents of the make-up water that become more concentrated due to evaporative losses during operation (steam production). This "blowdown" from the HRSG will be routed to a blowdown tank before being piped to the cooling tower for use as make-up water. The purpose of the tank is to absorb the "flashing" (the rapid and forceful decrease in temperature and pressure during blowdown release) as blowdown water is released from the boiler.

B-3.2.13 Regeneration Waste (Internal Stream)

Approximately 8 gpm of regeneration waste will be discharged from the boiler feed water treatment system to the cooling tower basin.

B-3.2.14 Plant Sump Discharge (Internal Stream)

Each plant sump will receive minor wastewater streams from the steam turbine oil purification system, the transformer containment structure drains, and the generator building floor drains. Wastewater in the plant sump will be routed to an oil/water separator.

B-3.2.15 Bypass and Overflow Facilities

Bypass facilities for wastewater would be limited to use in emergencies only. If a major fire were to occur, the capacities of floor and equipment drains would be greatly exceeded by water used to extinguish the fire, and the oil/water separator would likely overflow. Therefore, plant design includes a bypass around the oil/water separator to avoid overflow. This bypass will direct flows to a containment area specifically designed for each plant site and sized for a 30-minute event. The location of this facility will be shown in the final site plan.

No other bypass facilities would be included in plant design. All tanks would be equipped with overflow drains to prevent catastrophic losses. The discharge from overflow drains would be directed to a containment basin around each tank; each containment basin would be designed to hold 110 percent of the contents of the tank. The containment basin would be used to retain the collected fluids until a manual valve in the discharge piping is opened. Discharge from chemical tank containment basins would be routed to the neutralization tank for treatment; discharge from the fuel tank containment basin in each plant would be collected and disposed of off-site or routed to the oil/water separator for treatment. Administrative procedures require inspection of containment basin contents before opening the manual valve to discharge contents into the wastewater treatment system.

B-3.2.16 Alternative Methods

The infrastructure and permit for discharge into the Chehalis River already exist, are to be used for Phase I and, thus provide the most cost-effective and efficient approach to wastewater treatment for Phase II.

Zero discharge is another alternative approach. Zero discharge systems recycle and evaporate the water portion of wastewater and concentrate the solids for eventual off-site disposal. In this process, no wastewater is discharged. The zero discharge system was rejected for the following reasons: (1) no water would be returned to the river to supplement flows, and (2) the high cost of installing a zero discharge system.

The approach selected for the Phase II project minimizes plant wastewater discharges by recycling internal wastewater streams as make-up water for the cooling towers. However, some wastewater (up to 3.1 cfs for the entire Satsop CT Project) would be discharged to the Chehalis River, returning a portion of the water pumped from the Ranney wells (which obtain 88 percent of their water from the river). This is considered a beneficial condition since the wastewater returned to the river meets both NPDES permit criteria and state water quality standards.

Use of a deep well injection system represents another alternative method of wastewater handling. However, this approach is rarely used in power generation facilities. Deep well injection systems are dependent on the nature of the site's underlying aquifer, and are typically very difficult to permit. In addition, the water would not be recharged to the aquifer from which it is extracted. Due to the many risks associated with deep well injection, this alternative was not considered for the Phase II project.

B-3.2.17 Sanitary Water Discharge

Sanitary water effluent will be released to a constructed on-site septic system. Conservatively estimating the number of people on site (staff and visitors) per day, and using a sanitary waste flow typical for an operating plant, the estimated flow to the onsite system would be less than

3,500 gallons per day per phase. Therefore, the system will be designed to Grays Harbor County standards. Normal flow rate will likely be somewhat less.

Grays Harbor County requires that the design of the system include a preliminary report prepared by a professional engineer licensed in the state of Washington. The report will include: site conditions, schedule for development, water balance analysis, overall effects of the proposed system on the surrounding area, and any local zoning requirements.

At this time, a septic system has not been designed.

B-3.3 MITIGATION MEASURES

B-3.3.1 Surface Water

To minimize impacts on surface water, contractors will use Best Management Practices (BMPs) for erosion and sediment control during construction of Phase II and will implement a plan that complies with the requirements of the existing Erosion and Sedimentation Control Plan. BMPs will include limiting certain construction activities and installing temporary control structures such as sediment traps, silt fences, and diversion ditches.

To meet the temperature requirements of the discharge, either heat exchangers and/or flow augmentation will be used to quench the temperature of the cooling water discharge.

Runoff from the northern portion of the site will be routed through existing ditches and culverts to the C-1 pond, which is located on Satsop Development Park property to the west. If necessary, surface water runoff from the site can be pumped through a series of ditches and culverts to the existing Equalization Pond on the main Satsop Development Park property. This pond would provide additional storage capacity during construction if surface water runoff is unusually high. With implementation of this plan, surface water impacts due to construction of the plant will be temporary and minor.

B-3.3.2 Stormwater

B-3.3.2.1 Construction

The Certificate Holder currently has an approved NPDES permit that covers stormwater discharges, including stormwater discharges from the proposed plant site. In addition, the SCA addresses stormwater management during construction, and includes the following requirements:

- The project must comply with all pertinent industry standards for control of any unforeseen surface water runoff event during construction, and must notify EFSEC of surface water runoff problems.
- The project must abide by turbidity criteria for construction-related runoff as established in the State of Washington Water Quality Standards.
- The existing NPDES permit establishes water quality limits and monitoring schedules for total suspended solids, settleable solids, and pH in collected stormwater runoff. These limits are applicable for material storage runoff and construction runoff within the 100-year, 24-hour rainfall event (5.5 inches per 24 hours).

B-3.3.2.2 Operation

Runoff from the plant site will be directed toward the perimeter ditches and routed as described in Subsection 2.10.2.2. The Environmental Protection Control Plan will be modified if necessary to include specifications for any commitments made for Phase II plant operations. BMPs consistent with those in the *Stormwater Management Manual for the Puget Sound Basin* (WSDOE 2000) will be employed during operation of Phase II.

At least annually, facility employees will also receive training in the pollution control laws and regulations, and the specific features of the facility which are intended to prevent releases of oil and petroleum products. Employees at the site will be trained in the following spill response measures:

- Identifying areas that may be affected by a spill and potential drainage routes
- Reporting of spills to appropriate individuals
- Employing appropriate material handling and storage procedures
- Implementing spill response procedures

Stormwater catchbasins and detention systems will be inspected at least annually as part of the site preventive maintenance program. Stormwater catchbasins will be cleaned if the collected deposits fill more than one-third of the depth from the basin to the invert of the lowest pipe leading into or out of the basin.

Inspections will be conducted to confirm that non-permitted discharges are not entering the stormwater system. A summary of each inspection will be retained, along with any notifications of noncompliance and reports on incidents such as spills.

To meet the temperature requirements of the discharge, either heat exchangers and/or flow augmentation will be used to quench the temperature of the cooling water discharge.

B-3.3.3 Groundwater

The design of the on-site septic system will include a professional engineer's report on site conditions, schedule for development, water balance analysis, overall effects of the proposed system on the surrounding area, and any local zoning requirements.

The placement and design of the system will allow infiltration of effluent but inhibit its direct release to surface and/or groundwater bodies.

Figure B-3-1 Area Map

11 x 17, must start on odd-no page, allow 2 pages

Figure B-3-1 (continued)

Figure B-3-2 Chehalis River at Porter Flow Exceedance

8 1/2 x 11 color, must start on odd no. page, allow 2 pages

Figure B-3-2 (continued)

Figure B-3-3 Satsop River Near Satsop Flow Exceedance

8 1/2 x 11 color, must start on odd no.

Figure B-3-3 continued

Figure B-3-4 Cloquallem Creek Flow Exceedance

8 1/2 x 11 color, must start on odd no.

Figure B-3-4 continued

Figure B-3-5 Generalized Geologic Cross Section through Site Location and Chehalis River Valley

8 1/2 x 11 b/w

Figure B-3-6 Process Water Conceptual Flow Diagram

8 1/2 x 11 b/w

Figure B-3-7 Process Water Maximum

8 1/2 x 11 b/w

Figure B-3-8 Process Water Minimum

8 1/2 x 11 b/w

Figure B-3-9 Process Water Average Annual

8 1/2 x 11 b/w