CHAPTER 2: PROPOSED ACTION AND ALTERNATIVES

2.1 INTRODUCTION

The Applicant proposes to construct and operate a nominal 720-MW, natural-gas-fired, combined-cycle cogeneration facility adjacent to the existing BP Cherry Point Refinery in Whatcom County, Washington. The cogeneration facility would provide steam and electricity to meet the operating needs of the refinery and produce electrical power for local and regional consumption.

The Washington State Energy Facility Site Evaluation Council (EFSEC) has jurisdiction over the evaluation of major energy facilities including the proposed project and as such will recommend approval or denial of the proposed cogeneration facility to the governor of Washington after an environmental review.

All project components within the proposed cogeneration facility boundary, including the facility's primary access road (Access Road 1), are considered the "principal facility" and would be under EFSEC jurisdiction during project construction and operation. In addition, the proposed wetland mitigation sites and restoration areas would be under EFSEC jurisdiction for the life of the project.

Other facilities and equipment would be required to interconnect the cogeneration facility to the refinery for exchange of steam and steam condensate (e.g., piping and piperacks) or to connect the cogeneration facility with existing utility infrastructure (i.e., natural gas, industrial water supply, and electrical transmission lines). These connections would be made by modifying existing facilities or constructing new facilities on property that would not be under EFSEC jurisdiction. Such facilities, equipment, and property are referred to as "ancillary facilities."

For the purposes of this EIS, all principal and ancillary facility locations, temporary construction laydown areas, and wetland mitigation and restoration areas are collectively referred to as the project site.

2.2 DESCRIPTION OF PROPOSED ACTION

2.2.1 Project Location

The proposed cogeneration facility would be located near Ferndale and Blaine in northwestern Whatcom County, Washington (see Figure 1-1). The cogeneration facility would be sited at the eastern edge of the BP Cherry Point Refinery between Grandview and Brown roads. The project site is approximately 6 miles northwest of Ferndale, 7 miles southeast of Blaine, and 15 miles northwest of Bellingham. The nearest community is Birch Bay, approximately 2 miles northwest of the site. The Canadian border is approximately 8 miles north of the proposed site.

The cogeneration facility and associated systems and components that interface with the refinery, including new natural gas and water supply connections, stormwater detention and treatment facilities, construction laydown areas, and wetland mitigation sites, would be located on

Applicant-owned property. The project site is within the Cherry Point Major Industrial Urban Growth Area/Port Industrial Zone as defined in the Whatcom County Comprehensive Plan. The cogeneration facility would occupy approximately 33 acres of unimproved land, which is zoned Heavy Impact Industrial. Proposed construction laydown areas would include an additional 36 acres of land. Wetland mitigation sites proposed for the project north of Grandview Road would occupy approximately 110 acres.

The land surrounding the cogeneration facility site is relatively flat and owned by the Applicant for at least 0.5 mile in all directions. The closest residence is about 0.75 mile east of the site. Prior to construction of the refinery in 1969, the surrounding land was used for agriculture. Vegetation in the area mainly consists of grasses with areas of hybrid poplar trees that the Applicant planted between 1989 and 1991. The only relatively mature forests near the project site are small patches in the vicinity of the cogeneration facility site that developed from abandoned homesteads and riparian areas along Terrell Creek. The Applicant owns the land north of the refinery site and the cogeneration facility and uses it for habitat enhancement and as a visual buffer for industrial operations. Some portions of Applicant-owned land in the area are leased to local farmers for livestock grazing and hay production. Terrell Creek is about 0.5 mile north of the proposed cogeneration facility site within the Applicant's habitat enhancement area. Other industrial sites near the proposed project site include the Chemco wood treatment facility (located about 0.75 mile east), the Praxair industrial gas plant (located 0.5 mile south), and the Puget Sound Energy peaking power plant (located 1 mile west) (see Figure 2-2).

The new 230-kV electrical transmission line that would connect the cogeneration facility with the Bonneville transmission system also would be constructed on Applicant-owned land between the cogeneration facility site and Bonneville's Custer/Intalco Transmission Line No. 2 approximately 0.8 mile to the east. The new transmission line would require a 150-foot utility right-of-way (ROW) encompassing approximately 15 acres.

Bonneville has determined that modifications to the existing Custer/Intalco Transmission Line No. 2 would be required to allow the proposed project to connect to the existing power transmission system. The project portion of the transmission line is located within an existing 125-foot Bonneville transmission ROW, which extends for approximately 5 miles through predominantly agricultural lands, and covers approximately 70 acres (see Appendix B for a map and description of the existing corridor).

Figure 2-3 shows the infrastructure necessary to support the cogeneration facility. The Whatcom County Public Utility District No. 1 (PUD) would supply industrial water to the facility. The electrical transmission towers and corridor from the cogeneration facility to the Bonneville electrical transmission system would be on Applicant-owned land.

Natural gas would be supplied to the cogeneration facility from either the Arco Western Natural Gas Pipeline (Ferndale pipeline) or the Cascade Natural Gas Pipeline, both of which run through Applicant-owned land. The onsite stormwater detention pond would be within the boundary of the cogeneration facility. Sanitary wastewater would be sent to the Birch Bay Wastewater Treatment Plant for treatment and discharge to the Strait of Georgia.

Figure 2-1:

Figure 2-2: Project Site and Surrounding Area

Figure 2-3: Existing Utility Infrastructure

The Cherry Point Major Industrial Urban Growth Area/Port Industrial Zone is approximately 6,500 acres, of which approximately 2,500 acres is currently occupied by heavy impact industries. Land use and zoning maps of western Whatcom County and of the Cherry Point subarea from the Whatcom County Comprehensive Plan are presented in Section 3.10 Land Use. The northern boundary of the proposed cogeneration facility would be 337 feet south of the centerline of Grandview Road. This setback provides space for landscaping and a buffer from the existing gas pipeline easements that are 100 feet south of the centerline of Grandview Road.

2.2.2 Project Facilities

The proposed project includes a cogeneration facility and related components that would be located on an approximately 265-acre site. The cogeneration facility would be designed, constructed, and operated as a stand-alone plant that would have a number of systems integrated with the facilities and operations of the BP Cherry Point Refinery, including electrical power, steam and condensate systems, potable water, and industrial and sanitary wastewater (see Figure 1-3).

In this EIS, individual systems and/or components of the proposed project have been grouped into five major project elements to facilitate the analysis and discussion of potential environmental impacts associated with the proposal. The five major elements are defined below. The components of each element are briefly described in Table 2-1. A more detailed description of these facilities is provided in the text that follows.

Project facilities that would be constructed or installed within the boundary of the cogeneration plant are collectively referred to as "cogeneration facility," and include:

- A steam turbine generator (STG);
- Three combustion gas turbine generators (CGTs);
- Three heat recovery steam generators (HRSGs);
- Three HRSG exhaust stacks;
- Three 150 million volt amp (MVA) step-down transformers;
- An emergency diesel generator;
- An evaporative cooling tower;
- A variety of holding, storage, and transfer tanks and sumps (see Table 2-2);
- Stormwater collection, detention, and treatment facilities;
- An administration, control, and warehouse building complex;
- Perimeter security fence and gates; and
- A primary access road (Access Road 1).

Project facilities that would be constructed or installed in the BP Cherry Point Refinery to support integration and operation of the cogeneration facility are referred to as the "refinery interface," and include the following:

- Steam and condensate system connections and associated piping;
- Natural gas supply connection and associated piping;
- Natural gas compressor station;

- Industrial water supply connection and associated piping;
- Potable water supply connection and associated piping;
- Industrial wastewater connection and associated piping;
- Sanitary wastewater connection and associated piping;
- Elevated piperack to support pipes that connect the two facilities;
- An intermediate voltage (69 kV or 115 kV) electrical distribution substation;
- Six electrical distribution transformers;
- Stormwater collection, detention, and treatment facilities;
- Construction Laydown Areas 1, 2, and 3; and
- A connecting east-west access road (Access Road 2).

A new 230-kV double-circuit electrical distribution line would be installed to connect the cogeneration facility with the existing Bonneville transmission system approximately 0.8 mile to the east. Throughout the EIS, this line is referred to as the "transmission system."

Bonneville has determined that modifications to the Custer/Intalco portion of the existing Bonneville transmission system would be required to accommodate connection of the cogeneration facility. Two options have been identified to provide the required modifications. Option 1 is a Remedial Action Scheme (RAS). A RAS would install additional electrical equipment within the Custer and Intalco substations, and would require an operating agreement among the Applicant, Alcoa Intalco Works, and Bonneville for load-reduction protocols under certain conditions. Option 2 is to reconstruct the Custer/Intalco Transmission Line No. 2 between the Custer substation and the point of interconnection with the transmission system, a distance of approximately 5 miles. Reconstruction of the transmission line would involve installation of a second transmission line and replacement of existing towers for this portion of the corridor. Existing single-circuit towers would be replaced with either double-circuit steel lattice towers (Option 2a) or double-circuit steel monopole towers (Option 2b). For purposes of this EIS, the element of the project dealing with this modification is referred to as "Custer/Intalco Transmission Line No. 2."

Other elements of the project that would be constructed or installed in other locations as part of the project are referred to as "other project components," and include:

- Water supply connections, equipment, and piping at Alcoa Intalco Works;
- Laydown Area 4 (located at the northeast corner of the cogeneration facility site);
- Compensatory Mitigation Area (CMA) 1 and 2 (immediately north of Grandview Road); and
- A southern access road (Access Road 3) at the cogeneration facility.

Cogeneration Facility

The cogeneration facility would occupy approximately 33 acres immediately east of the BP Cherry Point Refinery. The combined-cycle cogeneration (steam and electricity) facility would produce a nominal 720 MW of power and export steam and electricity to the refinery.

Table 2-1: BP Cherry Point Cogeneration Project Components

Component	Component Description	Construction Responsibility[1]	Owner/Operator	Permits and Approvals
Cogeneration Facility				
Power Generation Block	Includes one STG, three CGTs, three HRSGs, and associated emission stacks, evaporative cooling tower, and administration building complex.	Applicant	Applicant	EFSEC Corps
230-kV Electrical Switchyard	Located at the east end of the cogeneration facility, it serves as the generation/transmission interface point.	Applicant	Ownership subject to terms of a Bonneville interconnection agreement. Applicant would own underlying land.	EFSEC Corps Bonneville
Stormwater Facilities	Includes stormwater detention pond 1 and associated oil-water separation system and drainage ditch system.	Applicant	Applicant	EFSEC Corps
Emergency Generator	Approximately 1,500-kW diesel generator.	Applicant	Applicant	EFSEC Corps
Electrical Distribution and Control Systems	Includes power distribution centers, switchgear, and associated metering and control systems for 480V and 4160V systems, and universal power supply and 125V backup systems.	Applicant	Applicant	EFSEC Corps
Fire Protection Systems	Includes a perimeter fire suppression water loop, detection, and alarm system, and an approximately 265-hp diesel-powered emergency water pump for fire suppression.	Applicant	Applicant	EFSEC Corps
Cogeneration Facility Roads and Parking Areas	Includes a permanent perimeter road, branch roads to access facility components, and parking area at administration building complex.	Applicant	Applicant	EFSEC Corps
Physical Site Security	Includes an 8-foot-high perimeter fence, automatic and manual gates, and personnel access controls.	Applicant	Applicant	EFSEC Corps
Other Systems and Equipment	Includes continuous emissions monitoring system, auxiliary closed cooling water system, and a distributed control system.	Applicant	Applicant	EFSEC Corps
Primary Access Road 1	Access Road 1, the northern access road and primary entrance, would be approximately 400 feet long and constructed from Grandview Road.	Applicant	Applicant	EFSEC

1 "at fence line" indicates the refinery is responsible for the elements within its fence line, and the cogeneration facility is responsible for elements within its fence line.

Table 2-1: Continued

Component	Component Description	Construction Responsibility[1]	Owner/Operator	Permits and Approvals
Refinery Interface				
Water Supply Connection and Piping	The PUD delivers water to the refinery via an existing 24-inch underground pipeline along Aldergrove Road. New 16-inch piping (location to be determined) would be installed at one of the existing but unused flanges on the 24–inch pipeline.	Applicant or Whatcom PUD – to be determined	Applicant or Whatcom PUD – to be determined	EFSEC if Applicant constructs and operates
Natural Gas Connection and Pipes	A new connection and natural gas pipes would be installed at the existing metering station for the Ferndale pipeline to support both cogeneration and refinery operations. The new pipes would be routed underground from the metering station to the new compressor station approximately 300 feet west. A connection from the compressor station to the refinery would be made with approximately 300 feet of new piping routed back under Blaine Road to connect with existing piping at the metering station. The connection from the compressor station to the cogeneration facility would be via new piping routed along the elevated piperack.	Applicant, Refinery, or Ferndale pipeline – to be determined, at fence line	Applicant, Refinery, or Ferndale pipeline – to be determined, at fence line	EFSEC if Applicant constructs and operates as part of the cogeneration facility - County, Ecology, and/or Northwest Air Pollution Authority otherwise. Any components on the cogeneration facility site would be regulated by EFSEC.
Natural Gas Compressor Station	A new compressor station would be installed within the refinery approximately 450 feet west of the cogeneration facility, and would include three electrically driven natural gas compressors enclosed in a single building.	Applicant, Refinery, or Ferndale pipeline – to be determined	Applicant, Refinery, or Ferndale pipeline – to be determined	EFSEC if Applicant constructs and operates as part of the cogeneration facility - County, Ecology, and/or Northwest Air Pollution Authority otherwise.
Ferndale Pipeline Metering Station Modifications	The existing Ferndale pipeline metering station located between the refinery and the cogeneration facility would require some modifications to accommodate metering for the cogeneration project and to reconnect the natural gas pipeline to Alcoa Intalco Works.	Ferndale pipeline	Ferndale pipeline	Whatcom County

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Table 2-1: Continued

Component	Component Description	Construction Responsibility[1]	Owner/Operator	Permits and Approvals
Intermediate Voltage (69 kV) Substation and Associated Power Lines	A new intermediate voltage (69 kV or 115 kV) substation would be installed within the refinery approximately 500 feet west of the cogeneration facility to facilitate power distribution. The substation would be connected to the 230-kV switchyard in the cogeneration facility and three existing substations elsewhere in the refinery via new overhead or underground power lines.	Applicant or Refinery	Refinery	EFSEC if Applicant constructs and substation remains part of the cogeneration facility
Modifications to Refinery Substations MS 1, MS 2, and MS 3	New distribution transformers would be installed at existing refinery Substations MS 1, MS 2, and MS 3.	Refinery	Refinery	
Steam and Condensate Systems	New steam and condensate system piping would be installed between the cogeneration facility and the refinery. Steam and condensate pipes would be routed above ground between the two facilities along the elevated piperack. The location and route of piping within the refinery are to be determined.	Applicant, Refinery, at fence line	Applicant, Refinery, at fence line	EFSEC for cogeneration facility to fence line
Elevated Piperack	A new elevated piperack would be constructed between the cogeneration facility and the refinery to support steam, condensate, and natural gas pipes between the two facilities. The piperack would be approximately 3,000-3,500 feet long.	Applicant, Refinery, at fence line	Applicant, Refinery, at fence line	EFSEC for cogeneration facility to fence line
Laydown Areas 1, 2, and 3	These laydown areas would be located within the refinery. Areas 1 and 3 and the southern portion of Area 2 would be permanently converted to industrial uses. The northern 273 feet of Area 2 would be restored upon completion of project construction.	Applicant	Refinery	The portion of Laydown Area 2 to be restored after construction would remain under EFSEC jurisdiction.
Potable Water Pipeline	The PUD supplies potable water to the refinery. New potable water piping (location to be determined) between the refinery and the cogeneration facility would deliver potable water to the congeneration facility. The Applicant anticipates that the pipe would be routed along Access Road 2.	Applicant, Refinery, at fence line	Applicant, Refinery, at fence line	EFSEC for cogeneration facility to fence line

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Table 2-1: Continued

Component	Component Description	Construction Responsibility[1]	Owner/Operator	Permits and Approvals
Industrial Wastewater Pipeline	Cogeneration facility industrial wastewater would be conveyed to the refinery for treatment via new piping (location to be determined) to be constructed between the refinery and the cogeneration facility. The Applicant anticipates that the pipe would be routed along Access Road 2.	Applicant, Refinery, at fence line	Applicant, Refinery, at fence line	EFSEC for cogeneration facility to fence line
Sanitary Wastewater Pipeline	Cogeneration facility sanitary wastewater would be conveyed to the refinery's sanitary wastewater system via new piping (location to be determined) to be constructed between the refinery and the cogeneration facility. The Applicant anticipates that the pipe would be routed along Access Road 2.	Applicant, Refinery, at fence line	Applicant, Refinery, at fence line	EFSEC for cogeneration facility to fence line
Stormwater Detention and Treatment Facilities	Includes stormwater detention pond 2 (170 feet by 150 feet by 6 feet), associated oil/water separation facilities, perimeter access road, and Ditch C-4 (approximately 1,500 feet long).	Applicant	Refinery	Construction: EFSEC Operation: County/Ecology
Access Road 2	Access Road 2, an east-west access road, would be constructed between Blaine Road and the western edge of the cogeneration facility; it would be 24 feet wide and approximately 300 feet long.	Applicant	Refinery	Construction: EFSEC Operation: County/state agencies
Transmission System				
230-kV Double-Circuit Transmission Line	A new 230-kV double-circuit transmission line would be installed between the cogeneration facility switchyard and existing Custer/Intalco Transmission Line No. 2. The new transmission line, which would be approximately 0.8-mile long, would require four lattice-style towers and one monopole-style tower.	Applicant	Ownership subject to terms of a Bonneville interconnection agreement. Refinery would own underlying land.	Bonneville
Custer/Intalco Transmission Line No. 2				
Option 1: Remedial Action Scheme	A RAS would involve the installation of new breakers and other electrical equipment and wiring at the Custer and Intalco substations. Agreement among Alcoa Intalco Works, the Applicant, and Bonneville would be required.	Bonneville	Bonneville	Bonneville

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Table 2-1: Continued

Component	Component Description	Construction Responsibility[1]	Owner/Operator	Permits and Approvals
Option 2: Reconstruct Transmission Line	Option 2 would reconstruct an existing Bonneville transmission line between the Custer substation and the cogeneration facility interconnection point (approximately 5 miles in length). The existing single-circuit line with lattice steel towers would be replaced with a double-circuit line using either lattice steel or monopole towers.	Bonneville	Bonneville	Bonneville
Other Project Components				
Industrial Water Supply Pipeline and Modifications at Alcoa Intalco Works	New piping would connect the Alcoa Intalco Works air compressor building with a new sump or wet well (10 feet by 40 feet by 10 feet deep) on the south side of the Alcoa facility. An enclosure (12 feet by 20 feet) containing three 150-hp electric pumps would be constructed and connected to the PUD control system. A new 16-inch pipe approximately 1,600 feet long (location to be determined, presumably within the Alcoa facility) would connect the wet well to an existing PUD water line.	Whatcom PUD	Whatcom PUD	Whatcom County
Access Road 3	Access Road 3, a permanent road, would provide access to the cogeneration facility from the south, and would be constructed between the facility and Brown Road by widening and extending the existing transmission corridor's maintenance road south of the site. The road would be 30 feet wide and approximately 1,500 feet long.	Applicant	Refinery	Construction: EFSEC Operation: County/other state agencies
Compensatory Wetland Mitigation Areas	CMA 1 and CMA 2 (approximately 110 acres total) would be located north of the cogeneration facility on each side of Blaine Road immediately north of Grandview Road.	Applicant	Applicant	EFSEC
Laydown Area 4 and Wetlands Mitigation	This temporary laydown area would be located at the northeast corner of the cogeneration facility. This area would be restored upon completion of construction.	Applicant	Applicant	EFSEC

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Table 2-2: Cogeneration Facility Tanks and Sumps

Service/Purpose	Tank Type	Working Capacity (gallons)	Diameter (feet)	Height (feet)	Secondary Containment
Anhydrous Ammonia Storage Tank - Store liquefied ammonia for use in selective catalytic reduction air pollution control system	Horizontal, cylindrical pressure vessel	12,000	7	45	Concrete Wall
Boiler Feedwater and Condensate Storage Tank - Storage for boiler feedwater (BFW) and condensate returned from the refinery before polishing treatment in demineralizer system	Vertical, cylindrical, atmospheric aboveground tank	500,000	52	32	--
Demineralized Water Storage Tank - Provide makeup BFW in case water delivery or treatment is temporarily interrupted	Vertical, cylindrical, atmospheric above ground tank (open vented)	100,000	--	--	--
Neutralization Tanks - Collect demineralizer regeneration wastes to adjust pH as necessary for discharge to refinery's biological wastewater treatment system	Vertical, cylindrical, atmospheric aboveground tank (open vented)	50,000 ea; 100,000 total	16	34	--
Fire Suppression Water Pump - Diesel Fuel Storage Tank	Horizontal tank	Approx. 460	4	5	Curbed Area
Diesel Generator - Diesel Fuel Storage Tank	Vertical tank	Approx. 1,500	6	8	Curbed Area
Steam Turbine - Lube Oil Storage Tank	Rectangular tank	Approx. 7,200	24L by 12W	7	Curbed Area
Three Combustion Turbines - Lube Oil Storage Tanks	Rectangular tank	Approx. 6,200	28L by 10W	4.0	Curbed Area
Oxygen Scavenger Tank - Storage for BFW treating chemical	Vertical, cylindrical, atmospheric	1,000	5'-2"	7'-4"	Curbed Area
Neutralizing Amine Tank - Storage for BFW treating chemical	Vertical, cylindrical, atmospheric	1,000	5'-2"	7'-4"	Curbed Area
Phosphate Tank - Storage for BFW treating chemical	Vertical, cylindrical, atmospheric	500	4	6'-3"	Curbed Area
Acid Storage Tanks - Storage for demineralizer cation; regeneration and cooling tower circulating water treatment	Horizontal, cylindrical, atmospheric	8,000 ea 16,000 total	9	12'-6" S/S	Concrete Wall
Caustic Storage Tank - Storage for demineralizer anion; regeneration	Horizontal, cylindrical, atmospheric	8,000	9	12'-6" S/S	Concrete Wall
Blowdown Sump - Gravity drain collection point for HRSG boiler blowdown drain, pumped from sump to neutralization tank	Below ground, concrete sump	5,865	14L by 8W	7	--
Oily Water Sump (GTG and STG Area) - Collection point for potential oily runoff from wash water and precipitation, pumped to refinery treatment system	Below ground, concrete sump	5865	14L by 8W	7	--
Wastewater Equilization Tank	Vertical, cylindrical, atmospheric aboveground tank (open vented)	400,000	52	26	--
Sodium Hypochlorite - 15% solution for cooling tower circulating water treatment	Vertical, cylindrical, atmospheric aboveground tank	8,000	9	12'-6"	Curbed Area
Filtered Water and Firewater Storage Tank	Vertical, cylindrical, atmospheric aboveground tank	425,000	43	40	--
CGT Wash Water Sump - Temporary storage of used wash water from periodic offline CGT cleaning	Below ground, concrete sump	5,865	14L by 8W	7	--

Source: BP 2002, Appendix D

Major Structures

Major structures at the cogeneration facility would include the STG enclosure; the administration, control, and warehouse/maintenance building; the water treatment building; and the switchgear building. The STG enclosure would house the STG, the condenser pumps, and other equipment associated with the STG; it would be approximately 190 feet by 90 feet by 50 feet tall.

The major buildings would be single-story metal buildings built on concrete slabs at grade. The administration, control, and warehouse/maintenance building would be approximately 220 feet by 65 feet. The water treatment building would be approximately 35 feet by 80 feet, and the switchgear building would be approximately 70 feet by 50 feet (BP 2002; Torpey, pers. comm., 2003).

Major outdoor equipment includes the cooling tower, the HRSGs, the CGTs, and the 230-kV electrical switchyard. The cooling tower would be approximately 110 feet by 330 feet by 60 feet tall and would be used to remove heat by circulating water to the condenser downstream of the steam turbine. Each of the three HRSGs would be approximately 110 feet by 30 feet by 95 feet tall with a 150-foot-tall exhaust stack.

Power Plant Processes

Electrical Power Generation

The power generation portion of the facility (power plant) would be configured with three 205-MVA natural-gas-fired CGTs, three HRSGs, and a single 243-MW STG. Thermal energy produced through the combustion of natural gas would be converted into mechanical energy in each CGT to drive an electric generator. Hot combustion gases from the CGTs would enter the HRSGs, which would transfer heat from the CGT exhaust gases to condensate and boiler feedwater to produce steam. Steam from the HRSGs would enter the STG, where it would expand and drive the steam turbine and its electric generator.

Electricity generated by the CGTs and STG would be transmitted to the 230-kV switchyard located on the east side of the cogeneration facility for further transmission to the refinery and the Bonneville transmission system. Major equipment within the 230-kV switchyard would consist of 230-kV breakers and associated controls, two outgoing circuits to the Bonneville transmission system, and three step-down transformers with overhead lines or cables to a new intermediate voltage substation to be constructed in the refinery.

Steam, Condensate, and Boiler Feedwater Systems

Systems within the Cogeneration Facility. The HRSGs would transfer heat from the CGT exhaust gases to condensate and boiler feedwater to produce high-pressure, intermediate-pressure, and low-pressure steam. The steam produced by the HRSGs would flow to the STG, where process steam would be extracted from the steam turbine and conditioned before it is exported to the refinery. Each HRSG would be equipped with duct burners for supplementary firing with natural gas. The duct burners would reheat the CGT exhaust gases to generate additional steam at times when additional electricity and/or process steam would be needed.

A selective catalytic reduction (SCR) emission control system would be integrated within each HRSG. The mechanical components of the system would include a catalyst bed and an ammonia storage and distribution system. Other than the replacement of spent catalyst every three to five years, the emission control system would produce no solid or liquid waste products. See Section 3.2 Air Quality for additional discussion of the cogeneration facility's emission controls. Each HRSG would have a 150-foot-tall exhaust stack.

Integration with the Refinery. The cogeneration facility would supply the refinery with steam required for refinery operations. During typical operation, steam would be provided at a flow rate of 510 thousand pounds per hour (kpph) and a pressure of 650 pounds per square inch absolute (psia). In return, the cogeneration facility would receive approximately 459 kpph of water that has been condensed from the steam after use (condensate) from the refinery (approximately 90% of the steam supplied). This stream is actually a mix of demineralized water and condensate that comes from the refinery. Steam from the cogeneration facility to the refinery and condensate from the refinery to the cogeneration facility would be transmitted through a piping system mounted on an aboveground rack that would be constructed south of the new east-west access road between the cogeneration facility and the refinery.

Cooling System

Exhaust from the steam turbine (steam not used by the refinery) would be discharged into an exhaust duct that leads to a surface condenser for cooling. The water-cooled condenser would use circulating water to condense the exhaust steam to condensate (water) for return to the HRSGs. Water from the circulating water-cooling system would be pumped to the evaporative cooling tower, where heat would be emitted to the atmosphere through the evaporation of a portion of the cooling water stream. The remaining cooling water would then be returned to the condenser to repeat the cooling process.

Approximately 145,000 gpm of circulating water would be required to pass through the surface condenser to condense the exhaust steam at maximum plant load. An additional closed loop cooling water system would use a mixture of 45% propylene and 55% demineralized water to provide auxiliary cooling in the facility.

Wastewater Treatment and Disposal

During normal operation, the cogeneration facility would generate wastewater from the following activities:

- Treatment of industrial water and refinery condensate to produce high-quality boiler feedwater;
- Collection of water and/or other minor drainage from various types of equipment and secondary containment areas;
- Sanitary wastes from employee water use; and

- Blowdown of water from the cooling tower.

A wastewater stream also would be generated periodically when a gas turbine is shut down to wash the compressor blades to restore peak operating efficiency. This would be done several times per year per gas turbine depending on need. The washing operation would generate approximately 2,300 gallons of water that contains airborne dirt removed from the blades, oil residue, and cleaning detergents. Wash water would be collected and temporarily stored in the CGT wash water sump. At this time, the Applicant assumes that the wash water would need to be moved offsite for treatment and disposal unless and until the spent wash water can be characterized and determined to be acceptable for treatment in the refinery wastewater system. The contractor in charge of washing the compressor blades would be responsible for transporting the wash water offsite for treatment and proper disposal.

Periodically, the HRSGs must be purged of their contents ("blowdown") to remove trace dissolved inorganic constituents that build up in the steam generation process. This blowdown is cooled and routed to the refinery's cooling system to be recycled. Recycling the HRSG blowdown reduces the overall amount of freshwater necessary to operate the refinery.

Demineralization Plant Wastewater and Refinery Condensate Treatment System Waste

Pressure filters would be used to remove suspended solids in the water coming into the cogeneration facility. Filtration would be required as a first step in the production of high-quality boiler feedwater. After 24 hours of use, each of the filters would be backwashed to remove the solids from the filter media. The backwash water would be collected in the wastewater equalization tank, which would be periodically pumped to the refinery for treatment.

Ion exchange units, which require periodic chemical regeneration with dilute sulfuric acid and sodium hydroxide, also would be used for water quality treatment. These chemicals, along with the removed ions and rinse waters, would be collected and neutralized to a pH of between 6.5 and 8.5 and pumped to the refinery's wastewater treatment system.

Water produced from condensed steam returned from the refinery would be treated with a system that uses powdered cellulose and activated carbon to remove any trace oil before the water is used as boiler feedwater at the cogeneration facility. The cellulose used in this process would require periodic regeneration. The regeneration waste, including oily water and spent cellulose material, would be collected in a sump and drained for disposal. The Applicant estimates that the cogeneration facility would generate about 1,200 pounds per day of spent precoat filter material with roughly equal distributions of water, oil, and cellulose. The sump would be designed to hold approximately 10 days' capacity, or approximately 1,500 gallons. Oily water recovered from the sump would be pumped to the refinery's wastewater treatment plant. The remaining cellulose material would be disposed of at the non-hazardous land treatment farm in the refinery (Torpey, pers. comm., 2003).

Equipment Drains and Secondary Containment Areas

Pumps, compressors, turbines, and other equipment generate wastewater in the form of wash water, rainwater runoff, leakage, or periodic flushing operations. Since this wastewater has the potential to carry traces of free oil, it would be collected separately and pumped to the refinery's oily water sewer for treatment before discharge unless testing confirms it can be discharged into the stormwater treatment system.

All chemical feed and chemical storage areas would have secondary containment curbs to capture spills and tank overflows. Containment designs would be established assuming manual cleanup. Spill containment at the chemical truck unloading areas would be provided to contain small spills only at hose connection points with curbs for manual cleanup. Water from these areas would be transferred to the refinery's wastewater treatment system for treatment and disposal unless testing confirms it can be discharged into the stormwater treatment system.

Sanitary Waste

The cogeneration facility would have lavatories and showers, which would generate sanitary waste requiring treatment. This waste would average between 1 and 5 gpm and would be collected and pumped to the refinery's sanitary system for disposal. The refinery's sanitary waste is sent to the Birch Bay Water and Sewer District for treatment and disposal.

Cooling Tower Blowdown

Approximately 7-10% of the water used by the cogeneration cooling tower (292,320 gpd base operating case) would be drained to control the cooling tower's water quality. The drained water would be pumped to the refinery's wastewater treatment system for treatment and disposal.

Wastewater Discharge

Refinery wastewater is treated and discharged to the Strait of Georgia under the National Pollutant Discharge Elimination System (NPDES) permit number WA-002290-0, effective November 1, 1999 until November 1, 2004 (BP 2002, Appendix D). Wastewater from the cogeneration facility would be sent to the refinery's wastewater treatment system for treatment and discharge to the Strait of Georgia along with wastewater from the refinery. The proposed project would discharge 190 to 260 gallons per minute (approximately 8% of existing refinery flow discharge) assuming 15 cycles of cooling water concentration in the cooling tower (BP 2002, Appendix D).

Refinery-treated wastewater is discharged at the mooring area of the refinery's marine pier, approximately 2,000 feet from the shoreline at an approximate depth of 60 feet below mean lower low water level. The existing discharge diffuser, constructed in 1971 along with the refinery, is supported by pilings that also support the pier. The diffuser is a 20-inch-diameter pipe with 13 4-inch-diameter ports spaced 8 feet apart. The diffuser ranges from 3 to 6 feet above the seafloor.

Stormwater Collection, Treatment, and Discharge

Most of the cogeneration facility site would be paved with asphalt or covered with crushed rock, grass, buildings, or enclosures. The finished surfaces would be sloped from a high point near the center of the facility toward low points along the edge of the facility's internal roads. Runoff would sheet flow across the site toward a collection system consisting of swales and catch basins. All surface runoff would be captured by the surface drainage system and directed through an underground piping system to the onsite stormwater treatment and detention system. The stormwater treatment and detention system consists of an oil-water separation system equipped with a shutoff valve for containment in case of an accidental release. Stormwater would be discharged from the oil-water separation system into a final treatment and detention pond properly sized in accordance with Whatcom County and Washington Department of Ecology (Ecology) requirements. Stormwater would be discharged from the detention pond to the proposed wetland mitigation sites. The detention pond would either be constructed as a lined pond, or a monitoring program would be established to ensure that stormwater composition does not adversely affect groundwater quality. See Section 3.3 Water Resources for additional information about the discharge of stormwater to the wetland mitigation sites.

Stormwater from the secondary containment structures for outside tanks and chemical storage areas would be kept separate from other stormwater because of releases that could potentially occur from the tanks. This stormwater would be collected and routed to the cogeneration facility's wastewater system and then on to the refinery's wastewater treatment system for treatment and disposal along with other cogeneration facility wastewater.

Ammonia Storage System

The cogeneration facility would use ammonia to facilitate required chemical reactions in the SCR emission control system. An ammonia storage and distribution system would be located onsite to supply 100% anhydrous ammonia to the SCR catalyst beds. The system would include a 12,000-gallon aboveground storage tank, a delivery truck unloading and containment area, and interconnecting valves and piping to feed the ammonia flow control unit. The working capacity of the storage tank would be sufficient for storing ammonia for approximately four weeks of operation. Safety devices such as pressure/vacuum relief valves, liquid overflow protection devices, isolation block valves, alarms, water spray (above storage tank), and associated instruments would be incorporated into the detailed design of this storage system. The cogeneration facility would receive anhydrous ammonia by tanker truck and would use up to 870,300 pounds (approximately 168,500 gallons) of ammonia per year. The number of round trips for ammonia delivery is estimated to be 23 per year.

Ancillary Systems

The cogeneration facility would include a number of emergency ancillary and support systems, including auxiliary cooling, control and communications, emissions monitoring, electrical distribution and control, security, and fire protection.

A new approximately 1,500-kilowatt (kW) emergency diesel generator would provide power to maintain the critical lubrication system if the total power grid ever fails. An approximately 265-horsepower (hp) diesel-driven pump would be provided to ensure adequate water pressure for fire suppression at the cogeneration facility in case of a power failure or low water pressure situation. The generator and pump would only operate in emergency situations or during periodic equipment tests.

Water Supply System

Water Sources

The Whatcom County PUD and the Birch Bay Water and Sewer District would supply water to the cogeneration facility. Two streams of freshwater would be required: (1) potable water, and (2) non-potable cooling tower and boiler makeup water.

The Birch Bay Water and Sewer District provides potable water to the refinery. A new water pipe routed between the refinery and cogeneration facility would supply potable water to the cogeneration facility. Potable water required for drinking, personal washing, and sanitation at the cogeneration facility would average between 1 and 5 gpm. The Applicant anticipates that the route of the piping between the two facilities and point of entry to the cogeneration facility would be adjacent to Access Road 2, however the exact route and refinery tie-in point have not been determined.

The Whatcom County PUD provides non-potable industrial water to the refinery. The refinery has a contract with Whatcom County PUD to purchase industrial water through December 31, 2030. Alcoa Intalco Works has a similar contract to purchase industrial water from Whatcom County PUD. Whatcom County PUD obtains water from the Nooksack River for both of these contracts under a certified water right.

Letters of intent have been entered into by the Applicant, Whatcom County PUD, and Alcoa Intalco Works to allow the cogeneration facility to purchase industrial water that is currently allocated to the aluminum smelter. If Alcoa Intalco Works is operational, Whatcom County PUD would supply industrial water to the cogeneration facility from recycled water used for once-through cooling at the nearby aluminum smelter. If Alcoa Intalco Works is not operational, the cogeneration facility would purchase the industrial water directly from the PUD, which would have otherwise provided it to the aluminum smelter. A maximum amount of approximately 2,780 gpm of water from the PUD would be used. The cogeneration facility would require an average of 2,244 to 2,316 gpm of industrial water, and when the aluminum smelter is operational, the remaining 484 to 556 gpm of recycled water would be used by the refinery to provide for a similar reduction in the amount of freshwater that needs to be withdrawn from the Nooksack River.

The Whatcom County PUD currently supplies freshwater to the refinery by an existing 24-inch pipeline, which enters the refinery at the southeast corner of the property. Freshwater or recycled industrial water would be conveyed to the cogeneration facility through a new 16-inch underground pipe to be constructed within the refinery. The Applicant anticipates that the route of the new industrial water supply pipe between the two facilities and point of entry to the cogeneration facility would be adjacent to Access Road 2, however the exact route and refinery tie-in point have not been determined at this time.

Water Treatment

Water for the HRSGs must meet stringent specifications for suspended and dissolved solids. The recycled industrial water from the Alcoa Intalco Works aluminum smelter or freshwater from the Whatcom County PUD does not meet the specifications required for steam generation. In order to meet these specifications, the water would be run through two pressure filters at the cogeneration facility. Demineralized water from the polisher would flow to the demineralized water tank, which would provide an uninterrupted supply of demineralized makeup water to the steam cycle and would have eight hours of boiler feedwater storage capacity.

A steam sampling and analysis system would monitor the water quality at various points in the facility's steam cycle. The water quality data would be used to guide adjustments in water treatment processes and to determine the need for other corrective operational or maintenance measures.

Access Road 1

The cogeneration facility's primary access road (Access Road 1) would connect the site to Grandview Road to the north. Access Road 1 would be approximately 300 feet long, 30 feet wide, and surfaced with asphalt (Torpey, pers. comm., 2003d). Access roads would also be constructed to Brown Road on the south and Blaine Road on the west. Three access roads are proposed to provide flexibility for access in case of an emergency. Access Road 2 is discussed as part of the refinery interface, and Access Road 3 is discussed as part of other project components. In addition, a permanent road would be constructed around the site perimeter with branch roads providing access to specific plant areas such as the CGTs, STG, HRSGs, water treatment facility, administration building, and cooling tower.

All roadwork within the plant would be constructed to facilitate plant access and maintenance in accordance with standards of the American Association of State Highway Transportation Officials (AASHTO). Roadwork outside the plant boundary would be constructed in accordance with the Washington State Department of Transportation (WSDOT) and emergency vehicle requirements. Figure 2-1 shows the proposed access roads for the cogeneration facility.

Refinery Interface

Steam and Condensate System

Steam from the cogeneration facility to the refinery and condensate from the refinery to the cogeneration facility would be transmitted through new pipes mounted on an elevated piperack that would be constructed between the facilities south of the new east-west access road (see Figure 2-1). The Applicant has not yet determined the exact route and tie-in point for the piping within the refinery.

Natural Gas Fuel System

Natural gas would be used as the fuel source for the CGTs and HRSG duct burners. Although the Applicant has not made a commitment to purchase natural gas from a particular provider, it is anticipated that natural gas would be supplied by the existing Ferndale or Cascade pipelines, which are routed through the refinery in the utility corridor immediately east of Blaine Road.

A new connection and natural gas pipes would be installed within the refinery at the existing metering station for the Ferndale pipeline to support both cogeneration and refinery operations. From the connection at the metering station, a new underground pipe would be routed approximately 300 feet west under Blaine Road to the new compressor station to be constructed within the refinery. A second pipe providing the compressed natural gas from the compressor station to the refinery would be routed back under Blaine Road to the refinery tie-in at the metering station. A third pipe providing compressed natural gas from the compressor station to the cogeneration facility would be routed above ground for approximately 450 feet along the new piperack. The Applicant has not yet determined the exact size, type, and route of the natural gas pipes (Torpey, pers. comm., 2002).

Natural gas would be delivered to the project at a pressure of approximately 250-300 pounds per square inch gauge (psig). The CGTs and some refinery operations require a higher fuel pressure, so natural gas compressors would raise the pressure of this gas to approximately 500 psig. The compressor station would include a building to enclose three electrically driven compressors, acoustic protection, and gas and fire detection and extinguishing systems. At this time, it has not been determined who would construct and operate the compressor station.

Industrial Water Supply

The Whatcom County PUD currently supplies freshwater to the refinery via an existing 24-inch pipeline, which enters the refinery at the southeast corner of the property. Freshwater or recycled industrial water from Alcoa Intalco Works would be conveyed to the cogeneration facility through a new 16-inch underground pipe to be constructed within the refinery. The Applicant anticipates that the route of the new industrial water supply pipe between the two facilities would be adjacent to Access Road 2, however the exact route and tie-in point within the refinery have not been determined.

Potable Water Supply

The Birch Bay Water and Sewer District provides potable water to the refinery via an existing 6-inch potable water pipeline that enters the refinery near the contractor’s gate from a utility ROW along Grandview Road. Potable water to the cogeneration facility would be provided by a new water pipe routed between the refinery and cogeneration facility. The Applicant anticipates that the route of the piping between the two facilities would be adjacent to Access Road 2, however the exact size, route, and tie-in point for piping within the refinery have not been determined at this time.

Industrial Wastewater Connection and Associated Piping

Cogeneration facility industrial wastewater would be conveyed to the refinery for treatment via a new wastewater pipe. The Applicant anticipates that the route of the piping between the two facilities would be adjacent to Access Road 2, however the size, route, and tie-in point for piping within the refinery have not been determined at this time.

Sanitary Wastewater Connection and Associated Piping

Cogeneration facility sanitary wastewater would be conveyed to the refinery's sanitary wastewater system for transmission to the Birch Bay wastewater treatment plant via a new sanitary wastewater pipe. The Applicant anticipates that the route of the piping between the two facilities would be adjacent to Access Road 2, however the exact size, route, and tie-in point within the refinery have not been determined at this time.

Elevated Piperack

An elevated piperack would be constructed between the cogeneration facility and the refinery to support steam, condensate, and natural gas pipes between the two facilities. The piperack would most likely be made of steel with vertical supports spaced at approximately 20-foot intervals and I-beams anchored to pile-supported concrete footings measuring approximately 3 feet by 3 feet. The piperack would be between 3,000 and 3,500 feet long, with height to be determined based on utility corridor maintenance requirements, locations of existing overhead power lines, and vehicle access requirements. Pile type, length, and configuration would be based on geotechnical investigations not yet conducted by the Applicant.

Intermediate Voltage Substation

An intermediate voltage (either 69 kV or 115 kV) substation for distribution of electrical power produced by the cogeneration facility would be constructed within the refinery at a site approximately 500 feet west of the cogeneration facility. The substation would be connected to the 230-kV switchyard in the cogeneration facility and to three existing transformers (MS 1, MS 2, and MS 3) elsewhere in the refinery via new overhead or underground lines.

New distribution transformers at Substations MS 1, MS 2, and MS 3 would facilitate the distribution of power within the refinery. The distribution transformers would be installed and operated by the refinery.

Stormwater Facilities

The Applicant would construct stormwater facilities in the refinery for the collection, detention, and treatment of stormwater runoff from laydown areas during project construction. Stormwater facilities to be constructed in the refinery would include a 0.6-acre stormwater detention pond (detention pond 2) and associated oil-water separation facility, a stormwater system perimeter access road, and approximately 1,500 feet of conveyance ditch (Ditch C-4). Upon completion of construction, the refinery would be responsible for maintenance and operation of these stormwater components.

Laydown Areas

Figure 2-1 presents the construction laydown areas that would be created within the refinery, which total approximately 28 acres. Laydown Areas 1, 2, and 3 would be located in the northeast corner of the refinery, immediately west of Blaine Road and immediately south of Grandview Road. In addition, the refinery's existing 3.2-acre contractors' parking lot in the same area would also be used as a construction laydown area. Laydown areas would be unpaved or surfaced with aggregate.

Once construction is completed, Laydown Areas 1 and 3 would be retained as material and/or equipment storage areas for the refinery. The northern 273 feet of Laydown Area 2 would be restored to native wetland and upland communities.

Access Road 2

Figure 2-1 depicts Access Road 2 to be constructed within the refinery. Access Road 2 would be constructed between Blaine Road and the western edge of the cogeneration facility. The road would be 24 feet wide and approximately 300 feet long, and would provide direct vehicular access between the refinery and the cogeneration facility. Access Road 2 would be constructed with aggregate placed over a compacted, engineered subbase, and would meet WSDOT and emergency vehicle requirements. The access road also would carry a variety of pipe and utility connections between the cogeneration facility and the refinery.

Transmission System

The cogeneration facility would be connected to Bonneville's Custer substation for transmission of power not used by the refinery. A double-circuit 0.8-mile-long transmission line from the cogeneration facility's 230-kV switchyard to the Custer/Intalco Transmission Line No. 2 would export power from the cogeneration facility to the Bonneville system. Figures 2-1 and 2-2 show the existing Bonneville transmission lines and the new electrical transmission system corridor.

Two 230-kV transmission lines would connect the cogeneration facility to the Bonneville transmission lines for redundancy. Each line would be capable of safely carrying the exported power to the Bonneville system. The cogeneration facility would use two types of towers for the electrical transmission lines between the facility and the Bonneville connection point. A monopole steel tower would be used at the 230-kV switchyard within the cogeneration facility. Within the electrical transmission corridor, lattice steel towers would be used. See Figure 1-2 for typical views of both tower designs.

Ownership of the 230-kV switchyard and new electrical transmission towers and lines connecting this switchyard to the existing Bonneville transmission lines would be subject to the terms of an interconnection agreement between the Applicant and Bonneville. The Applicant would retain ownership of the land underlying the switchyard and the transmission system.

Custer/Intalco Transmission Line No. 2

Two existing 230-kV transmission lines connect Bonneville's Custer substation to Bonneville's Intalco substation at the Alcoa Intalco Works aluminum smelter. These transmission lines are routed in separate corridors with lattice steel towers supporting one transmission circuit each. Near the refinery, these corridors both run in a north-south direction (see Figure 2-2).

In February 2001, the Applicant submitted an interconnection request to Bonneville to allow the cogeneration facility to connect to the Bonneville system. In response to that request, Bonneville completed a contingency analysis for the cogeneration project and refinery load along with the potential Alcoa Intalco Works load on the two existing Bonneville 230-kV transmission lines. The analysis showed that under certain conditions, one or more portions of the Bonneville system could exceed acceptable thermal operating limits with the proposed project. Two modification options for the Bonneville transmission system have been identified to address the potential condition.

Option 1 – Remedial Action Scheme

Option 1 would involve a RAS. The RAS would install additional electrical equipment within the Custer and Alcoa substations, which would automatically reduce the load at the Alcoa facility if thermal operating limits are exceeded on the Bonneville transmission lines. This option would not require any changes to the 230-kV lines or towers, but would require agreement among the Applicant, Alcoa Intalco Works, and Bonneville. This is the Applicant's preferred option.

Option 2a – New Transmission Line with Lattice Towers

Under both Option 2a and Option 2b, a second 230-kV transmission line would be installed inside the existing 125-foot ROW of Custer/Intalco Transmission Line No. 2 from the cogeneration interconnection point to the Custer substation to increase the transmission capacity along this segment. The existing single-circuit steel lattice towers in this approximately 5-mile-long segment are not strong enough to carry a second circuit so the 24 towers would be replaced with new double-circuit towers (see Figure 1-2 for typical single-circuit and double-circuit tower designs). Appendix C provides annotated aerial photographs that depict the existing tower locations and selected environmental features within the transmission corridor.

Under Option 2a, the new double-circuit towers would have a lattice steel design. The towers likely would be replaced one at a time by temporarily supporting the existing wires while each tower is installed. Some foundation work likely would be required to accommodate the new towers, which would be approximately 120 feet tall and spaced an average of 1,150 feet apart (Torpey, pers. comm., 2003). Figure 1-2 provides a typical view of a lattice steel tower.

Two basic types of 230-kV steel lattice towers would be used: tangent or light-angle structures and dead-end structures. Tangent structures are used to elevate wires a safe distance above the ground on relatively straight stretches of a line without sharp angles. Dead-end structures elevate the conductors above the ground and equalize tension of the conductors between two segments of transmission line when the line makes a turn. Dead-end structures are much stronger, heavier, and more expensive than tangent structures.

<u>Option 2b – New Transmission Line with Monopole Towers</u>

Option 2b is similar to Option 2a except that steel monopole double-circuit transmission towers would be installed instead of lattice steel towers. The monopole towers would be approximately 120 feet tall and spaced an average of 900 feet apart (Torpey, pers. comm., 2003). More towers would need to constructed under this option because of the closer spacing requirement for the monopole tower design. Figure 1-2 provides a typical view of a monopole tower.

Transmission Line Components

The following section briefly describes typical transmission line components.

Conductors are the wires that carry electrical current in a transmission line.

Insulators are used to suspend the conductors from towers. Insulators are made of non-conductive materials (porcelain or fiberglass) that prevent electric current from passing through the towers to the ground. Porcelain insulator strings would be non-reflective to reduce their visibility.

Transmission towers elevate conductors to provide safety within the ROW for people and buildings. The National Electrical Safety Code establishes minimum conductor heights. Minimum conductor-to-ground clearance for a 230-kV line is 22.4 feet depending on the type of land use under the line. Greater clearance would be provided over highway, railroad, and river crossings and some agricultural areas. Lines are generally strung above the minimum height to allow for future sag. As power lines (conductors) carry increasing amounts of power, electrical resistance causes the conductors to get warmer, expand, increase in length, and hang lower to the ground.

A **fiber-optic cable** may be attached to provide a communication link. The 0.5-inch-diameter fiber-optic cable would be hung below the conductors.

Overhead ground wires are two smaller wires attached to and strung between the tops of the towers to protect the transmission line against lightning damage. The width of each wire is typically 0.5 inch.

Counterpoise is a set of wires buried in the ground surrounding each tower to provide lightning protection by providing a low resistance path to the earth.

At this time, several aspects of the reconstruction of the Custer/Intalco Transmission Line No. 2 remain to be resolved by Bonneville and the Applicant. These include:

- Number, type, and location of transmission towers that would be installed;

- Type, length, and location of transmission line access roads to be constructed or improved; and
- Size and location of any temporary laydown, staging, and assembly areas that may be required.

Other Project Components

Alcoa Intalco Works Industrial Water Supply Piping and Equipment

To facilitate the cogeneration facility's use of recycled industrial water when the Alcoa Intalco Works aluminum smelter is operating, the Applicant would fund the construction of a recycled water pipeline and associated equipment within the Alcoa Intalco Works facility, approximately 2.5 miles south of the cogeneration facility site. The new facilities would be constructed and operated by Whatcom County PUD, and would consist of new piping that would connect the Alcoa Intalco Works air compressor building with a new 10-foot by 40-foot sump or wet well, which would be installed on the south side of the Alcoa Intalco Works facility. A 12-foot by 20-foot enclosure containing three 150-hp electric pumps would be constructed and connected to the PUD control system. A new 16-inch pipe approximately 1,600 feet long would connect the wet well to an existing PUD water transmission line located at Alcoa Intalco Works, which in turn connects to the BP Cherry Point Refinery.

Compensatory Wetland Mitigation Areas

The Applicant proposes to rehabilitate approximately 110 acres of wetland and wetland buffer to compensate for losses in wetland function expected from construction of the proposed project. Figure 2-1 depicts the location of the CMAs proposed for the project.

The Applicant would create two wetland mitigation areas on Applicant-owned land immediately north of Grandview Road near the cogeneration facility. CMA 1 would cover approximately 50 acres and would be located in the northeast quadrant of the intersection of Grandview Road and Blaine Road, extending to the vicinity of Terrell Creek to the north. CMA 2 would cover approximately 60 acres and would be located in the northwest quadrant of the same intersection, also extending to the vicinity of Terrell Creek to the north.

The wetland mitigation areas would be rehabilitated by restoring historical drainage patterns by rerouting treated stormwater runoff and plugging existing ditches, removing and suppressing non-native, invasive plants such as reed canarygrass, and establishing native plant communities. Rerouting stormwater runoff would include installing pipes, culverts, and an inlet channel with diffuse-flow outlets to direct runoff from the proposed detention pond at the cogeneration facility to CMA 1 rather than letting all of it go through a roadside ditch directly to Terrell Creek. All runoff from the other detention pond would be directed through an existing culvert to a series of ponds, known as the BP duck ponds, connected by natural channels and swales. The rerouted stormwater runoff would be directed to large natural areas that would provide additional hydrologic storage and water quality treatment.

Laydown Area 4

Figure 2-1 depicts Laydown Area 4, a 4.74-acre temporary construction laydown area in the northeast corner of the cogeneration facility immediately south of Grandview Road. The laydown area would be unpaved or surfaced with aggregate, and would be used to support project construction.

Once construction is completed, the western 2.94 acres of the laydown area would be part of the cogeneration facility and would be restored with natural wetland and upland vegetation. The eastern 1.81 acres of Laydown Area 4 would be outside of the cogeneration facility and would be planted as upland forest to be maintained by the refinery.

Access Road 3

Figure 2-1 depicts Access Road 3 to be constructed between Brown Road and the southern edge of the cogeneration facility. Access Road 3 would be constructed by widening and extending the existing maintenance road previously built to provide access to a future refinery power transmission corridor. The existing unsurfaced, two-track access road would be widened to 30 feet and extended to a length of approximately 1,500 feet to provide access to the facility from Brown Road. The road would be constructed with aggregate placed over a compacted, engineered subbase, and would meet WSDOT and emergency vehicle requirements.

2.2.3 Construction

The construction of the BP Cherry Point Cogeneration Project would involve:

- The cogeneration facility;
- The systems and components that interface with the BP Cherry Point Refinery;
- The 230-kV power transmission system;
- Modifications to Bonneville's Custer/Intalco Transmission Line No. 2; and
- Other offsite project components.

Cogeneration Facility and Refinery Interface

The existing terrain at the cogeneration facility site is relatively flat. Site grading would use onsite fill to the extent possible to reduce the need for imported fill. Site preparation would be completed using conventional methods of construction and conventional construction equipment, including bulldozers, front-end loaders, trucks, tractor scrapers, and graders. During site preparation, an erosion control and temporary stormwater drainage system would be installed. This system would convey surface water runoff into the storm drainage control system. To the extent possible, excavated material of acceptable quality would be retained on the site in designated locations using proper erosion protection methods for reuse as backfill. Excess material to be removed from the site would be disposed of at an acceptable location. The Applicant estimates the amount of imported fill required for site preparation would be 126,000 cubic yards. The fill material would be obtained from permitted, local sources (see Section 3.1 for additional discussion of the potential sources for required fill material).

Temporary roads, perimeter roads, laydown and parking areas, and other work areas would be surfaced with gravel as required. The Applicant estimates that the total amount of gravel aggregate and sand base material required for site preparation would be 28,200 cubic yards. The construction contractor would determine the source of these materials, but it is expected to be from local, permitted sources (see Section 3.1 for additional discussion of the potential sources for required aggregate material).

Undeveloped areas to the north and the west of the cogeneration facility have been identified for use as construction staging areas, known as laydown areas. These areas (Laydown Areas 1 through 4) would be graded and left unpaved or surfaced with aggregate during construction as required. Approximately 36 acres of land would be used for construction laydown (see Figure 2-1). Construction laydown and parking areas would be adjacent to the site. A security fence would be installed around the perimeter of the site and the perimeter of the laydown areas. Construction workers would enter through a security gate on Blaine Road on the Applicant's property.

Originally, the Applicant identified a Laydown Area 5 that could be used if additional laydown space was needed (BP 2002, Appendix D). The Laydown Area 5 site, which is approximately 10 acres of uplands owned by the Applicant, is 1.5 miles southwest of the cogeneration facility site. The Applicant has subsequently determined that Laydown Area 5 would not be required (Torpey, pers. comm., 2003).

After site preparation and rough grading is completed, the construction contractor would install the piling and concrete foundations required to support the combustion and steam turbine generators, HRSGs, stacks, pipe supports, electrical equipment, and other miscellaneous equipment items, tanks, and support facilities. Although the Application for Site Certification indicates that pile-supported concrete foundations would be used for all major equipment items, major building columns, and piperack supports, the Applicant now believes that only the STG building would require a pile-supported concrete foundation. Piles may be as long as 100 feet (Torpey, pers. comm., 2003). Pile type, length, and configuration would be based on geotechnical investigations not yet completed. Construction of these foundations would require the use of heavy equipment, including pile-driving equipment, excavation and backfill equipment, concrete-pumping equipment, and concrete-finishing equipment. In addition, light and medium trucks, air compressors, generators, and other equipment with internal combustion engines would be used. Onsite roads and parking areas would be constructed with asphalt over a compacted and engineered subbase. The perimeter and equipment access roads would be constructed with aggregate placed over a compacted and engineered subbase. Blasting is not expected to be required for construction of foundations.

The facility installation work would include underground systems, such as pipes, sewers, duct banks, and grounding grids. Construction materials such as concrete, structural steel, pipe, wire, cable, fuels, reinforcing steel, small tools, and consumables likely would be delivered to the project site by trucks using existing roadways. Some of these materials could be delivered by rail. These materials would be segregated and stockpiled in designated laydown areas. Fueling of construction equipment would occur at a designated location with appropriate spill containment provisions.

Combustion turbines and other large equipment would be transported to the site by rail (preferably) or barge. This large, heavy equipment would then be transferred by cranes to an oversize truck for delivery to the project site. Rail deliveries would be off-loaded and transported to the site by a heavy-haul contractor using specialized transports. The existing refinery's rail spurs could be used to unload heavy equipment transported by rail.

After the underground systems and foundations are installed, the excavated areas would be backfilled, compacted, leveled, and finished with gravel as required for the aboveground portion of the facility. The aboveground portion would include the piperack, CGTs, HRSGs, the STG, cooling tower, 230-kV switchyard, and monopole transmission tower and lines. For each HRSG, the exhaust stack would be assembled in the field and erected last. The underground piping system may have cathodic protection, as determined by the soil resistivity tests and piping material. Detailed pipe routes, surveys, and plans have not been prepared at this time for the piping systems that would interface with the refinery. Applicable regulations include U.S. Department of Transportation (DOT) 49 Code of Federal Regulations (CFR) 192, which specifies the required depth, fill, and cover for pipelines. In general, pipeline trenches would be 6 to 10 feet deep depending on soil conditions and the water table, and considering the engineering analysis of expected load conditions. Minimum fill would be 3 to 4 feet over the pipe, but also would depend on the evaluation of loads from vehicle traffic that may pass over the pipeline at designated points.

Construction of the natural gas supply piping would begin with the survey and staking of the natural gas pipeline route. Following the survey, work crews would begin excavation of the route. The natural gas piping would be connected to the existing Ferndale natural gas transmission line located within the refinery after the new piping and associated equipment have been constructed and pressure tested. Normal gas pipeline construction includes the following steps:

- clearing and grubbing;
- topsoil movement/stockpiling;
- trenching;
- lining the trench with a gravel bed and a water barrier on steep hills;
- pipe assembly and welding;
- X-ray of welds;
- hydrostatic testing;
- installing pipe in the trench;
- repeat testing (optional);
- backfilling;
- replacing topsoil; and
- seeding and restoring the site.

Once construction is completed, the final grading would be performed. The roads, parking lot, and other designated areas in the power block, maintenance, and warehouse areas would be paved while the balance of the site would be finished with gravel as required. The switchyard would be surfaced with gravel. All side slopes and embankments would be protected against erosion with landscaping or seeded with grasses common to the local area.

Transmission System

The 0.8-mile 230-kV double-circuit transmission line would be installed within a new 150-foot transmission ROW on Applicant-owned land. The corridor is relatively flat and would be accessible from Brown Road via previously constructed transmission line maintenance roads. Site preparation and the construction of gravel foundation pads would need to be accomplished for Tower 1. This work was previously performed under a separate project for Towers 2, 3, and 4.

Site Preparation and Clearing

Clearing around the towers would include removal of all brush and debris and possibly grading to level the working area. An area of approximately 0.25 acre would be cleared or disturbed for tower placement. Cleared or disturbed areas that are not directly covered by transmission towers, facilities, or accessories would be reseeded with naturally occurring shrubs and grasses at the end of the construction period. Vegetation within the transmission line ROW would be low growing to allow safe and uninterrupted operation of the transmission line.

Tower Footings

Transmission towers are attached to the ground by burying a metal footing assembly at each of four structure corners. A trackhoe is used to excavate the soil to allow footing placement. The excavation is usually 1 to 2 feet larger than the footing to be installed. Additional footing excavation could be required in certain soil types. The soil and rock materials removed are later used to backfill the excavation once the footings are installed. Excess material would be stockpiled and spread along the ROW.

Transmission Towers

Transmission towers would normally be assembled in sections at the structure site and lifted into place by a large crane (30- to 100-ton capacity). Occasionally, transmission towers may be assembled at a remote staging area, then lifted, transported, and placed on foundation footings at the structure site by large sky-crane helicopters. Using helicopters enables towers to be constructed more quickly and reduces ground disturbance. Helicopter construction could be more costly than conventional crane construction, but time saved by faster structure assembly sometimes reduces the cost differential. The construction contractor would decide when helicopter-assisted assembly is appropriate. The construction contractor would not be selected until the Record of Decision (ROD) is completed for the proposed project.

Conductors, Overhead Ground Wire, Fiber-Optic Cable, and Insulators

Workers would first attach a small steel cable called the “sock line” to the towers. The other end of the sock line would be attached to the conductor. As the sock line is pulled through pulleys on the towers, it would pull the conductor from large reels mounted on trucks equipped with a brake system. This allows the conductor to be unwound and pulled through the towers under tension, usually by a helicopter. The conductors would be attached to the tower using glass, porcelain, or fiberglass insulators. The conductor would be pulled through pulleys that are attached to the bottom of these insulators on each tower.

The overhead ground wires would be attached to the top of the transmission towers. Bonneville may also attach a 0.5-inch-diameter fiber-optic cable to the transmission towers to provide a communication link. The counterpoise would be buried in the ground at each tower.

Staging, Assembly, and Refueling Areas

Construction contractors usually establish staging areas near the transmission line to stockpile materials for towers, spools of conductor, and other construction materials until they are needed. Steel for towers would be delivered in pieces and would need to be assembled onsite. Optionally, general assembly yards could be used to erect the tower, which could then be moved into place by truck or helicopter. Because trucks would need to refuel often, these areas would also likely be used for refueling.

Custer/Intalco Transmission Line No. 2

Option 1 - Remedial Action Scheme

Under Option 1, additional electrical equipment and cabling would be installed within the Custer and Intalco substations, which would automatically reduce the load at Alcoa Intalco Works if thermal operating limits are exceeded on the Bonneville transmission lines. This option would not require any changes to the existing 230-kV lines or towers for Transmission Line No. 2.

Option 2a - New Transmission Line with Lattice Towers

Under both Option 2a and Option 2b, Bonneville would construct and operate a second 230-kV transmission line within the existing 125-foot ROW of Custer/Intalco Transmission Line No. 2 from the cogeneration interconnection point to the Custer substation (a distance of approximately 5 miles). This would require the replacement of 24 existing towers.

Under Option 2a, the new towers would be of the lattice steel design, and the method of construction would be similar to that described previously for the 230-kV transmission system. However, the towers would require relatively little additional ground disturbance for foundation work and structure placement because the existing tower foundations would most likely be able to be reused with only minor modifications. Existing towers would be removed from their foundations by crane or helicopter, and disassembled either onsite or at a nearby laydown area. The old wire, steel lattice towers, and other structures to be removed may be salvaged or made available for reuse, as appropriate. Other transmission line materials (such as hardware, cross arms, and insulators) would be removed from the ROW and properly disposed of. During replacement of each tower, the existing transmission lines would need to remain in service. The existing towers and lines would most likely be temporarily supported until the new tower is installed and the lines can be attached to the new tower (McKinney, pers. comm., 2003).

To the extent practicable, existing maintenance roads would be used for access during the construction effort. It is anticipated that the county roads would be of sufficient quality to allow equipment and personnel movement to the construction site without significant road improvement. Any damage to county roads from equipment movement or operation would be repaired to county standards prior to equipment demobilization.

Some improvement to agricultural roads may be required. If necessary, improvements to existing roads would generally be limited to a zone 20 feet wide (for a 16-foot roadbed and adjacent ditches). No permanent access road construction would be allowed in cultivated or fallow fields. Any roads in cropland would be removed and the ground may be restored to its original contour when the transmission line is completed depending on the landowner's needs. Dips and culverts would be installed within the access roadbeds to provide drainage. If the road were temporary, any disturbed ground would be repaired and reseeded with grass or other seed mixtures as appropriate. At the conclusion of construction, access roads would likely be used for transmission line maintenance. If the ground were disturbed by maintenance activities, the roadbed would be repaired and reseeded if necessary. Fences, gates, cattle guards, and additional rock would be added to these roads when necessary to maintain access.

Option 2b - New Transmission Line with Monopole Towers

Option 2b would involve the replacement of existing lattice towers with steel monopole towers. The construction process for this option would be similar to Option 2a. Although it is possible that some existing tower foundations could be reused with modifications, the closer spacing requirement for the monopole tower design would require the construction of a greater number of towers than currently exist, therefore some new foundations would be required.

Tower installation would require vegetation to be cleared in an area sufficient for pole installation. Holes would be dug with a backhoe or power auger and a concrete foundation pier would be poured in place. In some cases, rock drills may be required to excavate a foundation hole to sufficient depth. Where drilling is required, unsuitable construction debris would be removed and backfilled with suitable material. The poles would be bolted to the foundation piers, steel cross-arm and insulators installed, and the towers prepared for conductor stringing.

Other Project Components

Compensatory Wetland Mitigation Areas

Wetland mitigation construction activities would consist of several key components, as follows:

- Creating a pipe or ditch to carry stormwater discharge from detention pond 1 on the cogeneration facility site to a new culvert under Grandview Road, several hundred feet west of Blaine Road;

- Constructing a level inlet trench extending approximately 1,000 feet in a northerly direction across the eastern side of CMA 2;
- Filling existing ditches on both CMA 1 and 2;
- Eradicating noxious weeds, primarily reed canarygrass and blackberry, using mowing, discing, and herbicide treatment if necessary; and
- Replanting with native vegetation.

A temporary irrigation system may also be installed to support initial establishment of planted vegetation.

Methods for the construction of industrial water supply modifications at Alcoa Intalco Works, and construction of Laydown Area 4 and Access Road 3 would be similar to the construction methods for piping systems, laydown areas, and roads discussed above under refinery interface.

2.2.4 Schedule and Workforce

Construction

<u>Cogeneration Facility, Refinery Interface, and Other Project Components</u>

Construction and commissioning of the cogeneration facility and system that interfaces with the refinery are scheduled to start in February 2004 and would take approximately 25 months. Operation of the facility is scheduled to begin in 2006. The construction schedule assumes an average work week of 40 to 48 hours for construction workers. Table 2-3 provides an estimate of the workforce anticipated during construction of the facility.

Construction activities would be primarily conducted on single shifts with overtime as necessary to meet specific schedule milestones. A second shift could be instituted as necessary to accommodate a particular construction activity or meet a critical milestone. At present, the Applicant plans for the commissioning effort to be supported with a second shift.

Dayshift hours would begin between 6:30 a.m. and 7:30 a.m. and conclude between 5 p.m. and 6 p.m. The cogeneration facility would coordinate with the refinery to stagger the workforce start/stop times to minimize traffic congestion and maximize the efficiency of support resources. Lunch hours would also be staggered to minimize congestion on the roads and supporting areas. If a second shift were needed, the number of workers assigned would be much lower than the number of workers in the first shift. The second shift would typically start at 6 p.m. and would conclude at 4 a.m. The management of the construction workforce would be coordinated with other concurrent projects within the refinery to minimize congestion and offsite impacts.

<u>Transmission System and Custer/Intalco Transmission Line No. 2</u>

Construction of the transmission system would be performed concurrently with construction of the cogeneration facility. The number of construction personnel needed for work on the Custer/Intalco Transmission Line No. 2 would depend on the modification option (RAS or transmission line reconstruction) selected by Bonneville and the Applicant.

Table 2-3: Expected Construction Work Force (Number of Personnel)

Craft/Trade	Months																						
	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
Boilermakers					9	19	28	38	51	69	76	79	79	76	60	22	13	13					
Carpenters	1	1	12	22	34	47	63	75	85	91	83	62	52	41	29	28	27	27	24	19	11	7	3
Electricians					11	22	37	56	75	93	108	126	130	132	132	129	116	97	64	21	2	1	
Ironworkers			2	5	8	11	32	45	54	54	46	22	17	9	6	5	4	4	3	1	1	0	0
Laborers	10	13	23	29	26	28	23	28	33	36	35	29	26	23	22	23	23	23	22	19	11	7	3
Pipefitters				1	17	31	50	75	102	126	142	164	173	177	178	173	167	143	90	36	3	2	1
Painters/Insulation Workers																		22	35	40	37	25	
Bricklayers/Masons			2	3	5	7	11	13	16	16	15	10	7	3	1	1	1	1	1	1	1		
Millwrights						10	20	30	40	54	74	81	84	84	81	64	23	13	13				
Operating Engineers	17	22	34	39	32	29	16	22	27	33	34	34	33	33	30	25	22	20	15	9	4	3	1
Teamsters	6	8	13	15	12	12	6	8	10	12	13	14	14	14	14	14	13	12	10	7	4	2	1
Total Craft	34	44	86	114	155	218	286	391	493	584	626	620	615	591	553	483	410	375	278	154	72	47	9
Field Staff	11	18	25	32	39	41	45	45	47	47	47	56	56	56	55	55	54	51	48	39	30	17	14
Total Site Staff	45	62	111	146	194	259	331	436	540	631	673	676	671	647	608	538	464	426	326	193	102	64	23

Source: BP 2002
Note: This staffing represents the cogeneration project only and does not include the natural gas compression station.

Operation and Maintenance

Cogeneration Facility, Refinery Interface, and Other Project Components

The Applicant has projected that the cogeneration facility and associated infrastructure could start commercial operation in 2006. Operation of the cogeneration facility would require approximately 30 full-time employees in shifts 24 hours per day for seven days per week. The dayshift during weekdays would have the largest number of personnel at the plant with approximately 15 employees. Other shifts and weekend crew would total an additional four employees.

For scheduled maintenance, the number of personnel would increase. This number depends on the specific scheduled tasks of each maintenance period and would vary between 5 and 10 maintenance personnel per shift. The maintenance periods are expected to vary in duration from two weeks per year to 18 weeks per year (once every six years).

The cogeneration facility is designed to allow maintenance to be occur without a complete shutdown of the facility. The anticipated maximum maintenance effort would occur every sixth year of operation when approximately 3,200 staff hours (about 80 staff weeks) would be necessary for major inspection and overhaul of equipment. During this period, maintenance on each gas turbine generator would take about six weeks with only one CGT undergoing maintenance at a time (18 weeks total for all three CGTs). The facility may not be completely shut down for any of the planned maintenance periods.

Transmission System and Custer/Intalco Transmission Line No. 2

No new workers would be needed to operate and maintain the transmission system or Custer/Intalco Transmission Line No. 2. Bonneville would use its existing inspection and maintenance staff to check towers, transmission lines, and activities within the ROW.

2.2.5 Costs

Cogeneration Facility, Refinery Interface, and Other Project Components

Total capital costs for the cogeneration facility and associated components are estimated to be $574 million. A summary of the costs by major component is provided in Table 2-4. The Applicant estimates that the annual operation and maintenance costs for the cogeneration facility, excluding the cost of natural gas, would be $18.2 million.

Transmission System and Custer/Intalco Transmission Line No. 2

The Applicant estimates that capital costs for the transmission system would be $6 million.

The capital costs for work associated with Custer/Intalco Transmission Line No. 2 would depend on the modification option selected. Preliminary cost estimates prepared by Bonneville indicate that Option 2 (reconstruction of the transmission line) would be $10.4 million (Bonneville 2002).

Although costs for Option 1 (RAS) would be considerably less than those of Option 2 because the existing transmission line would not need to be reconstructed, a cost estimate for this option has not been prepared to date.

Cost estimates for operation and maintenance of the transmission line elements of the project have not been prepared to date.

Table 2-4: Cost Estimate for the Cogeneration Project

Component	Cost in U.S. Dollars
Land	$0
Power Block Costs	
Mechanical equipment	$200,000,000
Civil/structural/architectural	$19,000,000
Piping, insulation, paint, and scaffolding	$16,000,000
Electrical and controls equipment	$32,000,000
Field construction and construction indirects	$80,000,000
Engineering, commissioning, construction management, and fee	$52,000,000
Total Cogeneration Facility Costs (unescalated 2001 $)	$400,000,000
Supporting Facilities Costs	
Gas compression/pipeline modifications	$22,000,000
Integration projects	$37,000,000
Other Costs	
Sales tax	36,000,000
Owner costs	35,000,000
Owner's contingency	44,000,000
Total All Components	$574,000,000

Source: BP 2002, Appendix D

2.3 NO ACTION ALTERNATIVE

Under the No Action Alternative, the proposed BP Cherry Point Cogeneration Project and all associated features including the systems and piping that make up the refinery interface, the 230-kV transmission system, modifications to Custer/Intalco Transmission Line No. 2, and creation of proposed wetland mitigation areas would not be constructed. The refinery would either purchase electricity or use onsite turbines to generate electrical power needed for refinery operations. Under the No Action Alternative, the Applicant has no immediate plans to use the area proposed for the project site.

Under the No Action Alternative, there would be no environmental impacts from the cogeneration facility. However, because the site is zoned for industrial uses, future industrial development could occur at the site. The refinery's demand for both steam and electrical power is expected to grow in the future as other projects are implemented at the refinery. Although the existing refinery's boilers would continue to operate, additional heat generation capability would be required, and this likely would be produced by new boilers and/or fired heaters.

The No Action Alternative does not remove the long-term need for power production; it potentially transfers the impacts to another site and potentially another technology. There would be no increase in the power supply reliability for the BP Cherry Point Refinery and no contribution to new electrical generation required to meet projected long-term increasing power demand in the Pacific Northwest and adjoining regions.

2.4 ALTERNATIVES CONSIDERED BUT REJECTED

2.4.1 Alternative Cogeneration Facility Locations

Onsite Locations

In addition to the proposed cogeneration facility site (Site 3), four other potential sites on the Applicant's property were evaluated for the facility location. They are as follows (see Figure 2-4):

Site 1 East of Blaine Road and north of Brown Road adjacent to an existing cooling tower.
Site 2 Within the Cherry Point Refinery boundary fence near refinery components.
Site 4 Immediately north of Grandview Road and northwest of Site 3. This area was evaluated because it contains a moderately sized upland area adjacent to Grandview Road.
Site 5 Within the refinery boundary fence just south of Grandview Road and west of Blaine Road. This site currently has a contractors' parking lot and open areas.

Each of the sites was rated on the basis of six criteria as documented in the Applicant's Application for Site Certification (BP 2002). The criteria included:

- Sufficient area,
- Proximity to the refinery,
- Avoidance of wetlands,
- Proximity to infrastructure,
- Avoidance of other environmental impacts, and
- Security.

These criteria are discussed in more detail below.

Rating Criteria

Sufficient Area

A site of approximately 33 acres is needed to provide for all plant components including a switchyard and other ancillary features. This area allows for some buffer around the perimeter of the plant. The actual footprint of the project could vary somewhat depending on final design of the project. In addition to the plant area, additional space of 36 acres is also needed for construction laydown, fabrication yards, and access roads. These areas temporarily would be used by the project for approximately two years during the construction period and would be left in place for use by the refinery thereafter.

Figure 2-4: Alternative Cogeneration Site Locations

Proximity to the Refinery

The proposed cogeneration facility has to be located within a reasonable distance from the refinery to provide steam through relatively short pipelines that are properly insulated for steam transport. Increasing the distance of the power plant from the refinery would decrease the efficiency of the project or make it impractical. Additionally, increased pipeline length would result in increased disturbance to land and wetland areas. The project site has to take into account the delivery point of the steam at the refinery since refinery operations or other obstacles may prevent a reasonable connection.

Avoidance of Wetlands

Siting of the cogeneration facility took into account the presence of wetlands; the potential area of wetlands that would be affected; and in some cases the function and value of the wetlands. Alternative project configurations were also evaluated to reduce overall impacts. In addition, proposed future refinery construction requirements were assessed to determine if there were potential actions that would result in additional wetland impacts.

Proximity to Infrastructure

The operation of a gas-fired cogeneration plant depends on several elements of supporting infrastructure, including a natural gas pipeline, a source of water, road access, and a transmission line. Reducing the construction of new infrastructure lowers cost and reduces the impact on the environment. The refinery has the above-mentioned infrastructure already in place, and the proposed site allows use of this existing infrastructure with minimum modifications. Alternative sites would require an extension of this infrastructure to service the cogeneration facility.

A transmission line corridor has received Section 404(b) permit approvals in a previous action, including mitigation for wetland impacts. To minimize additional wetland and other environmental impacts, all of the sites were evaluated in relationship to this permitted transmission line corridor.

Avoidance of Other Environmental Impacts

Impacts on other environmental values were also considered in the analysis of alternative sites, including loss of wooded areas, upland habitat impacts, proximity to water bodies, and visual impacts.

Security

The refinery is located in a rural area and is surrounded by wooded areas and open fields that are bisected by paved roads. The Applicant owns much of the land immediately surrounding the refinery, except on the west where the property boundary is along Jackson Road. A chain-link fence topped by barbed wire surrounds the refinery, which is bounded by Grandview Road on the north, Jackson Road on the west, Blaine Road on the east, and Aldergrove Road on the south. An internal security road runs inside the fence line. A secondary chain-link fenced area encloses other ancillary facilities east of Blaine Road and bounded by Grandview Road and Kickerville Road. Security guards patrol all roads and fence lines and all other Applicant properties.

Alternative Ratings

For each criterion, a rating of high, medium, or low was assigned, where high indicated the alternative best met the criterion, and low indicated that the alternative marginally met or did not meet the criterion.

Table 2-5 summarizes the ratings for the five alternative sites that were evaluated. Appendix A contains the siting and wetland 404(b) alternatives analysis.

Table 2-5: Summary of Ratings of Alternative Cogeneration Facility Sites

Criterion	Alternative Location				
	Site 1	Site 2	Site 3 (Proposed)	Site 4	Site 5
Sufficient area	High	Low	High	High	Medium
Proximity to refinery	Medium	High	Medium	Low	High
Avoidance of wetlands	Low	High	Medium	Medium	Medium
Proximity to infrastructure	High	High	High	Low	High
Avoidance of other environmental impacts	High	High	High	Low	Medium
Security	High	High	High	Low	High

Source: BP 2002, Section 2

Site 1

Site 1 was the first site investigated for the cogeneration project. The site was delineated for wetlands and it was determined that the site is approximately 80% wetlands (30 acres). Although this site rated high in most criteria, the Applicant did not select this site because of greater impacts on wetlands compared to the proposed site.

Site 2

Site 2 would provide only 16 acres of space for facility construction; therefore, the Applicant did not select the site because it did not meet the criterion for size.

Site 4

Site 4 was evaluated because it contains moderately sized upland area adjacent to Grandview Road. The site is located approximately 0.5-mile east of the refinery on the north side of Grandview Road. This site would require significantly longer segments of piping to deliver steam to the refinery and would also require a 0.5-mile new transmission line to the refinery. The steam pipeline to the refinery would be difficult to construct because existing gas and water pipelines and electrical transmission lines are south of Grandview Road. The Applicant did not select Site 4 because of the distance from the refinery that would result in new utility corridors to the refinery. In addition, the new utility corridors would be less secure than other proposed sites.

Site 5

Site 5 is located within the refinery's boundary fence just south of Grandview Road and west of Blaine Road. This area is used for construction laydown and contractor parking during maintenance programs at the refinery. Portions of Site 5 were delineated for wetlands, and a reconnaissance of the remaining area indicates that the overall site is approximately 80% wetlands (23.5 acres). If Site 5 were chosen for the cogeneration facility site, Site 3 would be required for equipment laydown areas and the wetland areas east of Blaine Road would be affected. Site 5 would also affect Wetland I, which would not be affected by using Site 3 for the project. In addition, the Clean Fuels Project will be constructed by the refinery in the space that is currently used as a maintenance laydown area, which means that the refinery will need additional maintenance laydown space in the future. The Applicant did not select Site 5 as the preferred site because it would have greater wetland impacts than the proposed site and it would make future refinery activities more difficult.

In addition to the sites described above, reconnaissance surveys were conducted to evaluate two other general areas located on Applicant-owned property. These additional areas are described below (see Figure 2-4).

1. An area approximately 200 acres south of Brown Road was evaluated for the presence of wetlands. The site is approximately 90% wetlands, including herbaceous wetlands and high-quality forested wetlands, which comprise approximately 70% of the area. Additionally, several small ponded areas appear to be ephemeral, but hold water for extended periods of time. Old-growth trees were found on this site and large mammal and raptor species (including red-tailed hawk) and wading species (including great blue heron) were observed. This area rated low in all categories and was eliminated from further consideration.
2. An area east of the proposed cogeneration facility site also was evaluated. It was found to contain forested wetlands that are of high quality in terms of their functions such as sediment detention and general habitat suitability. This area was eliminated from consideration based on the high quality of the habitat and the associated cost of mitigating impacts to such an area.

Offsite Locations

Locations outside Applicant-owned property were not evaluated because the primary purpose of the cogeneration project is to supply electricity and steam to the refinery. The Applicant owns an extensive amount of property that surrounds the refinery site. These surrounding areas are the only feasible locations to ensure a reliable and efficient source of power and steam for the refinery. Offsite locations would require more pipeline interconnections, potentially affecting more priority habitat, and would significantly reduce the efficiency of steam transmission to the refinery. Securing an offsite location also would likely be more costly as an existing emergency response and security system is already in place at the refinery.

2.4.2 Alternative Power Generation Technologies

The Applicant's evaluation of alternative power generation technologies was limited to technologies that could produce both steam and electricity.

Stand-Alone Combined Cycle

This technology integrates natural-gas-burning combustion turbines and steam turbines to achieve higher efficiencies. The combustion turbine's hot exhaust is passed through an HRSG to create steam used to drive a steam turbine generator. This technology is able to achieve thermal efficiencies up to approximately 53%, considerably higher than most other alternatives. The use of clean natural gas and the high equipment efficiency also result in relatively low air emissions per kilowatt-hour generated. The capital investment for the combined-cycle plant is significantly less than either a boiler-turbine or fluidized bed combustion plant.

Because of its high efficiency and superior environmental performance, combined-cycle technology is an integral part of the proposed cogeneration project. However, the stand-alone combined-cycle facility is less efficient than a cogeneration facility and would not produce steam for use at the refinery. Because this alternative technology does not meet the project's purpose and need, the Applicant eliminated it from consideration for the proposed project.

Conventional Boiler and Steam Turbine

This technology burns fossil fuel (gas, oil, coal, etc.) in a conventional boiler to generate steam to drive a STG. Steam can be extracted directly from the STG or provided from the main steam pipe. The remaining STG exhaust steam is then condensed and returned to the boiler. Makeup water is added to the steam cycle to replace process steam not returned as condensate. This is an established technology that is able to achieve approximately 30-40% thermal efficiency when using natural gas. Because of the relatively low thermal efficiency, high emissions, and high capital and operating costs, the Applicant eliminated the conventional boiler and steam turbine technology from consideration for the proposed project.

Fluidized Bed Combustion and Steam Turbine

Fluidized bed combustion is an alternative to the conventional boiler for generating steam, especially while burning high-sulfur-bearing, difficult-to-burn fuels such as petroleum coke, a byproduct of the petroleum refining industry.

A fluidant such as limestone is added to the fluidized bed to capture in-situ sulfur oxides produced during the combustion process. The amount of limestone used is significant, about one-third of a ton of limestone for every ton of coke burned. The systems required to import, transport, crush, and size this quantity of limestone can have significant environmental impacts.

The hot combustion flue gas is cooled by rising steam, which drives a steam turbine. Thermal efficiencies are comparable to the conventional boiler technology (approximately 36% in full condensing mode). A large quantity of calcium sulfate is generated as a byproduct. This material can be used to manufacture gypsum board or used as road fill material. If local markets do not exist for these products, potential environmental impacts from waste disposal and additional costs are high. Because of the environmental concerns with solid waste disposal, higher emissions, and the low thermal efficiency, the Applicant eliminated the fluidized bed combustion technology from consideration.

Other Alternative Technologies and Fuels

The Applicant eliminated technologies based on fuels other than natural gas because they would not allow the project to achieve the environmental and operational advantages of natural gas. Additional factors that render alternative fuel technologies unsuitable for the proposed project are as follows:

- No geothermal or hydroelectric resources exist in the area.
- Biomass fuels such as wood waste are not locally available in sufficient quantities to make them a practical alternative fuel.
- Solar and wind technologies are generally not continuous and not capable of producing the large quantities of steam needed to supply the refinery.
- Coal and heavy fuel oil technologies emit more air pollutants than technologies that use natural gas.

The Applicant selected natural gas technology based on the availability of natural gas and the environmental and operational advantages for the proposed cogeneration project.

2.4.3 Alternative Cooling Systems

The Applicant evaluated three alternative cooling technologies for rejecting heat from the steam turbine's surface condenser. These include:

- Dry cooling system: air cooled condenser;
- Wet/dry cooling: wet/dry evaporative tower; and
- Wet/dry cooling: hybrid system.

Dry Cooling System: Air Cooled Condenser

Air-cooled condensing (ACC) systems are significantly more expensive and less thermally efficient than comparable water evaporative cooling systems. They also require more land area than evaporative cooling systems and have a larger visual impact. The main benefit of the ACC system is to provide cooling with less freshwater consumption. Since ACC cooling is done without evaporation, is does not have water vapor plumes.

The Applicant initially selected a dry cooling system using an ACC for the proposed project to minimize water use, but was subsequently able to reach an agreement with the Whatcom County PUD and Alcoa Intalco Works allowing purchase of cooling water from the Alcoa Intalco Works. When the aluminum smelter is in operation, more water would be recycled on an annual average basis than the cogeneration project would consume, resulting in a net decrease in the amount of water needed to be withdrawn from the Nooksack River. When the aluminum smelter is not in operation, the Whatcom County PUD would provide the freshwater to the cogeneration project that would have been allocated to Alcoa.

Wet/Dry Cooling System: Evaporative Wet/Dry Cooling Tower

The wet/dry cooling tower uses a conventional design but adds a tube bundle inside the tower above the fill that breaks the water column into a spray. Warm water from the cogeneration facility flows through this bundle and is cooled by air drawn through the tower by the cooling tower fan. The cooled water is then sprayed on the tower fill to achieve additional cooling through evaporation. Since the tube bundle does part of the cooling in the wet/dry design, less water is lost through evaporation than with a conventional wet cooling tower.

The ratio of dry cooling surface to wet fill can be designed for conditions ranging from a small amount of water conservation to a tower that requires the wet section only for the hottest days of summer, using 100% dry cooling most of the year. The wet/dry evaporative cooling tower can be designed to allow independent operation of the wet and dry section fans or designed to use common fans. The wet/dry cooling tower option uses less water than a conventional wet cooling tower, but is more expensive to construct and operate. The Applicant rejected this system because of the high capital costs.

Wet/Dry Cooling: Hybrid Cooling System

Another option is to use both an ACC and a cooling tower to cool water from the cogeneration unit condenser. The cooling tower is controlled to reduce water consumption and only dry cooling is used during cold months. The benefit of a hybrid cooling system is that the ACC and the evaporative cooling tower can be closer to standard manufacturer's designs, which are less costly than a custom wet/dry evaporative cooling tower design. The negative side of a hybrid cooling system is that the engineering design effort is increased since the number and interaction of components that must be designed for the two autonomous systems are greater. The land area for the evaporative cooling tower and ACC is greater than that of an ACC alone, since they both must have substantial open area around their perimeter to prevent interference with the air inlet path. The hybrid option also uses less water than a conventional wet cooling tower. For these reasons, the Applicant eliminated the evaporative cooling tower and ACC hybrid cooling system from further consideration.

2.4.4 Alternative Air Emission Controls

SCONOX

SCONOX, a brand name for a specific air emission control technology, uses a catalyst bed akin to that used in a selective catalytic reduction. SCONOX catalyst does not require ammonia to help convert nitrogen oxides to nitrogen dioxide. However, the SCONOX catalyst does get saturated during operation and requires periodic regeneration with a diluted hydrogen gas stream. A system of slide valves takes alternate beds of SCONOX catalyst in and out of service as required for regeneration while the gas turbines are operating. The Applicant reviewed SCONOX technology with the vendor and requested a quote for the system. The SCONOX system's cost was much higher than the cost of the selective catalytic reduction system; it was rejected by the Applicant because of the high capital cost and operating and mechanical complexity of the system and because it has not been proven feasible on a facility of this size.

XONON

XONON, a brand name for a specific air emission control technology, uses a catalyst in the gas turbine combustion chambers to burn natural gas rather than using a flame. The catalytic combustion takes place at a lower temperature and thus produces lower amounts of nitrogen oxides and carbon monoxide. Enron invested in Catalytica, the creators of XONON catalyst, and agreed to test the catalyst at its Pastoria Energy Facility in southern California. This facility was subsequently sold to Calpine and the current status of XONOX technology testing is uncertain. Until proven commercially, XONON is considered to be experimental, and has been rejected by the Applicant.

2.4.5 Alternative Wastewater Disposal Methods

The cogeneration facility's wastewater stream includes process wastewater, sanitary wastewater, equipment drainage, and runoff from curbed areas that could have come into contact with oil from equipment. The preferred method for disposal of process and potential oil-bearing wastewater is to send it to the refinery's wastewater treatment system. Secondary containment water is isolated until verified acceptable for discharge to the stormwater system through testing. The existing refinery system has the capacity to handle the small wastewater stream from the proposed project. Construction of new wastewater treatment facilities for the cogeneration facility would be expensive and would not provide any additional environmental benefit; therefore, the Applicant rejected this alternative disposal method.

A zero liquid discharge facility was evaluated by the Applicant as part of an evaporative cooling system. Such a facility would combine the refinery's and cogeneration facility's wastewater and would use evaporation to separate solids from the water. The water vapor would be condensed and recycled back to the industrial water system for reuse. This system would have the advantage of conserving freshwater since the water is recycled for use within the facility. However, the separation process would generate a large volume of cogeneration facility solids per day. The solid waste, while not hazardous, would be soluble and would have to be disposed in a suitable landfill. This would be a large volume of material requiring offsite disposal on a daily basis, thereby significantly increasing truck traffic. (Trucks would have to be used to haul solids to a landfill since most landfills are not accessible by rail.) Equipment for a zero liquid discharge plant also is costly. The Applicant eliminated the zero liquid discharge option from consideration because of solid waste disposal requirements, operating complexity, and higher cost.

2.4.6 Alternative Modification of Custer/Intalco Transmission Line No. 2

Replacing Bonneville's 230-kV transmission lines with higher capacity lines was evaluated to determine whether this option would provide a technically feasible means of upgrading the

Bonneville lines without requiring replacement or extensive modification of the existing Bonneville transmission towers. This option would involve replacing the existing Bonneville transmission lines between the Custer substation and the cogeneration/Bonneville interconnection point with a wire type that provides the required capacity to address the conditions identified in Bonneville's contingency analysis, but that has the same weight as the existing wire. Although, several wires were evaluated for possible use, a suitable wire type has not been identified.

2.4.7 "Refinery Load Only" Alternative

The Applicant examined a number of alternative facility configurations for the cogeneration project, including a facility that would generate only enough electricity to meet the operating needs of the refinery (approximately 85 MW) and would therefore not require interconnection with Bonneville's power transmission facilities.

Potential facility configurations were evaluated against a set of performance requirements that the Applicant established for the project. These considerations included:

- Steam supply reliability to the refinery;
- Flexibility to accommodate larger future steam demands; and
- Economy of scale to provide suitable capital risk.

The Applicant determined that an 85-MW facility would not provide suitable steam reliability, lacked the ability to accommodate increases in future steam demand, and had a higher capital risk profile than the proposed configuration. The "Refinery Load Only" Alternative was therefore eliminated from further consideration.

2.5 BENEFITS OR DISADVANTAGES OF RESERVING PROJECT APPROVAL FOR A LATER DATE

Reserving or delaying approval of the proposed project would not provide the BP Cherry Point Refinery with the needed reliable, efficient, and cost-effective heat and power. Specifically, the BP Cherry Point Refinery would not benefit from reliable and affordable electric power and process steam, and would continue to use three more than 30-year-old boilers that contribute to air pollutants emitted from the refinery. With the new cogeneration facility, these three boilers could be taken out of operation, thereby reducing the total air emissions from the refinery. In addition, reserving or delaying approval of the proposed project would not provide the associated tax revenue and employment benefits to the local community. Also, the refinery would have to continue to purchase power at fluctuating market prices.

If the proposed project were delayed, the projected 635 MW of excess power would not be available in the short term for distribution by the Applicant over Bonneville transmission lines. However, such a delay would also avoid or delay potential thermal operating limit problems on the Bonneville transmission system in the project vicinity, as well as the need to modify the existing Custer/Intalco Transmission Line No. 2. Project delays would not increase power in the Pacific Northwest served by the Bonneville regional electrical transmission network in the short term. However, because of several recent developments such as reduced electricity use by the aluminum industry and other electricity-intensive industries in the region, it is uncertain if there is a need for additional power in the region in the short term.

If project approval were reserved, direct, secondary, and cumulative impacts would be delayed and the refinery would continue to operate as it does today. The resources needed to construct and operate the proposed project are available at this time. Delaying approval decisions would create uncertainty for the funding of project and could delay operation beyond the requested transmission contract start date with Bonneville.

If this project were deferred for a lengthy period of time, it is uncertain whether this project would be available in time to meet regional long-term energy needs. If not, another generating facility would be required to meet these needs. That alternative project would likely not have the potential to offset emission reductions by removing older utility boilers at the refinery.

2.6 APPLICABLE FEDERAL, STATE, AND LOCAL PERMITS

If the proposed project is approved, EFSEC would specify the conditions of construction and operation, issue a Site Certification Agreement in lieu of any individual state or local permitting authority, and manage the environmental and safety oversight program of project operations. EFSEC is the sole non-federal agency authorized to permit the proposed project. The Applicant would enter contractual agreements with Bonneville to connect to Bonneville's electrical transmission system and the U.S. Army Corps of Engineers for an individual Clean Water Act Section 404 Permit. For informational purposes, Table 2-6 lists the major state and local permitting requirements preempted by EFSEC, as well as federal requirements.

2.7 COORDINATION AND CONSULTATION WITH AGENCIES, INDIAN TRIBES, THE PUBLIC, AND NON-GOVERNMENTAL ORGANIZATIONS

The Applicant has been communicating and meeting with agencies, Indian tribes, the public, and non-governmental organizations throughout the development process of the proposed project. Formal meetings and presentations held by the Applicant with these entities are listed in Table 2-7. The meetings and presentations were to inform stakeholders of the proposed project and to solicit comments.

Consultations with the public, agencies, Indian tribes, and interested parties will continue through the EIS process.