BP Cherry Point Cogeneration Project

Volume 2 - Appendices
DOE/EIS-0349

Lead Agencies:

Energy Facility Site Evaluation Council

Bonneville Power Administration

Cooperating Agency:

U.S. Army Corps of Engineers

September 5, 2003

SITING AND WETLAND 404(b)1
ALTERNATIVES ANALYSIS

BP CHERRY POINT COGENERATION PROJECT

[REVISED]

Prepared for:

BP West Coast Products, LLC

Submitted by:

Golder Associates Inc.

March 2003 013-1421.541

TABLE OF CONTENTS Page No.

LIST OF TABLES

LIST OF FIGURES

1. INTRODUCTION

This comprehensive alternatives analysis is prepared to meet EFSEC and SEPA requirements to identify and discuss alternative site locations and to satisfy the United States Army Corps of Engineers ("Corps") Section 404 (b)1 wetland alternatives requirement.

The alternatives analysis consists of five sections including this Section 1: Introduction. Section 2 describes the purpose and need of the project. Section 3 addresses the action and no action alternatives, including the alternative site locations, construction laydown sites, and alternative configurations on the selected site. Section 4 describes the mitigation goal and objectives. A mitigation plan has been prepared for the project. Section 5 presents reference information.

2. PURPOSE AND NEED

2.1 Proposed Action

BP West Coast Products, LLC (BP) is proposing to build a 720-megawatt (MW) natural gas-fired combined-cycle combustion turbine cogeneration facility (Cogeneration Project) on BP owned-land adjacent to the BP Cherry Point Refinery (Refinery). The Cogeneration Project site, laydown areas, and access roads total approximately 69 acres of land. This land is owned by BP and represents less than 3% of the approximately 2,500 acres BP owns at Cherry Point.

The Project site is located in an area zoned by Whatcom County as Heavy Impact Industrial on Cherry Point, approximately 15 miles north of Bellingham and 7 miles south of Blaine, Washington. Grandview Road (SR 548) provides the main vehicle access to the Cogeneration Project site and the Refinery. Grandview Road intersects Interstate-5 (I-5) approximately 5 miles to the east of the site. A Burlington Northern-Santa Fe (BNSF) railway line borders the eastern edge of the Refinery property.

The Project site is relatively flat with no dominant topographical features. The Cogeneration Project site is located on approximately 33 acres of unimproved land (See Figure 1-1, Vicinity Map), and the construction laydown (staging and assembly) areas and access roads will be located on approximately 36 acres. The project facility, ancillary facilities and construction laydown areas will impact approximately 35.37-acres of wetlands (See Figure 1-2, Impacted Wetlands within Study Area).

The most notable topographic features in the vicinity of the project include Terrell Creek, Point Whitehorn, and Birch Bay. Approximately 0.5-mile north of the site Terrell Creek flows through a wooded area and creates a narrow ravine as it drains westerly into Birch Bay. Point Whitehorn is a high bluff approximately 1.5-miles to the west of the site that overlooks Birch Bay, which is part of the coastline along the Strait of Georgia.

Natural gas will be delivered to the Cogeneration Project through a proprietary natural gas pipeline that currently provides gas to the Refinery. A gas compressor station will be constructed at the Project site to increase pipeline delivery pressure. If needed, additional gas will be obtained from other third-party pipelines. All other infrastructure is available at the Refinery, including water supply and a wastewater treatment system. Stormwater will be directed from the site to a detention area south of Grandview Road and then dispersed into a wetland mitigation area north of Grandview Road.

The Cogeneration Project will generate a nominal 720 megawatts (MW) of electric power and export approximately 85-MW of power directly to the Refinery and will also supply intermediate-pressure steam to the Refinery. The Refinery will return hot condensate to the Cogeneration Project. Major components related to the power generation plant are:

- Combustion turbine generators (3),
- Heat recovery steam generators (3),

- Steam turbine (1),
- Steam turbine electrical generator (1),
- Cooling tower (1)
- Electrical switchyard, with a connection to the Refinery and BPA transmission system
- 230-kV transmission line
- Natural gas compressor station

The power generated, net of Refinery consumption, would be exported via a new 230-kV transmission line that will connect the power plant to an existing 230-kV Bonneville Power Administration transmission line (See Figure 1-3, Project Site Plan). A new 230 kV transmission line approximately 0.8 miles long will be located entirely on BP property.

Wetland impacts related to construction of the transmission line were permitted previously. Wetland mitigation for the impacts of the transmission line has been constructed on the BP property, north of Grandview Road. Proposed mitigation for wetland impacts due to the Cogeneration Project would occur in the same general area, creating contiguous enhanced wetland habitat. A proposed mitigation plan for the Cogeneration Project has been prepared under a separate cover.

This alternatives analysis, as required by Section 404(b)(1) of the Clean Water Act, evaluates alternative locations and configurations for the generating facility and the construction laydown areas. Impacts related to the transmission line will not be addressed since they were subject to a previous permit action and mitigation.

2.2 Purpose and Need

The purpose and need for the project are as follows:

- To provide reliable, efficient and cost-effective steam and electrical power to the Refinery.
- To provide efficient and cost-effective electrical power to the region.
- To minimize the Refinery's reliance on outside sources for electricity.
- To minimize impacts to the environment.

These key points are discussed in more detail below.

2.2.1 Efficient and Reliable Energy

The Refinery operations require approximately 85 MW of electricity. Historically, BP has relied on electricity purchased from third parties and steam generated by on-site boilers. However, the Refinery’s reliance on third party sources for electricity has exposed the Refinery to the extreme volatility in the electricity markets. Cogeneration is considered one of the most efficient and reliable methods of electricity generation. Fuels such as natural gas, coal, oil and solid fuels such as wood waste, municipal waste or petroleum coke can be used for cogeneration facilities. However, because a proprietary natural gas pipeline currently supplies the Refinery, and the other solid fuels would have greater environmental impacts and poorer reliability, BP chose a natural gas-fired cogeneration facility.

For reliability purposes, three gas-fired turbines are used for the Cogeneration Project each with a heat recovery steam generator (HRSG) that can provide steam directly to the Refinery or to the cogeneration unit's steam turbine. Having three gas turbines and HRSGs will ensure a continuous supply of steam and electricity to the Refinery, even if one gas turbine is off-line for maintenance and a second turbine shuts down unexpectedly.

2.2.2 Regional Power

The Pacific Northwest also needs additional electrical generating capacity. During 2000 and 2001, the region experienced highly volatile electricity prices as well as supply curtailments. Current forecasts indicate the potential for future electricity shortages and concerns about system reliability. Extraordinary short-term actions during 2001 helped to significantly reduce electricity demand. In particular, the shutdown of aluminum smelters reduced demand by approximately 3,150 MW, which helped alleviate the critical near term electricity shortage in the Northwest.

However, the construction of additional generation capacity is still needed to address long term demand for additional power. Many generation projects previously proposed for the region have been cancelled or put on hold, some even after construction has started.

2.2.3 Self Reliance

Currently, all of the electricity used at the Refinery, approximately 85 MW, is purchased from the Mid-Columbia power market and transmitted to the Refinery by Puget Sound Energy (PSE). PSE owns and operates the transmission line and associated facilities that supply purchased electricity to the Refinery. BP had previously considered obtaining power from the Bonneville Power Administration (BPA) system and BP obtained local and wetland permits to construct the transmission line to allow such a direct connection to the BPA system (COE permit number 1998-4-02349).

As a result of electrical supply shortages and resulting extremely high electricity costs, BP installed 14 small gas turbine generators as a stopgap measure. These generators operated in 2001, but were removed last year when power prices abated due to reduced electricity demand created by BPA Direct Service Industry contract buyouts and a regional recession. BP now intends to construct a more efficient cogeneration facility to mitigate the effects of any future electricity shortfalls.

2.2.4 Environmental Impacts

Electricity demand in the Puget Sound area is growing at a rate of 200 MW per year, and additional generation is required in this area to provide for voltage stability in BPA's transmission system[1]. BP shares public concern over increased air emissions and use of water resources for power generation. For this reason, the Cogeneration Project is designed to allow offsetting reductions in emissions from the Refinery and to use water reuse to minimize the use of fresh water resources.

To address the need described above, BP is proposing a natural gas-fired Cogeneration Project on land adjacent to the Refinery. This project will be integrated with the Refinery to maximize the efficiency of power production, produce steam for the Refinery and to take advantage of the existing infrastructure at the site. Of the 720 MW of electricity produced by the project, 85 MW will be delivered to the Refinery, leaving 635 MW available for the northwest electrical grid. By providing electricity to the Refinery, the Cogeneration Project would enable the Refinery to eliminate its reliance on third-party sources of electricity, and would enable BP to decommission several older steam boilers at the Refinery.

2.3 Nature of Wetland Impacts

Wetland delineations were conducted on May 3-4, June 11, and August 6, 2001, and on January 22-23, 2002. After an informal review of the wetland delineation by regulatory agencies, including the Corps of Engineers, additional field verification of soil sample locations was conducted on October 7, 2002. The results of the field investigations determined that there is an extensive wetland system associated with the low-rolling glacial ground-moraine plains that lie within both the proposed plant site and construction staging areas (See Figure 1-2). This wetland system consists of a palustrine emergent wetland and a hydrologically connected forested area. Approximately 25 percent of the forested wetland exhibits wetland characteristics. As a result of the construction of the proposed Cogeneration Project, 35.37 acres of low value wetlands will be impacted.

The proposed project site, which is in an area immediately south of Grandview Road, contains patchwork emergent wetlands and an emergent wetland comprised primarily of planted hybrid poplars with an herbaceous understory. The wetlands that would be disturbed are low grade and have low functionality. A detailed account of the wetlands is given in a report entitled BP Cherry Point Wetland Delineation Report [Revised] (Golder Associates Inc., February 2003).

---

[1] “BPA Infrastructure Technical Review Committee Report" dated August 30,2001

3. ALTERNATIVES

3.1 No Action Alternative

Under the no action alternative, the Cogeneration Project would not be constructed. The Cogeneration Project's 720 MW of electricity would not be available to the Refinery, or the region. In addition, the existing, less efficient boilers would remain in place at the Refinery and new steam production would be required for other projects planned at the Refinery.

The North American Energy Reliability Council (NERC 2001) report states that long term adequacy of power supply will depend on how many of the currently proposed projects are permitted and constructed. It reports that near term (2001-2005) generation capacity is satisfactory, "*provided new generating facilities are constructed as anticipated.*" In addition, NERC reports that long-term adequacy is difficult to assess and is dependent on the continued response of independent power producers to respond to market forces by constructing new facilities and "*their ability to obtain the necessary siting and environmental approvals*".

If the Cogeneration Project is not built, another power plant will be built in the region that would likely be less efficient (non-cogeneration); not be able to take advantage of an existing infrastructure; and not provide corresponding expected on-site emission offsets similar to the proposed Cogeneration Project.

Under the no action alternative, the purpose and need of the proposed project would not be met as described below.

3.1.1 Self-Reliance

The Refinery would be supplied electricity either from PSE, through direct service from BPA (a transmission line for direct service was previously approved) or temporary on-site generators. None of these alternatives provides the Refinery with the assurance that long-term and cost-effective electrical energy can be supplied to the Refinery. The Refinery would also have to address long-term steam production without the efficiency advantages of Cogeneration.

3.1.2 Efficiency

Under the no action alternative, electricity and steam would continue to be supplied by separate sources, resulting in higher costs and less efficient use of energy resources. New electricity generation would likely come from stand-alone power plants in the region, which are less efficient than the Cogeneration Project.

3.1.3 Reliability

Under the no action alternative, the Refinery would be vulnerable to loss of electrical power from the PSE system, or from a lack of steam caused by future boiler outages. The PSE system has been generally reliable, but electricity disruptions have occurred. The Refinery's boilers are becoming less reliable. Proposed Refinery projects to produce cleaner burning fuels would require additional steam and thus more boiler capacity. Under the no action alternative, the Refinery would have to address these issues through other capital investments that would not have the efficiency advantages of a cogeneration unit.

3.1.4 Impacts of the No Action Alternative

Under the no action alternative, electricity would be supplied to the region from existing and new generation sources. New generation is likely to take the form of gas-fired stand-alone power plants that would not be able to offset their criteria pollutant emissions with corresponding emissions reductions at a steam host, so a net increase in emissions would be likely to result. These plants would also likely be less efficient and therefore generate more carbon dioxide and other greenhouse gases per MWh of electricity produced. These new plants might also use significant fresh water resources for cooling purposes depending upon the design chosen.

Land Use

Under the no action alternative, the acreage impacted by the proposed Cogeneration Project would remain available for other BP uses. It may continue to be used as a buffer zone, or used for future industrial development.

Plants and Animals

There are no immediate plans to disturb the low-value wetlands at the proposed Cogeneration Project site and therefore no plans to restore or enhance wetland habitats north of Grandview Road. However, harvesting of the pulpwood trees or future use of the project site may impact the wetlands.

3.2 Project Site Location Alternative Selection Process

In addition to evaluating the proposed action versus the no action alternative, BP evaluated alternative sites for the Cogeneration Project based on the following criteria:

- Sufficient acreage available
- Proximity to the Refinery and site size
- Avoidance or minimization of wetland impacts
- Proximity to infrastructure (roads, pipelines, and transmission lines)
- Potential for other environmental impacts
- Security

These criteria are discussed in more detail below.

3.2.1 Sufficient Acreage Available

A site of approximately 33 acres is needed to provide for all plant components including a switchyard and other ancillary features. This acreage 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 will be used by the Cogeneration Project for approximately two years during the construction period and will be left in place for use by the Refinery thereafter.

3.2.2 Proximity to the Refinery

The proposed Cogeneration Project 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.

3.2.3 Avoidance of Impacts to Wetlands

Siting of the Cogeneration Project took into account the presence of wetlands; the potential area of wetlands that would be impacted; 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. In the site alternatives described in Section 3.3, the acreage and type of impact and loss of wetland functions and benefits are described.

3.2.4 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 Project.

A transmission line corridor has been permitted 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. See Figure 1-4 for existing infrastructure

3.2.5 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.

3.2.6 Security

The Refinery is located in a rural area and is surrounded by wooded areas and open fields that are bisected by paved roads. BP owns much of the land immediately surrounding the Refinery industrial area, 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 on the north by Grandview Road, 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 BP properties.

The proposed Cogeneration Facility should be sited in a location where security can be maintained and interconnections to the Refinery and the electrical grid can be easily secured.

3.3 Alternative Project Sites

Five specific sites were evaluated for the power plant. In addition, several general areas within BP property boundaries and several off-site areas were evaluated. Site 3 is the preferred alternative. Table 1 summarizes the ratings for each evaluated alternative. See Figures 1-5 and 1-6 for site locations.

Table 1. Summary of Ratings of Alternative Cogeneration Facility Sites

Criterion	Alternative				
	Site 1	Site 2	Site 3 (Preferred)	Site 4	Site 5
Sufficient Acreage	H	L	H	H	M
Proximity to Refinery	M	H	M	L	H
Avoidance of Wetlands	L	H	M	M	M
Security	H	H	H	L	H
Proximity to Infrastructure	H	H	H	L	H
Avoidance of Other Environmental Impacts	H	H	H	L	M

Note: H = High (best meets criterion)
M = Medium
L = Low (does not meet or marginally meets criterion)

3.3.1 Site 1: Brown Road Site

Site 1 was the first site investigated for the Cogeneration Project. The site is located east of Blaine Road and north of Brown Road and adjacent to an existing cooling tower. In addition, it is in close proximity to the Refinery and proposed transmission line.

3.3.1.1 Sufficient Acreage

Site 1 has sufficient acreage and is rated high in this category.

3.3.1.2 Proximity to the Refinery

Site 1 is approximately 700 feet west of the Refinery and would require a minimal amount of pipeline for moving steam to the Refinery and providing the electrical connection. The pipeline runs to the Refinery would be in nearly a straight line. Construction of the Cogeneration Project at this location would not impact Refinery operations or increase health and safety risks for workers. This site rates high in meeting this criterion.

3.3.1.3 Avoidance of Impacts to Wetlands

Site 1 was delineated for wetlands and it was determined that the site is approximately 80 percent wetlands (30 acres). Although several different site plans were considered, the impact on wetlands, including forested wetlands, remained the same.

The dominant vegetation species reported within the herbaceous wetlands include reed-canary grass, tall fescue, bluegrass (*Poa* spp.), bentgrass, soft rush, baltic rush, red top, Himalayan blackberry, vetch, creeping buttercup, and small patches of hardstem bulrush. Homogeneous patches of spikerush were also observed in the southern portion of Wetland D, which would be almost entirely disturbed if Alternate Site 1 were chosen. More detailed information regarding the wetlands in the proposed project site can be found in two reports entitled *BP Cherry Point Wetland Delineation Report (Revised)*, and *BP Cherry Point Wetlands Functions and Values Assessment* (Golder Associates, Inc., 2003 and 2002). This site is rated low in meeting the wetland criterion. Of all the sites investigated, this site had the greatest impact on wetlands.

3.3.1.4 Proximity to Infrastructure

This site is adjacent to most of the Refinery infrastructure including an existing electrical substation, water pipelines, access roads, and the proposed transmission line corridor. The existing natural gas pipeline would have to be extended from the metering station near the intersection of Brown Road and Grandview Road to the project site. The site rates high in meeting this criterion.

3.3.1.5 Avoidance of Other Environmental Impacts

The site primarily consists of fallow agricultural and pastoral fields. There is a road to the site from Brown Road that is partially overgrown with vegetation. It appears that a former homestead and an orchard may have existed on the upland corner of the site. There are several pear, apple and walnut trees surrounded by Himalayan blackberry (*Rubus discolor*) thickets just west of the abandoned road. Except for the former homestead, the area is unremarkable compared to adjacent areas and relative to other alternative sites. The site is also farther away from residences or other public locations so noise and visual impacts would be less. Site 1 ranked high in avoiding other environmental impacts.

3.3.1.6 Security

The proposed facility is within the secure area of the Refinery and is a significant distance from public access. Steam pipelines and transmission lines would also be within the secure area and not accessible to the public. The site ranks high in this criterion.

3.3.1.7 Summary

Although rating high in most criterion, this site was not selected due to greater impacts on wetlands compared to the proposed site.

3.3.2 Site 2: Refinery Site

Site 2 is located within the Refinery boundary fenceline in close proximity to Refinery components (see Figure 1-5).

3.3.2.1 Sufficient Acreage

Only 16 acres of space are available at this location. This site rates low because it does not provide sufficient acreage.

3.3.2.2 Proximity to the Refinery

Site 2 is located in very close proximity to the Refinery and would require short segments of pipeline to move steam to the Refinery. This site rates medium in meeting this criterion because it not directly adjacent to the Refinery.

3.3.2.3 Avoidance of Impacts to Wetlands

The site is currently impervious surface with a few small patches of upland grasses that have been severely disturbed. This site rates high in meeting this criterion.

3.3.2.4 Proximity to Infrastructure

Site 2 is close to most of the Refinery infrastructure, including an existing electrical substation, water pipelines, access roads, and the proposed transmission line corridor. The existing natural gas pipeline would have to be slightly extended from the metering station near the intersection of Blaine Road and Grandview Road to the project site. The site rates high in meeting this criterion.

3.3.2.5 Avoidance of Other Environmental Impacts

Because the site is highly industrialized and composed mostly of impervious surface area, this site rates high in meeting this criterion.

3.3.2.6 Security

Site 2 is directly adjacent to the Refinery and would be the most secure site. The site ranks high in this criterion.

3.3.2.7 Summary

This site was not selected or further evaluated because it does not meet the criterion for site size.

3.3.3 Site 3: (Proposed) Grandview & Blaine Road Site

Site 3 is located approximately 300 feet south of Grandview Road and 100 feet east of Blaine Road in an area that is primarily fallow agricultural fields with some Himalayan and evergreen blackberry thickets, hybrid poplars (for pulpwood) and some young Douglas-fir trees (planted in early 1990s). The area between the site and Grandview Road includes a mix of wetland and upland areas and some of this land is currently planted with hybrid poplar trees that are planned for pulpwood harvest when mature and subject to market conditions making such a harvest practical. Upland areas at this location would be used as access to the proposed plant, for construction laydown, and as a buffer between Grandview Road and the power plant. The proposed site is set back from these utility corridors and meets the Whatcom County zoning ordinance for industrial setbacks from public highways.

3.3.3.1 Sufficient Area

This site has over 40 acres to accommodate the power plant facility and other ancillary components. This site rates high in meeting this criterion.

3.3.3.2 Proximity to the Refinery

The proposed site is approximately 600 feet from the steam delivery point at the Refinery. Steam lines would exit the Cogeneration Project plant and cross Blaine Road directly into the Refinery. Construction of the cogeneration facility at this location would not impact Refinery operations or increase health and safety risks for workers. This site has a medium rating since it is not adjacent to the Refinery.

3.3.3.3 Avoidance of Impacts to Wetlands

Site 3 was delineated for wetlands and it was determined that the site was approximately 30% wetlands (12 acres). Several site plans were considered at this site to minimize wetland impacts while maintaining the appropriate alignment for steam, gas, and electricity transport to and from the site and the Refinery.

Several individual wetlands (A, B, C, and D) were identified within the proposed building footprint for this site. The dominant vegetation species reported within the herbaceous wetlands include reed-canary grass, tall fescue, bluegrass (*Poa* spp.), bentgrass, soft rush, baltic rush, red top, Himalayan blackberry, vetch, creeping buttercup, and small patches of hardstem bulrush. Homogeneous patches of spikerush were also observed in the southern portion of Wetland D. Creeping buttercup and baltic rush communities dominate wetlands within the northern portion of the property in Wetlands B, C, and D.

Wetland A, located immediately south of Grandview Road, consists of palustrine emergent wetlands with planted hybrid poplars that will eventually be harvested for pulpwood. See the *BP Cherry Point Wetland Delineation Report*, and *BP Cherry Point Wetlands Functions and Values Assessment* for details (Golder Associates, Inc., 2003, 2002). This site rates medium in avoiding wetlands.

3.3.3.4 Proximity to Infrastructure

Site 3 is located near Brown Road and Grandview Road, which would provide easy access to the site. It is also adjacent to the natural gas pipeline and the metering station so the length of any natural gas pipelines interconnection would be minimized. This site is also close to the Refinery fresh water supply line and adjacent to the previously permitted transmission line corridor. This site rates high in meeting this criterion.

3.3.3.5 Avoidance of Other Environmental Impacts

Site 3 primarily consists of fallow agricultural fields and planted hybrid poplar areas that are beginning to be invaded by Himalayan blackberry. The poplars patch is isolated and is not contiguous with high-quality habitat. The area is located adjacent to Grandview Road and is therefore an edge habitat to small mammalian species. It is not likely that larger mammals use this area extensively due to the lack of cover, low quality habitat, and the proximity to the road. The area was assessed for wildlife habitat and no priority species or habitats, with the exception of the wetlands, occur within the parcel. There will be some aesthetic and visual impacts as a result of the removal of hybrid poplar trees and other vegetation, but the existing views also include the Refinery. Once construction is completed, BP would plant vegetation and trees to create a visual buffer between site 3 and Grandview road, and also on the northern portion of Laydown area 2. Site 3 ranked high in avoiding other environmental impacts.

3.3.3.6 Security

The site is within the secure area of the Refinery and has a significant buffer from public access areas such as Grandview Road. All infrastructure would be within the Refinery secure area. The site ranks high in this criterion.

3.3.3.7 Summary

This site was selected as the preferred alternative because relative to the other sites it met the size criteria; it is adjacent to most of the Refinery infrastructure; it has less or the same impacts on wetland as sites 1 and 5; and site security can be maintained.

3.3.4 Site 4: Grandview Road Site

Site 4 was evaluated because it contains moderately sized upland area adjacent to Grandview Road. It consists of approximately two acres of mixed forest and shrub habitat surrounded by old fields (emergent wetlands).

3.3.4.1 Sufficient Acreage

There is sufficient acreage (> 33 acres) at this site to accommodate the project, but because of setbacks from the road for security, county ordinances, and aesthetic buffers most of the upland area would not be available for construction of the power plant, resulting in significant wetland impacts. This site rates high in sufficient acreage to accommodate the power plant.

3.3.4.2 Proximity to the Refinery

Site 4 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 runs to the Refinery would be difficult to construct because existing gas and water pipelines and electrical transmission lines are south of Grandview Road. Construction of the cogeneration facility at this location would not likely impact Refinery operations. The site rates low in meeting this criterion.

3.3.4.3 Avoidance of Impacts to Wetlands

The site was not delineated, although, with the exception of the elevated upland habitat, the site is entirely surrounded by herbaceous wetlands. As described in the Wetland Mitigation Potential Report (URS Corporation, 2001), reconnaissance of the area indicates that the herbaceous wetlands within Site 4 are similar to those found within the proposed project site. Wetlands are palustrine emergent in classification and are dominated by plants that often occur within wetland systems including reed-canary grass, bentgrass, redtop, and sweet-vernal grass. This site rates medium in meeting the wetland criterion.

3.3.4.4 Proximity to Infrastructure

This site location is 0.5 miles from the Refinery and the existing infrastructure, including the electrical substation, water pipelines, and access roads, and the proposed transmission line corridor. The existing natural gas pipeline would have to be extended from the metering station near north and under Grandview Road to the project site. Additional pipeline and transmission line extensions would be necessary, including a steam pipeline over Grandview Road to the Refinery and a transmission line over Grandview to the Refinery. The transmission line interconnection to the BPA system could go over Grandview Road and connect to the existing corridor or a new corridor paralleling the north side of Grandview could be constructed. The site rates low in meeting this criterion.

3.3.4.5 Avoidance of Other Environmental Impacts

The site primarily consists of fallow agricultural fields and an elevated upland knoll that is forested. This patch of forested upland most likely serves as relatively valuable wildlife habitat based on the presence of old-growth trees and dense understory. Although the patch is fragmented, the isolated nature of the patch most likely attracts numerous bird species, including raptors that may roost or perch on the site to observe the fallow fields for prey items. Additionally, the patch is located in an area that BP has dedicated to wetland and wildlife habitat enhancement and preservation.

The scenic and aesthetic values on the north side of Grandview Road are high. There are no existing residential or industrial buildings. The scenic view consists of ponds, fields, and emergent wetlands across an open area to a tree line. The primary use of the site and adjacent fields is for cattle grazing. Transmission lines and a steam pipeline would likely be constructed over Grandview Road further impacting aesthetics. Site 4 ranked low in avoiding other environmental impacts.

3.3.4.6 Security

Site 4 is on BP property, but it is not within the secured area of the Refinery and would require a greater effort to establish and maintain security. In addition, natural gas and steam pipelines and transmission lines would be more accessible to the public. Maintaining security for this infrastructure would be difficult. The site ranks low in this criterion.

3.3.4.7 Summary

Site 4 was not selected due to 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.

3.3.5 Site 5: Contractor Parking Area

Site 5 is located within the Refinery boundary fenceline 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.

3.3.5.1 Sufficient Acreage

Site 5 consists of Laydown areas 1 and 2 and the existing contractor parking lot, which total approximately 30 acres. While not as large as the preferred site, depending on project configuration it is likely that Site 5 has enough area for the project, but not as much as other areas evaluated. It, therefore, rates medium in meeting this criterion.

3.3.5.2 Proximity to the Refinery

Site 5 is located within the fenceline of the Refinery and would require relatively short segments of piping to move steam to the Refinery. It, therefore, rates high in meeting this criterion

3.3.5.3 Avoidance of Impacts to Wetlands

Portions of Site 5 were delineated for wetlands, and a reconnaissance of the remaining area indicates that the overall site is approximately 80 percent wetlands (23.5 acres). Wetland areas are comprised of herbaceous vegetation, shrub-scrub willows, and planted hybrid poplars. Several small depressional patchwork wetlands occur that are composed primarily of willows and soft rush. There is a small forested area that is composed primarily of facultative tree and shrub species. There is evidence of inundation, and water-stained leaves occur within the leaf litter. The wetland delineation and function and value reports provide more information on wetlands.

If site 5 were chosen for the Project site, then site 3 would be required for equipment laydown areas and the wetland areas east of Blaine Road would be impacted. Site 5 would also impact wetland area I, which would not be impacted if, preferred site 3 is chosen for the project. Regardless of whether Site 3 or 5 were chosen for the preferred site the wetland acreage impacted would be approximately the same. This site rates medium in meeting the wetland criterion.

3.3.5.4 Proximity to Infrastructure

The site location is adjacent to most of the Refinery infrastructure including an existing electrical substation, water pipelines, access roads, and the proposed transmission line corridor. The existing natural gas pipeline would have to be extended from the metering station, near the intersection of Blaine Road and Grandview Road, to the project site. The site rates high in meeting this criterion.

3.3.5.5 Avoidance of Other Environmental Impacts

The site consists of grassland and areas with impervious surface area including gravel roads, a walking trail and a paved parking lot. The area is within the fenceline of the Refinery and natural resource values are relatively low considering surrounding land uses. Site 5 is required as temporary construction laydown area by the Cogeneration Project. However, another project under development, the Clean Fuels Project, will be built in the space that is currently used as a maintenance laydown area, which means that additional maintenance laydown area would needed in the future.

Rather than develop Site 5 and then restore it, and then possibly develop it again for Refinery needs, it is proposed to develop it once and mitigate for the wetland impacts once. Another disadvantage of Site 5 is visual impacts. If Site 5 were selected for the project, an uninterrupted view of the Cogeneration project and the Refinery beyond would be visible from Grandview and Blaine roads. If Site 5 were used for a laydown area then BP would plant trees and restore wetland vegetation along the north portion of the laydown area, providing a visual buffer of the Refinery to the west and the Cogeneration Project to the east.

Stormwater discharge, noise, transportation, and other potential impacts would remain similar to the proposed action. Site 5 therefore ranked medium in avoiding other environmental impacts.

3.3.5.6 Security

The site is within the secure boundary of the Refinery and all infrastructure would also be within the secured area and inaccessible to the public. The site rates high in this criterion.

3.3.5.7 Summary

Site 5 was not selected as the preferred site because it would not have lesser the impact on wetlands as did Site 3 and it would make future Refinery operation and construction activities more difficult.

3.3.6 Other Locations Evaluated

In addition to the sites described above, reconnaissance surveys were made of other areas to determine their suitability. These additional areas are described below.

Approximately 200 acres south of Site 1 were evaluated for the presence of wetlands. The entire area south of Brown Road was evaluated in the field for wetlands and it is estimated that the site is approximately 90 percent wetlands, including high quality forested wetlands (acreage unknown). The site primarily consists of herbaceous wetlands with high-quality forested wetlands that comprise approximately 70 percent of the area. Additionally, there are several small pounded areas that appear to be ephemeral, but hold water for extended periods of time. Based on the mature nature of the trees found on this site, in addition to the observations of large mammal and raptor species, including red-tailed hawk, and wading species, including great blue heron, this area rates low in avoiding other environmental impacts and was eliminated from further consideration.

The area east of Sites 1 and 3 consists of forested wetlands that are of higher quality in regards to their value for functions such as sediment detention and general habitat suitability. This area was eliminated from consideration based on the higher quality of the habitat.

3.3.7 Other Locations

BP owns approximately 2,500 acres of property surrounding the Refinery. BP did not consider other locations because the primary purpose of the Cherry Point Cogeneration Project is to supply steam and electricity to the Refinery. Other locations would require more extensive infrastructure interconnections such as new corridors for steam pipelines, electrical connections and access roads; potentially impact more priority habitats; would significantly affect the efficiency of steam transmission to the Refinery; and would be less secure.

3.4 Alternative Construction Laydown Areas Evaluation Criteria

It is estimated that approximately 41 acres are needed for storage and assembly of facility equipment during the construction phases. However, because of the potential for additional impacts to wetland areas BP has limited the construction laydown area that is adjacent to the site to 36 acres. BP would permanently convert a portion of the Cogeneration Project laydown areas to provide permanent laydown area needed at the Refinery for future construction and Refinery turnarounds. The required laydown area for the Cogeneration Project does not have to be contiguous. However, areas near the proposed site are needed for fabrication of major equipment, while areas further away could be used for temporary storage of other materials and equipment.

Table 2 shows the construction laydown areas uses and approximate acreage required for each use during peak construction.

Table 2
Construction Laydown Uses and Acreage

Item	Estimated Acreage Requirement
Gas Turbines	4.5
Steam Turbine	1.5
HRSGs	12
Cooling Tower	1
Structural Backfill	3
Civil Materials	1.5
Structural Steel	3
Misc. Equipment	1
Piping Materials	3
Electrical Bulks	2
Electrical Cable	1
Receiving area	0.5
Warehouse	0.5
Small Construction Equipment	0.5
Trailer Complex	3
Craft Parking	3
Challenge to Minimize Area	-5
Total	**36**

In addition to areas evaluated for the proposed Cogeneration facility construction, several potential laydown areas were evaluated based on the following criteria:

- Proximity to the Proposed Plant Site
- Site Access
- Avoidance of Impacts to Wetlands
- Avoidance of Other Environmental Impacts

3.4.1 Proximity to the Proposed Plant Site

HRSG and other major components are constructed near the project site and then transported to the project site for final assembly. These components are large and require significant effort to move them to the construction site. The laydown areas used for HRSG's and other subassembly construction should be near the construction site to minimize transportation and reduce cost and construction time.

3.4.2 Site Access

Laydown areas must have access to rail, barge and vehicle traffic for delivery of equipment and materials. All laydown areas considered have suitable access to transportation and roads capable of handling equipment and materials required for the project.

3.4.3 Avoidance of Impacts to Wetlands

As with the project site, the construction laydown areas were evaluated for the presence of wetlands. The Cherry Point area has extensive wetland systems. Wetland impacts were minimized as much as possible. The evaluation of alternative sites for construction laydown areas involved additional reconnaissance of areas within and adjacent to BP property. Alternative construction laydown area orientations were analyzed to reduce the impact to wetlands. In the laydown area alternatives described below, the acreage and type of impact and loss of wetland functions and benefits are described.

3.4.4 Potential for other Environmental Impacts

Impacts on other environmental values were also considered in the evaluation of alternative construction laydown areas, including loss of wooded areas, upland habitats, and old fields.

3.5 Construction Laydown Alternative Areas

A summary of ratings for performance criteria for construction laydown area alternatives is given in Table 3.

Table 3. Summary of Ratings of Alternative Laydown Area Sites

	Alternative			
	Site 1 - Preferred Alternative			Site 2
Criterion	Area 1	Area 2	Area 3	
Proximity to Proposed Plant Site	H	H	L	L-M
Site Access	H	H	L	H
Avoidance of Wetlands	H	M	H	L
Avoidance of Other Environmental Impacts	H	H	H	H

Note: H = High (best meets criterion)
M = Medium
L = Low (does not meet or marginally meets criterion)

3.5.1 Laydown Site One

The proposed construction laydown site is divided into three different areas. Portions of these areas would be used for storage of equipment and facility components, as well as to fabricate components before they are transported to the project site. Other areas would be used for construction parking and contractors offices.

3.5.1.1 Area One of Preferred Alternative

The first area that would serve as a construction laydown area is directly north of the proposed project site, south and adjacent to Grandview Road (Figure 1-7). This area would most likely be used for construction management and planning offices. Some land may be used for temporary storage of components that have been preassembled at one of the other two areas within the preferred alternative locations for laydown.

3.5.1.1.1 Proximity to Proposed Plant Site

This site would be located approximately 70 feet north of the proposed Cogeneration Project plant. Transport of assembled components would be easily accomplished and therefore this site rates high in meeting this criterion.

3.5.1.1.2 Site Access

This site would likely be accessed from Grandview Road, although Brown Road may be used as an alternative access point, if necessary. Grandview Road is currently capable of handling wide and heavy loads, although a turnout would be needed to access the site. Brown Road would be improved to accommodate the size and weights of hauled facility components and construction equipment. This site rates high in meeting this criterion.

3.5.1.1.3 Avoidance of Impacts to Wetlands

This site was chosen because it is mostly upland (4.7 acres) with blackberry communities comprising the dominant species of plants. The wetland area within the site is approximately 0.2 acres and 0.04 percent of the proposed site. This site rates high in meeting this criterion. The wetland mitigation plan includes the potential to convert much of this upland area to wetlands after construction is complete.

3.5.1.1.4 Other Environmental Impacts

This site minimizes the impact to priority habitats, although old fields would be affected. The site is currently overrun by invasive blackberry thickets and a few young Douglas fir trees. The proximity to Grandview Road currently limits use by large mammal species. A preliminary assessment has indicated that this site does not serve as habitat for priority species. This site rates high in meeting this criterion during the construction period of the plant.

3.5.1.2 <u>Area Two of Preferred Alternative</u>

The second area within the preferred alternative laydown area is located within the primary boundaries of the BP Refinery. It is located within the same area as Site 5 of the plant site alternatives.

3.5.1.2.1 Proximity to the Proposed Plant Site

This site would be located approximately 800 feet west of the proposed plant site. This site rates high in meeting this criterion.

3.5.1.2.2 Site Access

It is likely that this site will be accessed from an existing gravel road (see Figures 1-7 and 1-8) from within the Refinery and from Blaine Road. A parking lot is already present within this area, so construction parking may be provided. An existing security gate on Blaine Road would likely be opened, when required, to allow access to Grandview Road from the staging site. This site rates high in meeting this criterion.

3.5.1.2.3 Avoid or Minimize Impacts to Wetlands

The site was delineated for wetlands. Approximately 6.1 acres of palustrine wetlands, consisting of herbaceous and shrub-scrub vegetation would be impacted by the proposed construction laydown at the site. A portion of the impacted wetlands contains planted hybrid poplars that would not likely be considered forested wetlands. An 8-acre parcel was eliminated from consideration for use at this site because it was found to contain approximately 80 percent wetlands. The wetlands were evaluated for functions and values and found generally to rate low in most functions that were assessed. A full account of the functions and values assessment of these wetlands can be found in the *BP Cherry Point Wetlands Functions and Values Assessment* (Golder Associates Inc., 2002). This site rates medium in meeting this criterion.

3.5.1.2.4 Other Environmental Impacts

Approximately 3.5 acres of this site are comprised of existing impervious surface area in the form of a parking lot and an access road. The remaining acreage, excluding the aforementioned wetland, contains disturbed upland grasses and invasive weedy species within an old field habitat (fallow agricultural fields). Because this area is fenced and located within the Refinery fenceline, impacts to wildlife species are not likely to be significant. A preliminary assessment of the area has indicated that it does not serve as habitat for priority species. This site rates high in meeting this criterion.

3.5.1.3 Area Three of the Preferred Alternative

This upland site occurs south of Aldergrove Road and east of Jackson Road (Figure 1-7). This area is across from the Refinery crude and product pipelines to the docks at Cherry Point. The site is located within a relatively remote area that does not currently have access to main roads around the perimeter of the Refinery. Although it is not the most optimal location, the site would not impact priority habitats, including wetlands. This site would only be used if the other areas cannot meet all of the laydown requirements for storage. This site would not be used for fabrication or other uses that would require immediate use at the construction site.

3.5.1.3.1 Proximity to Proposed Plant Site

This site is approximately 1.5 miles southwest of the proposed plant location. Based on the significant distance of this site in relation to the proposed plant location, this site would likely be used for storage of construction equipment and facility components to be used during later phases of construction. Components would likely be transported to one of the other preferred locations for assembly prior to transport to the Cogeneration Project construction site. This site rates low in meeting this criterion in comparison to other alternatives.

3.5.1.3.2 Site Access

As previously stated, this site is relatively remote and is not easily accessible. The pipeline corridor prohibits access from Jackson Road, so access would have to occur from the eastern side of the site. There is an existing overgrown, narrow paved road that could provide access if it were improved. Unless other access options are considered, this site rates low in meeting this criterion.

3.5.1.3.3 Avoid or Minimize Impacts to Wetlands

This area is completely upland and would avoid impacts to wetlands. This site rates high in meeting this criterion.

3.5.1.3.4 Other Environmental Impacts

This site has been disturbed, and large amounts of fill material were placed in this area as a result of previous excavation and construction activities at the Refinery (Bill Campin, pers. comm., October 2001). Although disturbed, evidence of large mammal use was observed in the area including black bear, coyote, and mule deer scat. However, a preliminary assessment of the area has indicated that it does not serve as habitat for priority species. This site rates high in meeting this criterion.

3.5.2 Laydown Site Two

Approximately 20 to 30 acres south of Aldergrove Road and east of Jackson Road along the Refinery pipeline corridor were evaluated for priority habitats, including wetlands (Figure 1-7).

3.5.2.1 Proximity to the Proposed Plant Site

This site is approximately 1.5 miles southwest of the proposed plant site. This site rates low in meeting this criterion in comparison to other alternatives.

3.5.2.2 Site Access

This site could be accessed directly from Aldergrove Road if an adequate turnout were constructed that could handle maximum loads. This site rates high in meeting this criterion.

3.5.2.3 Avoidance of Impacts to Wetlands

Approximately 85 percent of this site contains herbaceous wetlands that extend into native forested wetlands. Additionally, two mudflats were observed that contained stands of cattail (*Typha latifolia*) and one great blue heron was observed foraging at the mudflat. Based on the occurrence of emergent wetlands and mudflats, this area rates low in meeting this criterion.

3.5.2.4 Other Environmental Impacts

Both the upland and wetland portions of this site are relatively disturbed. Evidence of large mammal use was observed, although, with the exception of wetlands, priority habitats do not occur at this site. This site rates high in meeting this criterion.

3.6 Cogeneration Project Design Alternatives

Impacts to the herbaceous wetlands at the proposed power plant site were minimized to the extent possible. Several different orientations of the plant layout were evaluated to determine the configuration that would impact the least amount of wetlands. Facility components were compressed into the smallest area possible to maintain efficiency and proper functioning of the facility.

Two project configurations were evaluated, air-cooling and water-cooling. In order to minimize the consumption of fresh water, BP's original application proposed to use an air-cooled condenser. In light of the availability of once-through cooling water from the Alcoa aluminum smelter, BP now proposes a water-cooled system that would use recycled industrial water. Although this change reduced the total footprint of the project, it has also allowed the stormwater system detention pond to be moved into the fence line of the project site. This may result in a small reduction in wetlands impacted by the project.

Upland areas just south of Grandview Road were excluded from consideration for part of the project area based on the need for visual screening of the facility. In addition to maintaining a visual screen from the moderately-trafficked road, Whatcom County requires that for heavy industrial facilities, “all setbacks shall be increased by one foot for each foot of building height, excluding tanks and similar structures, which exceeds 50 feet” along major thoroughfares, including Grandview Road, State Route 548, (Whatcom County Municipal Code 20.80.254). HRSG stacks for the proposed power plant will be 150 feet tall and therefore will require 150 feet of setback. The setback requirement dictates how far north the plant site could be located.

4. REFERENCES

Listed below are references and sources of information for the Alternatives Analysis.

Bill Campin, pers. comm., BP West Coast Products, October 2001.

BPA Infrastructure Technical Review Committee Report, August 30,2001

Corps of Engineers, Memorandum to the Field, Appropriate Level of Analysis Required for Evaluating Compliance with the Section 404(b)(1) Guidelines Alternative Analysis, August 23, 1993

Golder Associates Inc. BP Cherry Point Wetland Delineation Report [Revised], February 2003, Redmond, Washington

Golder Associates Inc. BP Cherry Point Wetland Functions and Values Assessment, June 2002, Redmond, Washington

Sumas Energy 2, Inc. Practicable Alternative Analysis for COE Permit No. 98-4-02021, March 20, 2000, Kirkland, Washington

Western Systems Coordinating Council, August 2001,10-year Coordinated Plan Summary 2001 – 2010, Salt Lake City, Utah

FIGURES

D R A F T

ENVIRONMENTAL RESOURCES REPORT

BPA Transmission Line Brown Road to Custer Substation

Prepared for:

BP Cherry Point Refinery

May 12, 2003

URS

1501 Fourth Avenue, Suite 1400
Seattle, WA 98101-1616
(206) 438-2700

33749546.05070

TABLE OF CONTENTS

Page

TABLES

FIGURES

APPENDIX

1.0 INTRODUCTION

BP West Coast Products (BP) is proposing to connect a cogeneration power plant proposed for construction at the BP Cherry Point Refinery to an existing Bonneville Power Administration (BPA) transmission line. The greater loads that would be produced by the cogeneration facility may require installing new towers, relocating existing towers, and/or replacing transmission lines. URS conducted a reconnaissance investigation to determine the presence, geographic extent, and character of environmental and cultural resources along a section of the BPA's Custer-Intalco No. 2 transmission line located in Whatcom County, Washington. The study area includes the 125-foot transmission right-of-way (ROW) corridor from Brown Road to the Custer Substation, approximately 5 miles in length (Figure 1). The study assessed existing conditions of streams, wetlands, wildlife, and cultural resources within the ROW.

This report documents the work performed and describes environmental resources within the study area. Regulations relevant to the on-site resources and potential mitigation for upgrade of the transmission line corridor are also discussed.

The project area is located approximately seven miles southeast of the community of Blaine, Washington, about three miles inland from the southern extent of Birch Bay on the northern Washington coast and about 7.5 miles south of the international border. It can be found on the Blaine, Washington USGS 7.5' topographic quadrangles, in Sections 1, 2, 3, 4, 5, and 8, Township 39 N, Range 1E. The current project area extends from the north side of Brown Road, near the community of Kickerville, north about 0.5 miles across Grandview Road, and east 3.5 miles to the Custer substation, which is located just west of Interstate 5 (see Figure 1).

1.1 RELEVANT REGULATION

Impacts to streams and wetlands are regulated at the federal level by the Corps of Engineers (Corps) and the Environmental Protection Agency (EPA). Permit process and standards for the disposal of fill primarily derive from Section 404 of the Federal Water Pollution Control Act Amendments of 1972 (Clean Water Act), which authorizes the Corps to issue permits and authorizes the EPA to set environmental standards that must be met by each permit. Other laws, including the Fish and Wildlife Coordination Act (FWCA), National Environmental Policy Act (NEPA), and the Endangered Species Act (ESA), impose additional substantive and coordination obligations on the Corps, EPA, and other relevant agencies.

The Washington State Department of Ecology (Ecology) acts in lieu of the EPA to add conditions to permits as necessary through the 401 Water Quality Certification. Ecology may also regulate impacts to wetlands as authorized by the State Water Pollution Control Act (Chapter 90.48 RCW) and the Shoreline Management Act (SMA). Ecology may also use the State Environmental Policy Act (SEPA) process as a means to identify potential wetland-related concerns during the permitting process. The Washington State Department of Fish and Wildlife (WDFW) regulates impacts to streams as authorized by the Hydraulic Code.

Local governments are required to regulate impacts to streams and wetlands within their jurisdictions by the Washington State Growth Management Act. Whatcom County Planning & Development Services regulate these resources through the issuance of Fill and Grade permits.

Cultural resources are defined as buildings, sites, structures, or objects, each of which may have historical, architectural, archaeological, cultural, and/or scientific importance. Numerous laws, regulations, and statutes at both the federal and state levels seek to protect and target the management of cultural resources. These include the Antiquities Act of 1906; Historic Sites Act of 1935; Reservoir Salvage Act of 1960; National Historic Preservation Act of 1966, as amended; National Environmental Policy Act of 1969; Executive Order 11593 (Protection and Enhancement of the Cultural Environment); Archaeological and Historical Preservation Act of 1974; American Indian Religious Freedom Joint Resolution of 1978; Archaeological Resources Protection Act of 1979; the Native American Graves Protection and Repatriation Act of 1990; and the State Environmental Policy Act (SEPA) of 1971 (RCW 43.21C), Public Lands Act (RCW 79), Forest Practices Act (RCW 76.09), Forest Practice Rules (WAC 222), Indian Graves Act (RCW 27.44), and Archaeology and Historic Preservation Act (WAC 25). Collectively, these regulations and guidelines establish a comprehensive program for the identification, evaluation, and treatment of cultural resources.

1.2 ENVIRONMENTAL SETTING

The project area is located within the Puget Trough physiographic province of Washington, which extends the entire length of the state from the Canadian border to Oregon. The northern portion of the province includes Puget Sound and the northern Washington coastline adjoining the Strait of Georgia. This portion of the province is a depressed, low-elevation glaciated area now partially submerged. The geology and topography result largely from a lobe of the cordilleran icecap that pushed into the area from the north during the Pleistocene epoch (Franklin and Dyrness 1988).

The study area lies within the western hemlock (*Tsuga heterophylla*) vegetation zone, the most extensive vegetation zone in western Washington and Oregon. This vegetation zone is characterized by a wet, cool maritime climate where late-successional forests are dominated by coniferous tree species such a western hemlock, western red cedar (*Thuja plicata*), and Douglas fir (*Pseudotsuga menziesii*) (Franklin and Dyrness 1988). As a result of extensive clearing of land for logging and agricultural pursuits, current vegetation in the project area is largely open pasture and mixed second growth forest that includes lowland deciduous, broad-leaf vegetation with some coniferous trees. Common species in these forests include red alder (*Alnus rubra*), birch (*Betula* spp.), and northern black cottonwood (*Populus trichocarpa*) (Reid 1999).

The plant communities present within the transmission line corridor are regularly to irregularly disturbed by livestock grazing and mowing by BPA. As a result, most of the study area is open pasture. In addition, there is a moderate amount of shrub-dominated habitat and the edges of nearby forests. A dirt road extends across most of the corridor to allow access for maintenance purposes.

2.0 METHODS

2.1 ENVIRONMENTAL RESOURCES

The investigation was conducted to estimate the location and extent of streams and wetlands within the study area. Channel dimensions, bank vegetation, and flow rates of on-site streams were noted. Wetland locations were identified and the locations of wetland boundaries were estimated and sketched on aerial photographs. Cursory observations of vegetation, soils and hydrology for both wetlands and uplands were made for the study site. Observations of wildlife on or near the study area during the investigation were also recorded. In addition, resources demonstrating presence of any priority habitats and species known to occur on or near the study area were consulted.

Documents reviewed to aid determination of wetlands, streams, and priority habitats and species in the study area and its vicinity were as follows:

- National Wetlands Inventory Map, Blaine, Washington, Quadrangle (USFWS 1989)
- USGS Topographic Maps, Blaine, Washington, Quadrangle (USGS 1991)
- *Soil Survey of Whatcom County Area, Washington* (Goldin 1992)
- BP Cherry Point Cogeneration Project, Application for Site Certification, Part III Technical Appendices, Appendix H (Golder Associates 2002)
- Priority Habitat and Species (PHS) database (WDFW 2003)
- Natural Heritage Program (NHP) database (DNR 2002)

2.1.1 Wetland Determination

Wetland determinations made during a reconnaissance level investigation are subject to change upon conducting a wetland delineation. A wetland delineation allows the opportunity to return to areas identified by the reconnaissance investigation and better determine locations of wetland boundaries. A wetland delineation must occur in areas where impacts are proposed before any wetland-related permits can be issued.

Wetland identification was made on site by wetland biologists using the 1987 U.S. Army Corps of Engineers (Corps) *Wetlands Delineation Manual* and the 1997 Washington State Department of Ecology (Ecology) *Wetland Identification and Delineation Manual* as guidelines. The 1997 Ecology methodology was developed to be consistent with the 1987 Corps Manual.

For regulatory purposes, wetlands are defined by the Corps (1987) as follows:

> Those areas that are inundated or saturated by surface or ground water at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil

conditions. Wetlands generally include swamps, marshes, bogs, and similar areas.

According to the two manuals, the following three characteristics usually must be present for an area to be identified as a wetland: (1) hydrophytic vegetation, (2) hydric soil, and (3) wetland hydrology. Hydrophytic vegetation consists of those plant species growing in water, in soil, or on a substrate that at least periodically lacks oxygen. Hydric soils are saturated, flooded, or ponded long enough during the growing season to become deoxygenated in the upper soil horizon. Wetland hydrology includes seasonal, periodic, or permanent inundation or soil saturation that creates anaerobic conditions in the soil for a portion of the growing season for wetland sufficient soil and vegetation to be maintained.

The growing season is the period when soil temperatures 19.7 inches below the ground surface are typically greater than 41 degrees Fahrenheit (5 degrees Celsius) according to the 1987 *Corps Wetlands Delineation Manual*. The growing season length for the area is approximately 223 days as determined by averaging growing season length given by Goldin (1992) for Bellingham and Blaine. This period occurs from March 12 to October 31.

The dominant plant species in each vegetation community were identified. Vegetation communities are defined here as a contiguous assortment of plants in a given area sharing similar environmental conditions. Dominant plants are those plant species that comprise at least 20 percent aerial cover of a given community.

The hydrophytic indicator status for each dominant species as designated by the US Fish and Wildlife Service for Region 9 (USFWS 1996) was used to determine whether the vegetation in each community is hydrophytic. To meet the hydrophytic vegetation criteria, more than 50% of the dominant species must have an indicator status of obligate, facultative wetland, and/or facultative. The facultative statuses are often modified using minus (-) or plus (+) symbols. For example, FAC+ species are considered to have a somewhat greater estimated probability of occurring in wetlands than FAC species, whereas FAC- species are considered to have a somewhat lesser estimated probability of occurring in wetlands than FAC species. Indicator status categories are defined in Table 1.

Table 1
Plant Species Wetland Indicator Categories

Indicator Category	**Occurrence**	**Probability in Wetlands (estimated)**
Obligate (OBL)	Occurs almost always in wetlands under natural conditions	>99%
Facultative Wetland (FACW)	Usually occurs in wetlands, but occasionally found in non-wetlands	67-99%
Facultative (FAC)	Equally likely to occur in wetlands and non-wetlands	34-66%
Facultative Upland (FACU)	Usually occurs in non-wetlands, but occasionally found in wetlands	1-33%
Upland (UPL)	Occurs almost always under natural conditions in non-wetlands in this region, but may occur in wetlands in another region	<1%

Soil observations were made in wetlands and adjacent upland areas by hand augering the upper horizons of the soil. Soil color and other characteristics used to indicate hydric soils were documented. Soil taxonomy and drainage class were determined by reviewing the results of the *Soil Survey of the Whatcom County Area*, Washington (Goldin 1992).

Soil in which any of the following indicators is present meets the criteria for hydric soil:

- **Gleyed soil (gray colors).** Gleyed soils develop when mineral soil is saturated or inundated for periods of time sufficient to result in anaerobic (no oxygen) conditions. Anaerobic conditions cause elements common in soil, such as iron and manganese, to exist in reduced forms that are usually bluish, greenish, or grayish in color. Soil colors are determined using a Munsell soil color chart (GretagMacbeth 2000), which has separate pages for gley-colored soils.

- **Low chroma matrix.** A low chroma matrix develops when mineral soil is saturated or inundated for substantial periods of time during the growing season (but not long enough to produce gleyed soil) to result in anaerobic (no oxygen) or hypoxic (low oxygen) conditions. A soil matrix is the portion of a given soil layer (usually more than 50 percent by volume) that has the predominant color. The Munsell soil color chart uses abbreviations to describe colors, for example, 10YR 3/2. In the abbreviation, the last number indicates chroma; a chroma of 1 or 2 is considered low. Soils with a matrix chroma of 2 are usually considered hydric when mottles are present. Mottles are rust-colored spots or blotches in the soil formed by the oxidation of iron compounds via fluctuating water levels.

- **High organic content.** Soil retains high levels of organic matter when saturation prevents decomposition over long periods, thus allowing organic debris to accumulate. Organic content is considered high if the soil is composed of more than 20 to 30 percent (threshold differs depending upon other soil characteristics) organic material by weight in a layer at least 8 inches thick located in the upper 32 inches of the soil profile.

- **Soils appearing on the hydric soils list.** A list of hydric soils has been compiled by the U.S. Department of Agriculture's National Technical Committee for Hydric Soils. Listed soils have reducing conditions for a significant portion of the growing season in a major portion of the root zone and are frequently saturated within 12 inches of the soil surface.

- **Other hydric indicators.** Other positive indicators of hydric soil include sulfide or "rotten egg" odor, aquic or peraquic moisture regimes, and the presence of iron or manganese concretions.

To determine whether a vegetation community has wetland hydrology, an area is examined for inundation, soil saturation, shallow groundwater tables, or other hydrologic indicators. An area in which soils are saturated to the surface for at least 5 to 12 percent of the growing season meets the criterion for wetland hydrology. Since the growing season in low elevation areas of

Whatcom County typically occurs from April 19 to October 21 (a total of 26.5 weeks), saturation is only required to occur here for at least 1.3 to 3.2 weeks to meet the wetland hydrology criterion. Seasonal changes in water levels and the effect of recent precipitation events must be considered when evaluating an area's hydrology. Wetland hydrology can also be inferred from the presence of any of the following indicators: watermarks on vegetation, drift lines, sediment deposits, water-stained leaves, surface-scoured areas, wetland drainage patterns, and/or oxidized root channels.

2.1.2 Aquatic Resource Classification

The aquatic resources observed on site were grouped into five categories: (1) streams, (2) seasonally saturated wetland areas, (3) seasonally inundated wetland areas, (4) semi-permanently/permanently inundated wetland areas (ponds), and (5) possible wetland areas.

Streams are characterized by unidirectional flow of water in a defined channel.

Categories 2, 3, and 4 classify wetlands according to hydrologic regime. Seasonally saturated wetland areas retain saturation at or near the surface of the soil for long periods, extending into the beginning of the growing season, but typically dry out substantially in the latter half of the growing season. Seasonally inundated wetland areas typically support shallow inundation for at least one month per year. These areas retain saturation at or near the surface of the soil for longer periods than seasonally saturated areas, but typically dry out substantially in the latter half of the growing season. Semi-permanently/permanently inundated wetland areas (ponds) typically retain inundation for most or all of the year and have some 'open water' area.

Possible wetlands are areas that contain some wetland indicators, but require further study to determine if they would be considered jurisdictional wetlands. If any of these areas are actually wetlands, they would be considered seasonally saturated wetland areas.

Wetlands were further classified according to the *Classification of Wetlands and Deepwater Habitats of the United States* (Cowardin et al. 1979). Under the Cowardin classification scheme, wetlands and deepwater habitats are grouped into systems based on shared hydrologic factors. These systems are as follows: palustrine, marine, estuarine, riverine, and lacustrine.

The palustrine system includes all nontidal wetlands dominated by trees, shrubs, emergent herbaceous plants, mosses, and/or lichens, and all such wetlands that occur in tidal areas where the salinity due to ocean-derived salts is below 5 parts per thousand. Wetlands included in the palustrine system are those commonly referred to as marshes, swamps, bogs, fens, prairies, seeps, and intermittent ponds.

Palustrine wetlands are divided into classes by the dominant vegetation. Forested wetlands or forested wetland communities are dominated by trees or arborescent shrubs greater than 20 feet tall with at least 30 percent cover. Scrub-shrub wetlands or scrub-shrub wetland communities are dominated by woody shrubs less than 20 feet tall with at least 30 percent cover. Emergent herbaceous wetlands or emergent herbaceous wetland communities are dominated by nonwoody, vascular plants with at least 30 percent cover. Open water areas of ponds are classified as palustrine unconsolidated bottom (PUB) communities, which are characterized by substrates with most particles smaller than stones and vegetation cover less than 30 percent.

Wetland Ratings and Buffers

Wetland were rated using Ecology's Four-Tier Wetlands Rating System (Ecology 1993). Ecology recognizes four categories of wetlands: Category I, Category II, Category III, and Category IV. These ratings would influence mitigation ratios if a permit from Ecology is required for the proposed construction.

Category I wetland contains the following criteria:

- Documented habitat for endangered or threatened fish or animal species or for potentially extirpated plant species recognized by state or federal agencies
- High quality native wetland communities, including documented Category I or II quality Natural Heritage wetland sites and sites which qualify as a Category I or II quality Natural Heritage wetland
- High quality regionally rare wetland communities with irreplaceable ecological functions
- Wetlands of exceptional local significance

Category II wetlands are those that meet the following criteria:

- Regulated wetlands that do not contain features outlined in Category I
- Documented habitats for sensitive plant, fish, or animal species recognized by federal or state agencies
- Rare wetland communities that are not of high quality
- Wetland types with significant functions that may not be adequately replicated through creation or restoration
- Regulated wetland contiguous with salmonid fish-bearing waters, including streams where flow is intermittent
- Regulated wetlands with significant use by fish and wildlife

Category II wetlands occur more commonly than Category I wetlands but still need a high level of protection.

Category III wetlands meet the following criteria:

- Regulated wetlands that do not contain features outlined in categories I, II, or IV

Category III wetlands are smaller, less diverse, and/or more isolated in the landscape than Category II wetlands. They occur more frequently, are difficult to replace, and need a moderate level of protection.

Category IV wetlands meet the following criteria:

- Regulated wetlands that do not meet the criteria or a category I or II wetland
- Isolated wetlands that are less than or equal to one acre in size; and have only one wetland class; and have only one dominant plant species
- Isolated wetlands that are less than or equal to two acres in size, and have only one wetland class and a predominance of exotic species

Category IV wetlands are the smallest, most isolated, and have the least diverse vegetation. These are wetlands that should be replaceable and, in some cases, can be improved from a habitat standpoint. These wetlands do provide important functions and values and should be protected to some degree. Regional differences may call for a more narrow definition of this category.

The Whatcom County Code (WCC) defines which wetlands will be regulated by Whatcom County. For those wetlands that will be regulated, the WCC identifies wetland classes based on specific criteria, and establishes wetland buffer requirements, development standards, permitted alterations, and mitigation requirements. Definitions of wetland classes, mitigation, and other important definitions that pertain to wetland regulation are promulgated in Chapter 16 of the code (WCC 16.16.800).

According to the WCC, non-regulated wetlands include:

- Areas in which wetlands were created by activity, intentional or unintentional, other than mitigation subsequent to July 1, 1990
- Isolated wetlands less than one-third acre in size
- Any wetland hydrologically isolated, with vegetation dominated by invasive species or pasture grasses, and the dominant functions of which are restricted to storm water storage/flood attenuation, and the functions of which are no greater than all alternative nonwetlands sites on the parcel of property in question

Regulated wetlands include all other wetlands according to WCC 16.16.620.

Buffer areas shall be established to protect wetland functions, according to WCC 16.16.240, Regulatory Requirements. All regulated wetlands shall be protected by a standard 100-foot buffer, except that:

- Isolated wetland areas not characterized as mature forested fens, sphagnum bogs, or estuarine wetlands shall be protected by a 50-foot buffer
- Isolated wet meadows shall be exempt from the standard buffer requirement when it is determined that the wetland functions are restricted primarily to storm water storage or attenuation.

2.2 CULTURAL RESOURCES

2.2.1 Preliminary Research Record Search and Literature Review

The cultural resources investigation of the proposed transmission line upgrade corridor was initiated with a record search and literature review at the Washington Office of Archaeology and Historic Preservation (OAHP), Olympia, Washington, on January 22, 2003. During the course of the record search, maps, site files, and Whatcom County survey report files were examined to determine the presence or absence of previously recorded archaeological sites within the project corridor, as well as the extent of previous archaeological survey coverage in the project vicinity. This review indicated that a number of investigations have occurred in the near vicinity, several of which were conducted for BP/ARCO in association with various developments related to the Cherry Point refinery. As a result of these and other studies, a number of archaeological sites have been identified in the general project vicinity. None of these, however, occur within the proposed construction corridor. Information on previous studies and recorded sites is presented below.

In addition to review of records on file at OAHP, historic US General Land Office (GLO) plats were examined to assess historic land use patterns and the potential for early historic sites or features in the project area. An 1860 GLO cadastral survey map for Township 39 North, Range 1 East confirms that the area had not been settled as of this date. No structures or other notable features were recorded with the exception of an unnamed trail leading from a marsh area for approximately one mile west to "Lake Terrill." Similarly, a subsequent 1872 survey of lands immediately north of the project corridor (Township 40 North, Range 1 East) indicates the area was not developed at the time of the survey, as no historical features or structures were documented.

Patent records of the GLO were reviewed for information pertaining to early land claims and confirm that the area was not settled until the late 1800s. The earliest claims in the project area date to 1872 and were filed by Harriett Baxter (Section 8) and William Price Jones (Section 5); by the 1890s, a total of ten patentees held claims to those lands included in the project corridor. The majority of these land claims were filed from 1884 to 1894 under the authority of 3 Stat. 566 and the Homestead Entry Act (12 Stat. 392).

Previous Investigations in the Project Area

The Birch Bay area has been the focus of archaeological investigations since the 1960s, when staff from the University of Washington recorded the first sites in the area. Survey and testing projects under the direction of Garland Grabert, of Western Washington State College (now WWU) followed these studies. Between 1969 and 1971, Grabert and Larsen of WWSC performed construction testing and mitigation at the location of Birch Bay Village (Reid 1999:22).

In 1975, additional research around Birch Bay was conducted in conjunction with construction of a sewer system and wastewater treatment facility. Survey, testing, and trench-monitoring activities were conducted as part of these investigations. Several sites were identified as part of these studies, including 45WH09, discussed below. This initial study was followed the next year with survey and testing of proposed Birch Bay State Park facilities. In 1982, severe winter erosion exposed several burials at 45WH09, resulting in salvage and protection measures. Additional sites were tested to the north of the project area, on Semiahmoo Spit (Reid 1999:22).

Additional work in the project area includes a mitigation and salvage study along the southern shoreline of the bay (Reid 1996, 1997a), related to mitigation of the effects of construction activities; surveys on the southern portion of Birch Point (Reid 1997b, c); archaeological investigations associated with the widening of Birch Bay Drive and Birch Point Road (Reid 1999) and Lake Terrell and Mountain View roads (Reid 2001); archaeological investigations of the proposed Williams/BC Hydro pipeline crossing of Georgia Strait (Hess et al. 2000; Thompson et al. 2000; Maas 2001a and 2001b); inventory of a new sewer line from the Cherry Point refinery to the Birch Bay area (Kelly 2001); and a cultural resources inventory along the I-5 corridor for the proposed Washington Light Lanes Project from Seattle to Blaine (Juell et al. 2000). Finally, two recent projects in the immediate project vicinity include a cultural resources survey for BPA's Bellingham to Custer fiber optic corridor (Wilt 2002) and the investigation of the proposed BP cogeneration facility adjacent to the Cherry Point refinery (Whiteman et al. 2002).

Known Archaeological Sites in the Project Vicinity

The record search and literature review revealed that while no known archaeological sites are present within the actual project area, several sites are located within close proximity. These include several shell midden sites along the shoreline of Birch Bay, three or more miles to the west and northwest of the current area. These include sites 45WH09, 45WH66, 45WH72, and 45WH74, all of which were recorded during the WWSC investigations of the mid-1970s. Site 45WH22 is a small, interior shell midden located along Terrell Creek, one mile west of the project and about 1.5 miles inland from the shore of Birch Bay. Two miles west of the project area is site 45WH23, known as the Golgotha Church site. This site was recorded in 1969, and consists of a small number of flaked cobbles. It is also located over one mile from the shoreline.

Two additional sites in this area, recorded more recently, include 45WH569 and 598. The first of these is a historic-era farmstead, recorded in 2000, and located about 0.75 miles west of the westernmost extent of the current project. About 0.5 miles to the south, adjacent to the Cherry Point refinery, is 45WH598. This site is a small, ephemeral lithic scatter associated with charcoal and stained soil. It was discovered during shovel probing conducted in 2002 in conjunction with study of the proposed cogeneration facility (Whiteman et al. 2002).

Site 45WH30 is located on the bank of Terrell Creek about 0.35 miles east of the westernmost north-south leg of the project. Recorded in 1970, it consists of two conical earth mounds that may represent the remains of earth ovens.

Finally, about 1.5 miles north of the eastern project extent, near the community of Custer, is site 45WH35. This site consists of a small lithic scatter associated with stained soil recorded in 1972.

Additional sites, primarily coastal shell middens, are located to the north and south of the project area, well outside of the current study area.

The presence of these resources indicates that historic and prehistoric resources are present within the project vicinity, but are largely concentrated along the shoreline of Birch Bay. Extensive shell midden deposits are present in the coastal area, and human remains have been documented at these sites. Resources identified to date in the near vicinity of the project corridor, however, tend to be more ephemeral lithe scatters with limited subsurface deposits.

Native American Consultation

BP has maintained an active program of consultation with representatives of the Lummi Indian Nation with regard to ongoing and planned developments associated with the Cherry Point refinery and proposed cogeneration facilities. Recent inventory of the cogeneration facility was contracted to the Lummi Indian Nation and included tribal representatives in several aspects of the study (Whiteman et al. 2002). BP will submit information on the current undertaking to the Lummi Indian Nation, with a request for information on potential traditional cultural properties or other areas of concern in or near the corridor.

2.2.2 Field Investigation

Intensive archaeological inventory of the proposed construction corridor was conducted by URS archaeologists Michael S. Kelly and Sarah McDaniel on January 23-24, 2003. Inventory was conducted at 15 m contours, providing full coverage of the proposed 40 m (125-foot) corridor. The majority of the transmission line corridor is composed of open pasture. Consequently, ground visibility was limited across much of the corridor, with much the ground surface obscured by dense grasses. Consequently, during the course of the inventory, an effort was made to carefully examine exposed cuts and banks, rodent spoil piles, and other soil exposures. In addition, 15-cm soil probes were excavated at periodic intervals along the length of the corridor, each excavated to average depths of 40-60 cm or more, depending on soil composition and subsurface water levels. Soil probes were specifically placed at anticipated tower locations, which will be placed at average intervals of 900 feet. Probing indicated the presence of heavy clay sediments across a majority of the project areas, with very few pebbles, gravels, or other materials present. Standing water was present along much of the corridor. In all areas, subsurface sediments were extremely wet, and in most locations, groundwater was encountered at depths as little as 10-15 cm below the surface.

3.0 RESULTS

3.1 ENVIRONMENTAL RESOURCES

3.1.1 Aquatic Resource Classification

To simplify reporting of the findings, aquatic resources were grouped into five categories: streams, seasonally saturated wetland areas, seasonally inundated wetland areas, semi-permanently/permanently inundated wetland areas (ponds), and possible wetland areas. The wetland areas were further classified according to *Classification of Wetlands and Deepwater Habitats of the United States* (Cowardin et al. 1979)., Upland areas also briefly described.

In addition, the transmission line was divided into five one mile-long segments beginning at the Custer Substation and ending at the BP interconnection point. The Custer Substation is the farthest point northeast that the route travels whereas the BP interconnection point is at the southwest terminus of the route studied. Five streams, thirty wetlands and four potential wetland areas were identified. Each resource category is first characterized, then individual wetlands and streams are briefly described as they occur under their respective transmission line segment. Wildlife in the study area is also discussed.

Streams

The transmission line corridor crosses parts of the California Creek and Terrell Creek sub-basin. Five streams were found within the 5-mile long study area: California Creek , two unnamed streams that feed California Creek, Fingalson Creek, and Terrell Creek . Other ditches and swales are present within the corridor, but are typically associated with wetlands and are described in the subsequent sections. Terrell Creek and California Creek each provide habitat for anadromous fish and discharge into Birch Bay. Fingalson Creek provides habitat for anadromous fish for a portion of its length, but a barrier to fish passage is present within mile four of the transmission line, limiting usage to resident fish only. Fingalson Creek connects to Terrell Creek within mile four of the transmission line.

Seasonally Saturated Wetland Areas

Every wetland surveyed in the study support seasonally saturated areas. Several wetlands consisted entirely of seasonally saturated areas and contained no other type of hydrologic regime. These areas were either situated in a slight depression or on a slope, but none had standing water present during the field investigation. Most wetlands, including most seasonally saturated wetland areas, are hydrologically connected to one of the streams mentioned above. The typical soil in these wetland areas is a dark brown silt loam (chroma of 1 or 2) with visible mottling.

The majority of seasonally saturated wetland areas found on site support PEM wetland communities. As mentioned earlier, PEM wetlands are dominated by herbaceous vegetation. Most of the PEM wetlands within the study area are actively grazed, regularly mowed, or have been disturbed by historical agricultural practices. The PEM wetland communities within seasonally saturated areas are classified as palustrine emergent, temporarily flooded (PEMA) wetland areas. Vegetation in PEMA wetlands on site is typically dominated by non-native herbaceous plants such as oft rush (*Juncus effusus*) and non-native pasture grasses such as reed canarygrass (*Phalaris arundinacea*), bentgrass (*Agrostis* sp.), and velvetgrass (*Holcus lanatus*).

A few scrub-shrub (PSS) communities and one forested (PFO) wetland community inhabit seasonally inundated areas as well. BPA maintains most shrubs to a certain height (approximately 25 feet). In most areas, trees growing in PSS wetlands are removed or topped by BPA to maintain a safe distance between the lines and vegetation. Vegetation dominating PSS wetland communities within seasonally inundated areas include Douglas spirea (*Spiraea douglasii*), salmonberry (*Rubus spectabilis*), immature red alder (*Alnus rubra*), rose (*Rosa* sp.), and snowberry (*Symphocarpos albus*).

The only PFO community that occurred within the study area was found in a seasonally saturated area. However, a very small patch of standing water was found within this community away from where any trees were rooted. The community occurs within Wetland O and is dominated by mature paper birch (*Betula papyrifera*) and red alder.

Seasonally Inundated Wetland Areas

Most of the wetlands surveyed support seasonally inundated areas, which are typically contiguous with seasonally saturated wetland areas. They are situated in depressions and supported standing water during the investigation. Some of the seasonally inundated wetland areas are situated near or within the bounds of a shallow pond. The typical soil in these wetland areas is a dark brown silt loam (chroma of 1 or 2) with visible mottling.

As with seasonally saturated wetland areas, the majority of seasonally inundated wetland areas support PEM communities. Vegetation in the PEM portions of the seasonally inundated areas is typically dominated by non-native herbaceous plants such as soft rush and creeping buttercup (*Ranunculus repens*) and non-native pasture grasses such as reed canarygrass, cattail (*Typha latifolia*), and bentgrass.

A moderate proportion of the PSS communities present in the study area are found in seasonally inundated areas. BPA maintains most shrubs to a certain height (approximately 25 feet). Vegetation dominating PSS wetlands within seasonally inundated areas include Douglas spirea (*Spiraea douglasii*), Sitka willow (*Salix sitchensis*), and red-osier dogwood (*Cornus sericea*).

Semi-permanently/Permanently Inundated Wetland Areas (Ponds)

Several of these wetlands contain ponds that are either permanently or semi-permanently inundated. The ponds range in size from less than 1 acre to greater than 5 acres and range in depth from a few inches to perhaps 2 feet or more. These ponds are predominantly ‘open water’ areas, but often support a patch of vegetation within their bounds and/or along the fringe. Vegetation found within the ponds includes both shrubs and emergent plants.

Possible Wetland Areas

Four areas were identified as possible wetlands (see Figures 2-A through 2-J). These areas are found in heavily grazed areas or disturbed fields where topography has been altered by motorized activity. The conditions present in these areas inhibited accurate identification of pre-disturbance vegetation and topography.

3.1.2 Uplands

Uplands within the study area are dense blackberry thickets, mowed fields, or grazed fields. The blackberry thickets are typically found near steep slopes and/or stream crossings, as with Terrell Creek. These areas include Himalayan blackberry (*Rubus armeniacus*) and evergreen blackberry (*Rubus lacinatus*), with occasional snowberry and salmonberry. Upland fields are dominated by tall fescue (*Festuca arundinacea*) and bentgrass, approximately 3 to 4 inches tall.

3.1.3 Streams and Wetlands by Transmission Line Segment

Figures 2-A through 2-J show streams and wetlands identified along the 5-mile transmission line route. The table below presents a summary of the amount of wetlands occurring with in the ROW. The span of each wetland within the study area parallel to the direction of the ROW corridor is quantified in linear feet. The buffer area widths shown in the table buffers are based on interpretation of Whatcom County Code Critical Areas Ordinance. These widths must be confirmed by Whatcom County Planning & Development Services.

Table 2
Summary of Wetlands in Right-of-Way (ROW)

Study Area Mile	Wetland	Location	Approximate length in ROW	Buffer Area Width
Mile 1	A	Between Tower 1/1 (substation) and 1/ 2 (Vista Drive)	1,200	100
	B	Southwest of Tower 1/ 2 and Vista Drive	100	100
	C	On both sides of Tower 1/3	250	50
	D	South of Tower 1/ 3 and Fox Road	125	100
	E	South of Tower 1/ 4	375	100
	F	North of Tower 1/ 5	300	100
	G	East of Tower 1/6	250	100
	H	East of Tower 1/6 and Olson Road	75	100
Mile 2	I	West of Olson Road	500	100
	J	West of Olson Road and Wetland Z	30	100
	K	East of Tower 2/1	40	100
	L	West of Tower 2/1	50	100
	M	West of Tower 2/2 and unnamed creek	130	100
	N	East of Elk Road	60	100
	O	West of Elk Road and East of Tower 2/4	375	100
	P	East of Tower 2/5 and Valley View Road	200	100
Mile 3	Q	West of Valley View Road	50	100
	R	On both sides of Tower 3/2	60	100
	S	On both sides of Tower 3/ 4	500	100
	T	East of Tower 3/5 and West of Yukon Road	30	100
Mile 4	U	West of Tower 3/5	125	100
	V	East of Tower 4/1	375	100
	W	West of Tower 4/1	375	100
	X	On both sides of Tower 4/2	40	100
	Y	West of Tower 4/2 and adjacent to eastern portion of Fingalson Creek	500	100
	Z	On both sides of Tower 4/3	150	100
	AA	West of Tower 4/4 and Terrell Creek	40	50
	BB	On both sides of Tower 4/5	300	100
Mile 5	CC	West of Tower 4/5 and Kickerville Road	180	100
	DD	On both sides of Tower 5/1	600	100
	EE	North of Grandview Road	60	100
	FF	South of Grandview Road and north of Tower 5/2	300	100
	GG	North of Tower 5/3	60	100
	HH	South of Tower 5/3 and north of Brown Road	850	100

Mile 1

Mile 1 of the transmission line extends from the Custer substation southwest across Vista Drive (Blaine-Ferndale Road) and Fox Road, then turns west ending just east of Olson Road (see Figures 2-A and 2-B). Within the Mile 1 study area there are six towers (1/1 through 1/6), one stream, seven wetlands, and one possible wetland area.

California Creek flows northwest across the transmission line ROW just southwest of the substation. At this location, the creek appears to have been straightened and the banks appear fairly stable. The channel is approximately 2 to 3 feet deep, 2 feet wide, and the upper part of the steep banks are almost entirely covered with reed canarygrass. A small amount of woody debris, mostly below 1 foot in diameter, was found in the creek. At the time of investigation, flow in the channel was approximately 5 to 7 cubic feet per second (cfs) and the water was very silty, limiting visibility to the upper 6 inches.

California Creek flows northwest through Wetland A, which is a PEM/PSS wetland that is approximately 1,200 feet in length (within the ROW) extending from the Custer Substation to near Vista Drive. Wetland A is a seasonally saturated wetland that drains mainly by subsurface pathways to California Creek. This is the largest wetland within the study area. The PEM portion of this wetland is dominated by reed canarygrass, bentgrass, and soft rush. The PSS portion is dominated by Douglas spirea, evergreen blackberry and clustered rose (*Rosa pisocarpa*). Near Tower 1/1, the PSS community contains some semi-mature red alder, paper birch, and Sitka willow. Wetland B is approximately 100 feet in length and located just southwest of Vista Drive and extends north of the ROW. It discharges north to a roadside ditch on the southwest side of Vista Drive. This PEM wetland appears regularly grazed and is dominated by bentgrass, fescue, and soft rush.

Wetland C is a possible wetland area approximately 250 feet in length located north of Fox Road and on both sides of Tower 1/3. It has no apparent outlet or flow channels. This PEM wetland also appears regularly grazed and is dominated by bentgrass and fescue with some soft rush and creeping buttercup.

Wetland D is approximately 125 feet in length extending along the eastern third of the ROW corridor, south of Fox Road. The wetland drains north to a ditch on the south side of Fox Road. This PEM wetland is dominated by reed canarygrass and bentgrass and extends across the grassy area east of the ROW.

Wetland E is approximately 375 feet in length and includes a pond that is approximately 1 acre in size. The pond is likely semi-permanently inundated but may occasionally draw down entirely during the latter half of the dry season. This wetland is a depressional system with no apparent outlet. A large portion of the PEM/PSS wetland community that surrounds the pond contained shallow standing water (2 inches deep) during the time of the investigation. This PEM/PSS wetland community is primarily vegetated by reed canarygrass, soft rush, with some red alder saplings and mature Sitka willow.

Wetland F is approximately 300 feet in length and is crescent-shaped extending outside the ROW. This PEM wetland has been disturbed by motor vehicles that created tracks that contain pools of standing water up to 2 inches deep. The wetland is drained by a seasonally flowing swale channel that flows north along the east edge of the ROW. The channel continues east into a red alder forest. Flow in this channel was very limited (<0.05 cfs) during the investigation. Vegetation present is primarily bentgrass, with some velvetgrass (*Holcus lanatus*) and creeping buttercup. Piggy-back plant (*Tolmiea menziesii*) is abundant in the less disturbed areas away from the vehicle tracks. Wetland G is approximately 250 feet in length and begins 300 feet west of Tower 1/5 and extends south of the ROW. It contains a seasonally to semi-permanently inundated pond that was 4-5 inches deep at the time of the investigation. An outflow swale from this wetland extends approximately 200 feet north to a topographically indistinct area where flow infiltrates below surface of the soil. A PEM community within this shallow pond supports forget-me-not (*Myosotis* sp.), foxtail (*Alopecurus* sp.), and Pacific water-parsley (*Oenanthe sarmentosa*). The PEM wetland community surrounding the pond is dominated by soft rush, bentgrass, and tall fescue. A small patch of semi-mature Douglas-fir (*Pseudotsuga menziesii*) is located on the west edge of the pond, near the edge of the ROW. Wetland H is approximately 75 feet in length and extends east from Tower 1/6. This PEM wetland is situated in a depression, but contains a swale channel that supports seasonal flow. The swale meanders across a gentle (<1%) slope outside of the study area to the west where it connects to a roadside ditch on the east side of Olson Road. Vegetation in the wetland is dominated by tall fescue, bentgrass, and creeping buttercup.

Mile 2

Mile 2 of the transmission line extends from a tower west of Olson Road to a tower just east of Valley View Road (see Figures 2-C through 2-E). Within the Mile 2 study area there are five towers (2/1 through 2/5), two streams, seven wetlands, and one possible wetland area.

Wetland I is approximately 500 feet in length and extends from the west edge of Olson Road east toward Tower 2/1. It is situated on an east-facing slope with a 3 to 5 percent grade. Several small pools of standing water 4 to 5 inches deep are present on small topographic benches occurring along the slope. The wetland discharges into a roadside ditch that flows north on the west side of Olson Road. This PEM wetland is dominated by tall fescue, soft rush, and bentgrass.

Wetland J is approximately 30 feet in length and consists of a narrow ditched swale that originates south of the ROW and flows northeast. This PEM wetland is dominated by bentgrass and velvetgrass, with some soft rush and creeping buttercup present. The swale is approximately 2 feet wide and 2 feet deep and is on a slope at 1 percent grade. Flow in the swale during the investigation was 2 inches deep.

Wetland K is approximately 40 feet in length and is located 125 feet east of Tower 2/1. This PEM wetland consists of a curving swale situated on a 2 percent slope and drains north of the ROW. Although no surface flow was observed, a small pool of standing water up to 3 inches in depth occurred in this wetland. Vegetation in the wetland swale is dominated by bentgrass, with some creeping buttercup and soft rush present.

Wetland L is approximately 50 feet in length and is located 60 feet west of Tower 2/1. A small creek flows north through the wetland in a channel that has been modified by ditching. The ditched stream channel is 8 inches wide and 8 inches high with fairly steep banks. The ditched channel crosses under a gravel road twice through 12-inch diameter culverts. The wetland and ditched creek are situated on a gentle north-facing slope. The creek is likely a tributary of California Creek. Vegetation in this PEM wetland is dominated by bentgrass, with some soft rush, velvetgrass, and clover (*Trifolium* sp.) present.

An unnamed creek flows north through the ROW, west of Tower 2/2. The creek is situated in a gully that is 50 feet wide and 30-foot deep. The creek flows north through a 24-inch culvert under a gravel access road that extends east-west along the south edge of the ROW. The creek is 10 to 15 feet wide and was flowing at less than 0.25 cfs at the time of the investigation. A larger creek, also unnamed, joins the smaller creek from the southeast within the ROW. This creek travels north under the gravel road through a 24-inch culvert before joining the smaller creek. The creek is likely a tributary of California Creek. The banks of both creeks and the confluence are strongly dominated by Himalayan blackberry. The associated riparian area south of the ROW is dominated by mature red alder, with some salmonberry, Douglas fir, and Himalayan blackberry.

Wetland M is approximately 130 feet in length and is located 250 feet east of Elk Road. This PEM wetland has been overgrazed by livestock and consequently contains much bare soil pocked by hoof prints. A thin layer of hay was present across most of the area to mitigate erosion. Standing water is present in portions of the wetland up to 1.5 inches deep. The wetland is a situated in a depression, but appears to release outflow to the north. Vegetation present is dominated by bentgrass, with some creeping buttercup, soft rush, and velvetgrass present.

Wetland N is approximately 60 feet in length and is located 50 east of Elk Road. It is situated on a north-facing slope with a low trickle flow through a narrow swale. This PEM wetland is dominated by foxtail, creeping buttercup, and bentgrass, with some soft rush present.

Wetland O is approximately 375 feet in length and is located approximately 500 feet west of Elk Road. This wetland is a PSS/PEM wetland that is connected to a PFO wetland south of the ROW. Standing water is present is in the PEM community up to 3 inches depth. This wetland complex is a depressional system with no apparent inlet or outlet; there is hydrologic connection to any creek. Vegetation in the PSS portion is dominated by Douglas spirea, with some willow and reed canarygrass present. Within the PEM community, Cattail dominates vegetation in the PEM community, but some creeping buttercup, soft rush, foxtail, and a few Sitka willow sprigs are also present. The PFO community is dominated by mature paper birch (*Betula papyrifera*) and red alder.

Approximately 200 feet east of Tower 2/4 is another unnamed creek, which flows northwest across the ROW until it joins a larger creek that enters from the east. This larger creek flows westward within the northern part of the ROW for approximately 300 feet before its confluence with the smaller unnamed creek. The larger creek and the portion of this creek below the confluence is situated within a 10-foot deep gully that has relatively steep banks. The smaller creek has silt substrate whereas the larger creek and the section below the confluence have silt, sand, and gravel substrate. - The channel for the larger creek is situated on a 2 to 3% grade and confined within a 30-foot wide V-notch that appears to have been artificially deepened and straightened. At the time of investigation, flow in the smaller creek was approximately 0.15 cfs whereas flow in the larger creek was approximately 0.3 cfs. Below the confluence, the creek continues off-site to the northwest for at least 2 more river miles before entering California Creek.

The smaller unnamed creek runs through a shrubby area along the south edge of the ROW that is heavily vegetated by vine maple, red-osier dogwood, Douglas spirea, and Himalayan blackberry. Other species include snowberry, red alder seedlings, evergreen blackberry on the upper banks, and reed canarygrass and bentgrass in the open areas near the channel. It begins south of the ROW in overgrazed fields, and outlets north of the ROW in mature deciduous forest. The banks of the larger creek are heavily vegetated with Douglas spirea.

Wetland P is a possible wetland that is approximately 200 feet in length and located 30 feet east of Tower 2/5. It is situated on a north-facing slope and occurs within a narrow, shallow ditch that extends across only the northern portion of the ROW. Saturation was present near the soil surface during the investigation. This possible PEM wetland is dominated by reed canarygrass and tall fescue.

Mile 3

Mile 3 of the transmission line extends from a tower west of Valley View Road to a tower west of Yukon Road (private road) (see Figures 2-E through 2-G). Within the Mile 3 study area there are five towers (3/1 through 3/5), no streams, three wetlands, and one possible wetland area.

Wetland Q is approximately 50 feet in length and is located 100 feet west of Valley View Road. It is situated on a bench on a north-facing slope (approximately 2.5 percent grade) and contained 1 inch of standing water. A driveway ditch leads down the slope near the wetland. This PEM wetland is dominated by reed canarygrass, tall fescue, and bentgrass, with some velvetgrass and clover present.

Wetland R is a possible wetland that is approximately 60 feet in length and located adjacent to Tower 3/2. It receives drainage from an uphill slopes to the east and west along with precipitation, seeping to an upland meadow to the north. This possible PEM wetland is dominated by reed canarygrass and tall fescue, with some bentgrass and cut spirea present.

Wetland S is approximately 500 feet in length and occurs on both sides of Tower 3/4, including an upland lobe (175 feet in length) in the eastern portion. Patches of standing water up to 2 inches deep were present during investigation. The wetland is situated on a gentle south-facing slope. This PEM wetland is dominated by soft rush and bentgrass, with some foxtail present.

Wetland T is approximately 30 feet in length and is approximately 200 feet west of Yukon Road. This PEM wetland is situated in a constricted gully approximately 12 wide at its narrowest point. The wetland is a situated in a depression and flows south during high flows to a driveway ditch that is within the ROW. It is dominated by reed canarygrass and soft rush, bordered by Himalayan blackberry on the gully banks.

Mile 4

Mile 4 of the transmission line extends from a tower west of Yukon Road to a tower east of Kickerville Road (see Figures 2-G through 2-I). Within the Mile 4 study area there are five towers (4/1 through 4/5), two streams, seven wetlands, and one possible wetland areas.

Wetland U is approximately 125 feet in length and is located on the west side of Tower 3/5. It is situated on a 1 percent southwest-facing slope and contained standing water up to 2 inches in small depressions during the investigation. This PEM wetland is dominated by reed canarygrass, bentgrass, and soft rush, with some creeping buttercup present. It also contains red alder saplings and some Douglas spirea in the southern portion.

Wetland V is approximately 375 feet in length and is located on the east side of Tower 4/1. It is situated on a 5 percent slope and drains slowly to the north and northeast. This PEM wetland is dominated by reed canarygrass, soft rush, and tall fescue, with some red alder saplings present.

Wetland W is approximately 375 feet in length and is located east of Tower 4/2. The wetland is situated on a south-facing slope, receiving water from the north. It drains to the south into a large, artificially created pond located outside of the ROW and within Fingalson Creek. This PEM wetland is dominated by bentgrass, reed canarygrass, soft rush, with some tall fescue, Douglas spirea, and red alder near the edges.

Wetland X is approximately 40 feet in length and is located on both sides of Tower 4/2. It contained standing water up to 2 inches deep and is situated on a southwest-facing slope. This possible PEM wetland is dominated by bentrgrass and reed canarygrass, with some soft rush present.

Wetland Y is approximately 600 feet in length and is located between Towers 4/2 and 4/3. Wetland Y is adjacent to a portion of Fingalson Creek and likely influenced both by the stream through groundwater seepage and surface water flooding. This PEM wetland is dominated by reed canarygrass and Himalayan blackberry, with some willow and Douglas spirea present. The eastern portion of the wetland is dominated by cattail and reed canarygrass.

An approximately 500-foot long section of Fingalson Creek occurs within the southern part of the ROW between Towers 4/2 and 4/3. The creek then meanders south of the ROW before crossing the ROW completely just east of Tower 4/4 and continuing off-site to the north. The stream channel is 6 to 10 feet wide with a substrate of sand and silt. The stream is confined within moderately broad gully with fairly steep side-slopes to 40 feet above the creek bed. Flow in this portion of the creek was less than 0.25 cfs during the investigation Fingalson Creek is drains into Terrell Creek less than 300 feet after crossing the ROW.

Within the ROW, the creek meanders for approximately 1000 feet through dense Himalayan blackberry thickets with some red alder saplings. A small patch of native shrubs is present in the eastern portion of the creek within the ROW. Willow, red-osier dogwood, and salmonberry are present along with small amounts of reed canarygrass and cattail. Outside of the ROW, the associated riparian area of Fingalson Creek is intact and dominated by mature red alder with vine maple in the understory.

Wetland Z is a possible wetland approximately 150 feet in length and is located on both sides of Tower 4/3. Topography in this area is variable with knolls and low spots. Standing water up to 2 inches was present over a 70 square foot area. Surface and ground water from this possible wetland drains southeast toward Fingalson Creek. Vegetation within this community is dominated by reed canarygrass, with some Himalayan blackberry, Douglas spirea, red-osier dogwood, and willow. Neighboring areas within the ROW appear to be a wetland mosaic on rolling topography.

Terrell Creek also flows north across the transmission line ROW east of Kickerville Road and a small residential area (between Towers 4/4 and 4/5). The riparian area associated with Terrell Creek outside of the ROW is the similar to Fingalson Creek. Within the ROW, the creek flows through a somewhat narrow, deep gully with banks that are densely covered with Himalayan blackberry. The gravel substrate of this portion of the creek is relatively clean and free of sedimentation, but the water level is low in comparison to portions outside of the ROW. The channel is moderately confined to 4 feet wide and flow at the time of investigation was over 10 cfs at the time of the investigation.

Wetland AA is approximately 40 feet in length and is located east of a gravel driveway and west of Terrell Creek. This depressional wetland receives water from surrounding uplands and precipitation and had inundation up to 2 inches in depth during the investigation. This small PEM wetland is dominated by bentgrass, with some soft rush and reed canarygrass.

Wetland BB is approximately 300 feet in length and is located east of Kickerville Road. This wetland is primarily located within a narrow swale that parallels a gravel driveway extending east of Kickerville Road. Wetland BB receives drainage from an artificially created small pond/wetland just north of the ROW and drains north to the ditch along the east side of Kickerville Road. Much of the wetland supported approximately 2 inches of slowly flowing water during the investigation. Vegetation in the portion of this PEM wetland within the ROW is dominated by soft rush and reed canarygrass and contains standing water throughout most of the swale.

Mile 5

Mile 5 of the transmission line extends from a tower west of Kickerville Road south to a tower north of Brown Road (see Figures 2-I and 2-J). Within the Mile 5 study area there are three towers (5/1 through 5/3), no streams, six wetlands, and no possible wetland areas.

Wetland CC is approximately 180 feet in length and is located west of Kickerville Road. This wetland is situated on a subtle bench within a gentle west-facing slope and contains a circular area of standing water 3 to 4 inches deep. Most of the wetland is dominate by bentgrass, but the standing water area is dominated by foxtail.

Wetland DD is approximately 600 feet in length and is located just south and east of Tower 5/1. The wetland is situated on a gentle west to northwest-facing slope with some standing water present up to 3 inches in depth. Vegetation in this PEM wetland is dominated by bentgrass, tall fescue, and velvetgrass.

Wetland EE is approximately 60 feet in length and is located north of Grandview Road. Some patches of standing water 2 inches deep were present near the center of the ROW. Wetland EE is situated on a slight west-facing slope and extends outside of the ROW. This PEM wetland is dominated by meadow fescue (*Festuca pratensis*) and foxtail.

Wetland FF is approximately 300 feet in length and is mostly in the east half of the ROW between Tower 5/2 and Grandview Road. Patches of standing water up to 3 inches deep are present in small, depressed areas. Wetland FF drains north to ditch along south edge of Grandview Road, but no outflow was observed during the investigation. This PEM wetland dominated by reed canarygrass and contains some tall fescue.

Wetland GG is approximately 60 feet in length and is located 150 feet north of Tower 5/3. A shallow ditched swale extending northeast is present in the wetland. The swale supported trickle flow (<0.01 cfs) during the investigation that traveled off-site to the east and leads north to narrow swale that leads west across the corridor. This PEM wetland is dominated by bentgrass, soft rush and tall fescue.

Wetland HH is approximately 850 feet in length and extends from the north edge of Brown Road to Tower 5/3. It is situated on a gentle west-facing slope (less than 2 percent grade) and connects to a large deciduous forest wetland to the west. This PEM wetland is dominated by bentgrass, tall fescue, and clover, with some soft rush present.

3.1.4 Threatened and Endangered Species

A list of threatened or endangered species of plants and animals and priority habitats have been identified by the USFWS (2002), National Marine Fisheries Service, NHP, and the Washington Department of Fish and Wildlife (WDFW) for the project vicinity.

A query on the NHP database indicated that there are no known rare, threatened or endangered species of plant or high quality ecosystems within the study area. Priority Habitats identified by the WDFW include wetlands scattered throughout the study area. According to the USFWS, two federally listed species may occur within the project vicinity: bull trout and bald eagle.

Bull trout do not utilize the area and would not be affected activities under consideration for this project. However, at least one bald eagle nest occurs within 0.25 mile of the study area.

A bald eagle and possible nest were observed during field investigation, near Towers 4/2 and 4/1. The eagle was perched near the top of a mature cottonwood approximately 130 feet tall. A large nest is present in the main crook of the cottonwood, approximately 80 feet above ground. The possible nest tree is within upland forest, approximately 300 feet north of the edge of the ROW, and within 0.25 mile of Towers 3/5, 4/1, 4/2, and 4/3. The eagle was first seen perched in the nest tree around 12:00 pm during one day of the field investigation, then flew southeast. At 2:15 pm, it was again observed perching in the same tree, above the nest.

The behavior and timing of the bald eagle observation suggest the possibility that nesting activities may be occurring at the observed nest. Bald eagles in Washington typically begin courtship behavior in January and February and begin egg incubation in March or April (Stinson et al. 2001; Rodrick and Milner, 1991). Another field visit in late March or April could better determine if the nest is active.

Neither the nest nor any other area near the project area is known to be traditional wintering grounds for bald eagles (Stinson et al., 2001). Bald eagles typically arrive at wintering areas in late October and leave by February (Rodrick and Milner, 1991). Because wintering grounds are typically near areas where food during this time is abundant and disturbance is minimal, it is not likely that a wintering area exists within or near the project area.

3.1.5 Other Wildlife

The study area surroundings provide habitat for a limited number of species. Most wildlife observed during field investigation was found outside of ROW within intact riparian areas, forests, and fields. The expansive fields dominated by overgrown pasture grasses provides habitat for mice and voles, which attract red-tail hawks, great blue herons, and coyotes. Some native grassland birds, such as song sparrow, fox sparrow, and common snipe, and one game bird species (ring-necked pheasant) regularly stocked here by WDFW, also inhabit the fields. The forested areas in the vicinity provide cover for several species that primarily utilize the fields for foraging. These species include coyote, mule deer, red-tail hawk, American robin, and others. Most migratory and resident bird species that likely breed within or near the ROW, such as northern flicker, house finch, common yellowthroat, chickadee, song sparrow, kinglet, and spotted towhee, utilize the shrubby and forested areas for cover and foraging.

A red-tailed hawk nest was observed between Towers 2/1 and 1/6, west of Elk Road. The nest is in a mature red alder tree, located approximately 600 feet south of the ROW. The property owner of adjacent properties noted that the nest has been used by red-tailed hawks for the previous twelve years. No red-tailed hawks were observed near the nest during field investigations.

3.2 CULTURAL RESOURCES

3.2.1 Background

Pre-history

Archaeologists began investigating the prehistory of the Northwest Coast in the 1870s, resulting in the compilation of substantial amounts of data (Carlson 1990:107). Two sequences of prehistoric development are recognized within the Puget Sound region, the littoral and riverine sequences (Nelson 1990). These sequences are closely tied to the environments for which they have been developed and represent aboriginal adaptations to these specific conditions. Specifically, the littoral sequence refers to cultural adaptations to coastal or seashore environments, while the riverine sequence applies to inland, river-based settings.

Most of the sites that have been excavated within littoral areas have consisted of midden deposits marked by molluscan shell and fragments of mammalian and avian bone. These sites generally contain low quantities of tools, and tools that do exist are often stylistically quite variable. Because of the paucity of artifacts suitable for development of temporally sensitive typologies, archaeologists have often relied upon changes in the midden constituents to interpret prehistory in the littoral zones of Puget Sound (Nelson 1990).

Early investigations leading to development of the littoral sequence primarily took place at the Skagit River delta and adjacent islands (Bryan 1957, 1963; Kidd 1964, 1966; Mattson 1971 and Thompson 1978). The earliest identified assemblages are believed to date to the period between 2000 - 500 B.C. These remains suggest an adaptation focused upon the exploitation of the littoral zone, with the hunting of coastal land animals and the gathering of intertidal resources being of prime importance. This pattern of resource exploitation appears to have remained relatively constant for the next 2,000 years. Although little change is observed within the adaptive strategies of the aboriginal inhabitants of Puget Sound's littoral zone, stylistic change has been identified within local technologies. Intermediate, Late, and Protohistoric, as well as the previously mentioned Early, components have been identified. Scallop, dentalium, and olivella shells, jade adzes, and graphite are common components of Late period assemblages, while exotic aboriginal trade goods and items of European manufacture mark the Protohistoric period (Nelson 1990).

The riverine sequence, appropriate for more inland settings, is based primarily on assemblages from sites located in the Snohomish, Sammamish, and Snoqualmie river valleys. Unfortunately it is still poorly understood and is based almost entirely on changes in artifact forms. Few data are available pertinent to subsistence activities, and it cannot be correlated in detail with the littoral sequence (Nelson 1990:483).

The earliest assemblages, known as the Olcott complex, are marked by cobble tools and leaf-shaped projectile points and are similar to materials from the Fraser River valley dating from 8000 to 4000 B.C. In the Puget Sound basin, evidence suggests that the Olcott complex may have persisted until 2000 B.C. (Nelson 1990:482-483).

Following the Olcott complex is a regional variant of the Plateau-wide Cascade phase marked by Cascade and Cold Springs Side-notched series projectile points, types that spread throughout the Columbia Plateau between 4500 and 2000 B.C. West of the Cascades, it appears likely that these forms arrived no earlier than 1800 B.C. These point types were eventually replaced by a number of projectile point types similar to the Frenchman Springs phase of the Plateau, suggesting the presence of a poorly documented phase of Northwest Coast prehistory dating between about 1000 and 200 B.C. (Nelson 1990:482).

The subsequent phase, characterized by a single site on the Snoqualmie River, is marked by a variety of point styles similar to those from the Quilomene Bar phase of the western Columbia Plateau, dating to the first millennium B.C. The site assemblage includes a rich lithic industry dominated by large side-notched points, end and side scrapers, cobble tools, microblades, twined basketry, fishhooks, and net weights (Nelson 1990:483).

The final and most recent phase in the riverine sequence, best illustrated by a site near Snoqualmie Falls, appears to represent a continuity in local traditions. Small flaked stone tools present in the site collection are identical to those of the Cayuse phase of the western Columbia Plateau (Nelson 1990:483).

Ethnography

The current project area is located within the region of North America referred to by ethnographers as the Northwest Coast culture area. This area is comprised of the coastal strand located between the redwood forests of northern California and Prince William Sound, Alaska. The aboriginal peoples who inhabited this environmentally rich area shared many cultural traits, including an adaptation focused upon the utilization of marine resources, well-developed class systems, complex concepts of wealth, and the extensive use of wood for items of material culture (Spencer et al. 1977: 114-162).

The ethnographic inhabitants of the project area were the Lummi, speakers of the Straits Salish division of the Central Coast Salish language family. The Lummi oriented their subsistence activities toward the Gulf of Georgia and the San Juan Islands. Like most other groups in the area, Lummi subsistence practices centered on the taking of marine resources, although terrestrial resources were also heavily utilized. The most important resource was salmon, all five species of which (sockeye, chinook, coho, pink, and chum) seasonally occurred within their territory. Salmon were primarily captured using reef nets, although trapping, harpooning, and gaffing were also employed. Halibut, sturgeon, bottomfish, and numerous shellfish species were also harvested. Terrestrial resources were also relied upon, including such plant resources as fern roots, wild carrot, camas, wild onion, nuts, and berries. Seals, otters, sea mammals, waterfowl, and terrestrial game animals were also hunted (Reid 1999: 17; Suttles 1990: 453-459).

Yearly subsistence cycles were primarily focused on winter villages, used intensively from November through February. Lummi villages were located near coastal fishing sites, river mouths, and prairies, reflecting the relationship between settlements and resource procurement locations. Ethnographic records report three village locations and a number of seasonal sites along Birch Bay. The three village locations include the present community of Birch Bay (45WH11), a site near the present mouth of Terrell Creek (45WH67), and a site to the south near the old mouth of the creek (45WH09). Spring, summer and fall were spent traveling to a variety of environments to harvest a wide range of resources (Reid 1999: 17; Suttles 1990: 453-459).

Villages were always on water and usually placed where canoes could be easily beached. Villages could consist of a single house, a row of houses, or several rows of houses. In the early nineteenth century, the most common form of dwelling was a shed-roofed structure with a permanent post-and-beam framework and a removable cover of roof and wall planks. Houses were usually built parallel to the shoreline, sloping to the rear, and measured from 20 to 60 feet in width and twice or more in length. Other structures included summer mat houses, cedar bark huts, wooden grave houses, and sweat lodges of mats and poles (Suttles 1990:462).

The Central Coast Salish, like all the inhabitants of the Northwest Coast culture area, made extensive use of the dense forests found throughout the region. Trees were felled and often split with wedges to produce lumber for their houses or hollowed out for canoes. Smaller items produced from wood include boxes, bowls, and spoons, while cedar bark and other plant materials were used for clothing and other items of material culture. Stone, shell, deerskin, and other materials were also put to many uses.

History

The first non-native group known to enter the Puget Sound area was a British expedition under the command of George Vancouver in 1792. Peter Puget, from whom the area derives its name, was one member of this expedition. Members of Vancouver's expedition named Birch Bay after the black birch and poplars in the area. They apparently went ashore on the southern side of the bay near an "overgrown" village and set up an observatory on the southern portion of the Terrell Creek spit, land now occupied by Birch Bay State Park. The party remained camped in the area from June 11-15, 1792 (Reid 1999: 18). Indirect contact, however, appears to have reached local inhabitants prior to Vancouver's visit. Many of the aboriginal inhabitants of the greater Puget Sound area had already obtained European goods through long distance trade, and furthermore, the Southern Coast Salish showed evidence of having experienced a smallpox epidemic. Following Vancouver's expedition, little direct contact occurred for the next three decades. This is primarily due to the fact that otters were relatively scarce in the general vicinity and maritime fur traders had no other reason for entering the area (Cole and Darling 1990; Suttles and Lane 1990).

In 1818, an agreement was signed between the United States and Great Britain giving both parties rights to the Oregon Country, of which Puget Sound was a part. This agreement for the joint occupation of the region was renewed in 1827 (Marino 1990). Shortly following the initial agreement, a permanent Euroamerican presence in the area was established.

In 1824, a Hudson's Bay Company party reportedly stopped at Birch Bay (Reid 1999:18). Three years later, in 1827, Fort Langley was established on the Fraser River and in 1833 the Company founded Fort Nisqually on the Nisqually River. Some Puget Sound peoples may have been trading at Hudson's Bay Company outposts on the Columbia River earlier, but in 1827 there were certainly Snohomish, Skagit, and others trading on the Fraser. The establishment of Fort Nisqually, however, began continuous contact within the region. Not long after the traders established their presence within the Puget Sound area, various Christian missionaries arrived. In 1839, 1840, and 1841, Catholic missionaries Fathers Norbert Blanchet and Modeste Demers traveled through the region spreading their religious doctrines to native groups throughout the area (Hajda 1990; Suttles and Lane 1990).

In 1846, the United States and Great Britain signed a treaty that split the Oregon Country. The Treaty of Washington drew the international boundary line at 49 degrees north latitude with a zigzag through the Strait of Juan de Fuca. Britain took sole possession of the lands located north of the demarcation, while the United States took the lands to the south. The Puget Sound area was henceforth a United States possession, becoming part of Oregon Territory in 1848 and of Washington Territory in 1853 (Marino 1990; Suttles and Lane 1990).

Although Euroamericans had settled within Puget Sound as early as 1845, it was following the establishment of the territories that the area witnessed a great influx of settlers. Congress enacted the Donation Land Act of 1850 that provided opportunities for settlers to acquire homesteads, and the exploitation of the region's natural resources soon became a major force behind the influx of settlers into the region. Settlement was aided by the eventual construction of wagon roads into the Puget Basin area in the 1850s; previously, emigrants were forced to travel the more common trails to California or Oregon, and then proceed north, often by ship. In 1858, the Whatcom Trail was completed, which ran from the town of Bellingham through Sumas, on the Canadian border, to the gold fields of the Fraser River. This road helped to further open up the area to settlement (Avery 1965:175-176; Winther 1950:130-132).

As the century progressed, the industries developed for which this region is famous, including timber and commercial fishing. Development of these industries was aided by the arrival of the railroad. In 1883, the Columbia River branch of the Northern Pacific Railroad was completed to Tacoma; four years later, the main line of the Northern Pacific across the Cascades to Tacoma was finished. By the early 1890s, the area was linked to Seattle by the Seattle, Lakeshore, and Eastern Railroad, later absorbed by the Northern Pacific Railroad. Eventually, the Milwaukee Road and the Burlington Northern Railroads would also serve the area. The railroads also ensured that the population of the area would continue to grow to a point where a state government could be supported, and in 1889, the state of Washington was admitted to the union (Avery 1965:201-202).

By the turn of the century, the Puget Sound basin was well upon its way to being the urban center of the northwestern United States (Marino 1990; Suttles and Lane 1990). Basic industries such as lumbering, fishing, and farming continued to prosper, but the presence of excellent harbors in the Sound encouraged the growth of major manufacturing centers. During the course of this growth, the Sound was also identified as a strategic location for the U.S. Navy, resulting in the development of a number of naval facilities. Smaller rural communities throughout the region in part supported the industrial and military centers. With the continued urbanization of the Puget Sound region, however, these towns have become part of a largely continuous suburban environment.

3.2.2 Results of Field Investigation

No cultural materials were identified during the course of inventory or subsurface probing activities. Although ground surface visibility was poor in many areas of the corridor, examination of areas of improved visibility, combined with subsurface probing, indicate that the likely presence of resources along the corridor is low. While archaeological resources have been identified in the general project vicinity, a majority of these consist of shell middens along the shoreline of Birch Bay and other nearby coastal areas. Other nearby sites include small, sparse scatters of lithe materials and fire-affected rock. No materials of this nature were identified along the corridor.

No historic or archaeological resources were identified within the project corridor. Although visibility was limited in many areas, given the nature of the environment along much of this route, and the distance from the coastline where cultural resources in this area are concentrated, the presence of unidentified archaeological deposits seems low. This is supported by the results of subsurface probing, which did not produce any evidence of buried resources. In the unlikely event that buried cultural materials are encountered during construction related activities, however, all ground-disturbing activities in the vicinity should cease until a qualified archaeologist can evaluate the find and determine an appropriate course of action.

4.0 IMPACTS AND MITIGATION

If towers need to be relocated within the transmission line segment surveyed, then some impacts to environmental resources may occur. Cultural resources will not likely be impacted by relocating towers or any other activity that may occur within the project area.

The only species considered federally threatened or endangered that may be affected by relocating towers or replacing transmission lines is the bald eagle. A bald eagle nest is present within 300 feet of the ROW, but it has not yet been determined whether the nest is active. In general, construction activity that could disturb nesting activity should not occur within 0.25 to 0.5 miles from an active nest during the nesting season, which is generally considered by USFWS to extend from January 1 to August 15.

Relocating towers within the transmission line ROW may cause impacts to wetlands and streams. However, these impacts could be avoided, minimized, restored (if temporary), or compensated.

Eliminating or filling wetlands typically requires a Section 404 permit from the Corps. Such activities may also require a 401 Water Quality Certification from Ecology and/or a Fill and Grade permit from Whatcom County. Activities directly affecting streams or other channels supporting flowing water (i.e. ditches) may require a Hydraulic Project Approval (HPA) from WDFW.

Impacts to wetlands and wetland buffers associated with the project activity under consideration would be mitigated by applying the standard mitigation sequence as described in the Memorandum of Agreement between EPA and the Department of the Army on Clean Water Act Section 404(b)1 Guidelines. The mitigation sequence would be implemented as follows:

1. **Avoiding impacts.** Impacts to wetlands would be avoided by designing a project that covers relatively few sensitive areas including wetlands, streams, and buffers. Because the transmission line corridor contains several wetland areas, completely avoiding wetland impacts is not feasible. However, impacts to higher quality wetlands within the transmission corridor would be avoided as much as practicable.

2. **Minimizing impacts.** Unavoidable impacts to wetlands and wetland buffers would be minimized by narrowing construction zones within wetlands and wetland buffers as much as is practicable. In addition, Best Management Practices would be used during construction to minimize erosion and prevent the discharge of fill material in wetlands and streams.

3. **Rectifying (Restoring) impacts.** Any unintentional, unauthorized impacts to sensitive areas that may occur during construction would be repaired and rehabilitated as appropriate. Temporarily disturbed areas can be reverted to pre-construction conditions if impacts are not very extensive. Vegetation will be

restored to its former condition or replaced with appropriate native vegetation if the vegetation removed is non-native.

4. **Compensating impacts.** Unavoidable impacts to wetlands would be compensated by enhancing on-site wetland areas that would not be directly impacted by the proposed construction. The Corps normally recommends compensating for permanent wetland impacts at a minimum ratio of 3:1 when using wetland enhancement as the means for compensation. According to Ecology's guidelines (Ecology 1998), impacts to Category III PEM wetlands should be compensated at a 4:1 ratio when using enhancement. An appropriate level of enhancement will occur within each sub-basin where impacts occur. Impacts that occur within the California Creek sub-basin will likely be compensated by enhancing Wetland A, which is the large wetland adjacent to the Custer Substation. Impacts that occur within the Terrell Creek sub-basin may be compensated in degraded wetland area(s) that have a high potential for successful, sustainable enhancement.

5.0 REFERENCES

Avery, Mary W. 1965. Washington: A History of the Evergreen State. University of Washington Press, Seattle.

Bryan, Alan L.

———. 1957. An Intensive Archaeological Reconnaissance in the Northern Puget Sound Region. Unpublished M.A. Thesis, Department of Anthropology, University of Washington, Seattle.

———. 1963. An Archaeological Survey of the Northern Puget Sound. Occasional Papers of the Idaho State University Museum 11. Pocatello.

Cole and Darling. 1990. History of the Early Period. In Northwest Coast, edited by W. Suttles, pp. 119-134. Handbook of North American Indians, vol. 7. W.C. Sturtevant, general editor. Smithsonian Institution, Washington, D.C.

Corps (U.S. Army Corps of Engineers), Environmental Laboratory. 1987. Corps of Engineers *Wetlands Delineation Manual*. Technical Report Y-87-1. U.S. Waterways Experiment Station, Vicksburg, Mississippi.

Cowardin, L.M., V. Carter, F.C. Golet, and E.T. LaRoe. 1979. Classification of Wetlands and Deepwater Habitats of the United States. Publication FWS/OBS-79/31. U.S. Fish and Wildlife Service, Office of Biological Services, Washington, DC.

DNR (Department of Natural Resources). 2002. Washington Natural Heritage Program Geographic Information System Data Set. Washington State Department of Natural Resources. January 2002

Ecology (Washington State Department of Ecology). 1999. Methods for Assessing Wetland Functions. Publication 99-116. Olympia, Washington.

———. 1998. How Ecology Regulates Wetlands. Washington State Department of Ecology Shorelands & Environmental Assistance Program. Publication No. 97-112. Olympia, Washington.

———. 1997. Washington State Wetlands Identification and Delineation Manual. Publication 96-94, Olympia, Washington.

———. 1993. Washington State Wetlands Rating System—Western Washington, 2nd edition. Publication 93-74. Olympia, Washington.

Franklin, Jerry F. and C.T. Dyrness. 1988. Natural Vegetation of Oregon and Washington. USDA Forest Service General Technical Report PNW-8.

Gallacci, Caroline. 1981. Pierce County Cultural Resource Survey. Office of Community Development, Tacoma. Records on file, Office of Archaeology and Historic Preservation, Olympia.

Golder Associates Inc. 2003. BP Cherry Point Cogeneration Project, Application for Site Certification (Revised), Part III Technical Appendices, Appendix H. Prepared for Washington State Energy Facility Site Evaluation Council on behalf of BP West Coast Products, LLC.

Goldin, Alan. 1992. *Soil Survey of Whatcom County* area, Washington. U.S. Department of Agriculture, Soil Conservation Service, Washington, D.C.

GretagMacbeth. 2000. Munsell soil color charts. GretagMacbeth, New Windsor, New York.

Hajda, Yvonne. 1990. Southwestern Coast Salish. In Northwest Coast, edited by W. Suttles, pp. 503-517. Handbook of North American Indians, vol. 7. W.C. Sturtevant, general editor. Smithsonian Institution, Washington, D.C.

Hess, Sean C., John Zachman, and Gail Thompson. 2000. Cultural Resource Survey for Williams/BC Hydro Georgia Strait Crossing Project, Whatcom County, Washington. Prepared for Williams Pipeline Company, Salt Lake City. Prepared by Historical Research Associates, Seattle.

Juell, Kenneth E., Michele E. Parvey, Janet A. Liddle, Margaret A. Nelson, and Leslie K. Norman

Cultural Resources Inventory of the Proposed Washington Light Lanes Project, Route 2 Backbone: Downtown Seattle to the Canadian Border. Submitted to Universal Communications Networks, Inc, and David Evans & Associates, Inc., by Northwest Archaeological Associates, Inc., Seattle.

Kelly, Michael S. 2001. ARCO Sewer Line Project: Cultural Resources Investigation. Prepared for BP/ARCO Cherry Point Refinery, Blaine, Washington, by URS, Portland.

Kidd, Robert S. 1964. A Synthesis of Western Washington Prehistory from the Perspective of Three Occupational Sites. Unpublished M.A. Thesis, Department of Anthropology, University of Washington, Seattle.

———. 1966. The Archaeology of the Puget Sound Area, Washington. Ms. on file, Department of Anthropology, University of Alberta, Edmonton.

Maas, Alex. 2001a. Addendum to: Supplemental Cultural Resource Survey and Archaeological Testing for Williams/BC Hydro Georgia Strait Crossing Project, Whatcom County, Washington. Submitted to Williams Gas Pipeline Company by Historical Research Associates, Seattle.

———. 2001b. Second Addendum to: Supplemental Cultural Resource Survey and Archaeological Testing for Williams/BC Hydro Georgia Strait Crossing Project, Whatcom County, Washington. Submitted to Williams Gas Pipeline Company by Historical Research Associates, Seattle.

Marino, Cesare. 1990. History of Western Washington Since 1846. In Northwest Coast, edited by W. Suttles, pp. 169-179. Handbook of North American Indians, vol. 7. W.C. Sturtevant, general editor. Smithsonian Institution, Washington, D.C.

Mattson, John L. 1971. A Contribution to Skagit Prehistory. Unpublished M.A. Thesis, Department of Anthropology, University of Washington, Seattle.

NRCS (Natural Resources Conservation Service). 1999. WETS database. United States Department of Agriculture.
Available at <http://www.wcc.nrcs.usda.gov/wccbin/getwetst.cgi?state=Washington>.

———. 1996. Hydric Soils of the United States. U.S. Department of Agriculture in cooperation with the National Technical Committee for Hydric Soils. Available at <http://soils.usda.gov/soil_use/hydric/main.htm>.

Nelson, Charles M. 1990. Prehistory of the Puget Sound Region. In Northwest Coast, edited by W. Suttles, pp. 481-484. Handbook of North American Indians, vol. 7. W.C. Sturtevant, general editor. Smithsonian Institution, Washington, D.C.

Reid, Alfred R. 1996. Cultural Resource Investigation on the Hanson Property at 45WH09, Birch Bay, Washington. MS on file, Lummi Nation and Whatcom County Department of Planning and Building Services, Bellingham.

———. 1997a. Cultural Resources Investigation, Phase 2, on the Hanson Property at 45WH09, Birch Bay, Washington. MS on file, Lummi Nation and Whatcom County Department of Planning and Building Services, Bellingham.

———. 1997b. Cultural Resource Investigation on the Semiahmoo South Residential Property at Birch Point, Washington. MS on file, Lummi Nation and Whatcom County Department of Planning and Building Services, Bellingham.

———. 1997c. Letter Report of Archaeological Assessment at 5979 Birch Point Road, Birch Bay, Washington. MS on file, Lummi Nation and Whatcom County Department of Planning and Building Services, Bellingham.

Cultural Resource Management for the Structural Pre-Level and Shoulder Widening of Birch Bay Drive: Birch Point Road from Point Whitehorn Road to Birch Point Loop Road. MS on file, Lummi Nation and Whatcom County Department of Planning and Building Services, Bellingham.

———. 2001. Cultural Resource Assessment of the Lake Terrell and Mountain View Roads, Whatcom County, Washington. MS on file, Office of Archaeology and Historic Preservation, Olympia.

Spencer, R.F., J.D. Jennings, E. Johnson, A.R. King, T. Stern, K.M. Stewart, and W.J. Wallace. ———. 1977. The Native Americans: Ethnology and Backgrounds of the North American Indians, second edition. Harper & Row, New York.

Stinson, Derek W., James W. Wastoson, and Kelly R. McAllister. 2001. Washington State status report for the bald eagle. Washington Department of Fish and Wildlife (WDFW). Olympia, Washington.

Suttles, Wayne. 1990. Central Coast Salish. In Northwest Coast, edited by W. Suttles, pp. 485-502. Handbook of North American Indians, vol. 7. W.C. Sturtevant, general editor. Smithsonian Institution, Washington, D.C.

Suttles, Wayne and Barbara Lane. 1990. Southern Coast Salish. In Northwest Coast, edited by W. Suttles, pp. 485-502. Handbook of North American Indians, vol. 7. W.C. Sturtevant, general editor. Smithsonian Institution, Washington, D.C.

Thompson, Gail. 2000. Prehistoric Settlement Changes in the Southern Northwest Coast: A Functional Approach. University of Washington Reports in Archaeology 5. Seattle.

Thompson, Gail, John Zachman, and Alex Maas. 2000. Supplemental Cultural Resource Survey and Archaeological Testing for Williams/BC Hydro Georgia Strait Crossing Project, Whatcom County, Washington. Submitted to Williams Gas Pipeline Company by Historical Research Associates, Seattle.

U.S. Fish and Wildlife Service (USFWS). 2002. Threatened and Endangered Species List for BP Cherry Point dated December 26, 2002. Lacey, Washington.

———. 1996. National List of Plant Species That Occur in Wetlands: 1996 Northwest (Region 9) Summary. Washington, DC.

———. 1987. National Wetlands Inventory: Blaine Quadrangle, Washington.

U.S. Geologic Survey (USGS). 1991. Topographic Maps for Blaine, Washington, and Birch Point, Washington.

Washington Department of Fish and Wildlife (WDFW). 2003. Priority habitats and species request package (maps) dated January 2, 2003. Olympia, Washington.

Rodrick, Elizabeth and Ruth Milner. 1991. Management recommendations for Washington's priority habitats and species. Washington Department of Fish and Wildlife (WDFW). Olympia, Washington.

Whiteman, Erik A., Sts'aStelQuyd, and Al Scott Johnnie. 2002. Cultural Resources Investigation of the Proposed Xwechi 'exen, Cherry Point, BP Cogeneration Facility Project, Whatcom County, Washington. BOAS Research Report 200107.2. Submitted to the Lummi Indian Nation.

Wilt, Julia J. 2002. Results of a Cultural Resources Survey for the BPA's Bellingham to Intalco to Custer Fiber Optic Project, Whatcom County, Washington. Prepared for Bonneville Power Administration.

Winther, Oscar O. 1950. The Old Oregon Country: A History of Frontier Trade, Transportation, and Travel. University of Nebraska Press, Lincoln.

FINAL

VISUAL RESOURCES

BPA Transmission Line
Brown Road to Custer Substation

Prepared for

BP Cherry Point Refinery

July 15, 2003

URS

1501 4th Avenue, Suite 1400
Seattle, Washington 98101-1616
(206) 438-2700

33749546.05070

TABLE OF CONTENTS

TABLES

APPENDIX

1.0 INTRODUCTION

BP West Coast Products (BP) is proposing to connect a cogeneration power plant proposed for construction at the BP Cherry Point Refinery (Whatcom County) to an existing Bonneville Power Administration (BPA) transmission line. With the refinery and the cogeneration facility connected to the BPA system and under certain conditions, line overloads could occur, resulting in unacceptable sagging of the transmission line conductors under some combinations of conditions.

First, the following conditions would have to occur: 1) outside temperatures must be higher than 85 degrees Fahrenheit, and 2) one of the two transmission lines from the Custer substation to the Intalco plant must be out of service. Then, if either of the following combinations occurs, the remaining line could be overloaded:

a) the cogeneration plant is shut down (producing no power), the refinery is operating with a normal power demand of 100 megawatts (MW), and Intalco is operating with a normal power demand of 490 MW. This would place a 590 MW demand on the remaining line.

b) the Intalco plant is shut down (no power demand), the cogeneration plant is operating at the full capacity of 720 MW, and the refinery is operating at 100MW. This would place a total load on the remaining line of 620 MW.

The preferred approach for addressing the potential overload situation is a remedial action scheme (RAS) to adjust the demand to be below the capacity of the line. In the case where the power plant is shut down, Intalco would implement a RAS to reduce their demand by 40 MW. In the case where Intalco is shut down, the cogeneration plant would implement a RAS to reduce the power output by 70 MW. The other option for addressing the overload problem is by replacing existing transmission towers and transmission lines with a double-circuit line. The existing single-circuit line is on steel lattice towers. The double-circuit line would be on steel lattice towers or monopole tubular towers. The double-circuit line may require the towers to be closer together than the existing towers. The rebuild option is the reason for the visual study.

The project area is located in Sections 1, 2, 3, 4, 5 and 8, Township 39 N, Range 1E, W.M., about 7 miles southeast of Blaine, Washington. The study area includes a 125-foot transmission line right-of-way (ROW) corridor approximately 5 miles long along a section of BPA's Custer-Intalco No. 2 transmission line from Brown Road to the Custer substation (see Figure A-1, Appendix A).

This report briefly analyzes effects of the rebuild option on the visual resources or visual quality along the transmission line corridor. Visual quality refers to visual patterns created by a combination of natural landscape characteristics and industrial and man-made features. For this project, visual quality was estimated for rural, urban/industrial, and natural components. The methodology consisted of a brief inventory of existing visual quality (site visit), identification of any sensitive views, an estimate of the proposed project on visual quality, and brief descriptions of any visual changes that may result from the project as well as assessments of visual effects from sensitive viewpoints. Viewer sensitivity is based on the importance of features, conditions that affect visual perception, and social factors that contribute to viewer perception. It depends on viewer types and direction and viewer awareness/sensitivity to visual changes. The levels of sensitivity generally are classified as low, moderate, and high. This depends on whether the viewer is focused on work activity near the project area and not surrounding views, whether the views are by travelers from highways and local roads, and whether these views are from residential and other local viewers. Supplemental photographs and simulations are included in Appendix A. The simulations were based on photographs of the existing transmission line.

2.0 EXISTING CONDITIONS

2.1 EXISTING TRANSMISSION LINE

The existing transmission line extends southwesterly and southerly from the Custer substation, then westerly along higher ground north of Grandview Road to a point west of Kickerville Road before turning south to a BP interconnection point between Grandview Road and Brown Road. For much of the route the transmission line crosses farmland (cattle grazing and hay production) near a few rural residences, but it is also situated within mixed deciduous and evergreen forested areas, primarily on the eastern and western ends of the project. The existing steel lattice towers carry a single-circuit (three conductors), stand about 85 feet high and are spaced approximately 1,150 feet apart along the route.

2.2 EXISTING VIEWS

In reference to the three viewer sensitivity levels described in the introduction, three viewpoint areas were selected to represent the levels. They were based on a site visit that included viewing properties along the transmission line corridor and roadways near the corridor. One viewpoint area is along Grandview Road (not a scenic byway, but a major road in the project vicinity), another viewpoint area is from the Bannerman property (representative of the rural residences along the route), and the third viewpoint area is a point west of the Custer substation where the focus is not on surrounding views.

Along Grandview Road (west to east), the towers and transmission lines are generally not visible (except where the corridor crosses Grandview Road) from about Kickerville Road to about Yukon Way. They are intermittently visible from Yukon Way to North Star Road, but visible from North Star Road to about Elk Road. They are generally not visible from Elk Road east and northeasterly to the Custer substation. Along approximately 40% of the road segment, the transmission towers and line are not visible, and along approximately 60% of the segment they are intermittently visible or visible. Viewer sensitivity from the road is low to moderate, depending on visibility. From the Bannerman property on the higher ground north of Grandview Road along the route, the towers and transmission lines interrupt vistas (viewsheds) looking east (toward Mt. Baker) and north (pastoral panorama). Other rural residences along the route also experience interruption of views looking east or north. Viewer sensitivity is high. Near the Custer substation (from Blaine/Ferndale Road), the existing substation along with the existing towers and transmission lines are prominent in the landscape although not significantly interrupting any viewsheds. The surrounding vegetation and topographic relief also tends to confine the viewshed. Viewer sensitivity is low.

3.0 ALTERNATIVES

Two alternatives are being considered for the new transmission facilities associated with the proposed cogeneration power plant. One alternative is essentially a No-Action Alternative whereby a remedial action scheme would be implemented to reduce the load demand on existing transmission towers and lines, which would remain with no additional facilities. The other (Rebuild Alternative) will involve replacement of the existing steel lattice towers with an increased number of tubular towers or poles (spaced at about 900-foot intervals) and additional transmission lines (double-circuit, six wires instead of three).

4.0 VISUAL EFFECTS

Under the No Action Alternative no new visual effects on nearby residences along the route would occur. Under the Rebuild Alternative (with new proposed facilities), there could be additional view effects on the surrounding viewshed in the rural residential areas along the transmission line corridor. The proposed tubular poles would be approximately 120 feet high (taller than the existing steel lattice towers), and as stated, would be spaced at approximately 900-foot intervals (closer spacing than the existing towers, totaling about 5 additional towers). Use of tubular poles (instead of steel lattice towers) may reduce the visual effects somewhat for individual towers (by a narrower profile), but the increased number and height of proposed poles would mean that more towers would be visible interrupting the views (east toward Mt. Baker and north toward the pastoral panorama) when compared with existing conditions. The visual simulations (see Figures A-4 and A-5, Appendix A) show tubular poles near the Custer substation and from viewpoints on the Bannerman property looking west and east. A summary of visual effects of the Rebuild Alternative from representative viewpoints is included in Table 1. In general, the visual effects would be about the same as existing conditions, except for a slight increase in effects in the area where rural residences are located along the route.

Table 1
Summary of Visual Effects from Representative Viewpoints
(Rebuild Alternative)

Location Description	Visual Quality	Visual Sensitivity	Visual Effect
Grandview Road/Kickerville Road	Rural and Urban/Industrial	Low to Moderate	Low
Bannerman Property (west)	Rural	High	High*
Bannerman Property (east)	Rural	High	High*
Custer Substation (Blaine/Ferndale Road)	Rural and Urban/Industrial	Low	Low

*Potential for slight increase above existing conditions (also a high visual effect)

APPENDIX A

VICINITY MAP, PHOTOGRAPHS AND SIMULATIONS

APPENDIX H

TECHNICAL REPORT

WETLAND DELINEATION REPORT
BP CHERRY POINT COGENERATION PROJECT

[REVISED]

Submitted to:

BP West Coast Products, LLC
4519 Grandview Road
Blaine, Washington 98230

Submitted by:

Golder Associates Inc.
4445 SW Barbur Blvd, Suite 101
Portland, Oregon 97239

Schott and Associates
11977 S. Toliver Road
Molalla, Oregon 97038

February 21, 2003 013-1421.541

021803jt1.doc

EXECUTIVE SUMMARY

Golder Associates performed wetland delineations for the BP Cherry Point Cogeneration Project in Whatcom County, Washington on May 3 and 4, June 11, and August 6, 2001. Additional delineations were performed on January 22 and 23, 2002 to revisit construction staging areas. On October 7, 2002, based on comments received from regulatory agencies, field checking of sample plots were conducted which resulted in some changes to the original wetland delineation. The changes are incorporated in to this document. The results of the field investigations indicate that there are extensive wetlands associated with the low-rolling glacial ground-moraine plains that lie within the construction staging areas and a mosaic of wetlands and grassland pasture that lie within the plant site footprint.

The Cogeneration Project is a 720 megawatts (MW) natural gas-fired combined cycle cogeneration facility. It will provide 85 MW of electrical power and steam to the BP Cherry Point Refinery (Refinery). The remaining electric power generated by the facility will be made available to northwest customers. Because the Cogeneration Project will be an integral part of the Refinery, it must be located in close proximity to the refinery facilities. The project will impact approximately 69 acres, 35.37 acres of which are classified as wetlands, including construction access routes, a natural gas compression station, stormwater ponds and lay down areas. Approximately 52 acres of wetland were delineated in the vicinity of the project area and approximately 200 additional acres were subject to reconnaissance level surveys.

The proposed project site lies within BP property south of Grandview Road, north of Brown Road, and east of Blaine Road.

Prior to conducting the wetland delineation, the following information was reviewed.

- Previous wetland delineations for the area (1991);
- Whatcom County Soil Survey;
- National Wetland Inventory Maps, and
- Whatcom County Critical Areas Ordinance.

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

LIST OF APPENDICES

LIST OF ACRONYMS AND ABBREVIATIONS

Ecology	Washington State Department of Ecology
Golder	Golder Associates Inc.
HRSG	Heat Recovery Steam Generator
NHP	National Heritage Program
PEM	Palustrine Emergent
PEMA	Palustrine Emergent Temporarily Flooded
PEMC	Palustrine Emergent Seasonally Flooded
PFOA	Palustrine Forested Temporarily Flooded
PFOHx	Palustrine Forested Permanently Flooded Excavated
POWH	Palustrine Open Water Permanently Flooded
NRCS	Natural Resources Conservation Service
Nwi	National Wetlands Inventory
USCOE	U.S. Army Corps of Engineers
USDA	U.S. Department of Agriculture
USFWS	U.S. Fish and Wildlife Service
USGS	United States Geological Survey
WDFW	Washington Department of Fish and Wildlife

1. INTRODUCTION

This report details the findings of wetland delineations performed by Golder Associates Inc. (Golder) and Schott and Associates. The wetland delineations were performed in May, June, and August 2001 and January 2002 for the BP Cherry Point Cogeneration Project. On October 7, 2002 additional field checking of wetland sample plots and wetland edges, as surveyed, was conducted. This report presents the detailed findings of wetland delineations within the Cherry Point Refinery (construction staging areas) and a parcel located east of the Refinery (proposed plant site). The purpose of these delineations is to determine the impact of a proposed energy-generating facility on wetlands in Whatcom County. The project proponent, BP West Coast Products, LLC, proposes to construct a 720-MW natural gas-fired combined-cycle combustion turbine cogeneration facility within a 33.17-acre parcel of land adjacent to the refinery. Approximately 36 acres of land located within the Refinery fence line would be used for construction staging and assembly. The plant would be configured with three combustion turbines, each driving an electric generator. Each of the gas turbine trains would be equipped with a heat recovery steam generator (HRSG) with duct firing capability to augment steam production. Steam would be produced at high pressure in the heat recovery steam generator and sent to one steam turbine-driven electric generator, with extraction and condensing capability. The refinery would also serve as a "steam host" for a portion of the steam produced by the combustion turbines.

The proposed project is located in Whatcom County, Washington, approximately two miles east of Cherry Point within the Strait of Georgia (T39N, R1E, S8). A vicinity map is provided in Figure 1. A USGS Quad study site map is provided in Figure 2.

Whatcom County is bordered by Skagit County to the South, Georgia Strait on the west, and by Canada on the north. The western one-third of the County ownership is primarily private, including the project site, however, much of the eastern two-thirds of the county lie within the Mount Baker National Forest. Western Whatcom County lies primarily within the Puget Sound Basin and most of the lands within the basin are agricultural. The basin consists of alluvial flats and low, smooth glacial and post-glacial fluvial terraces, low rolling glacial plains, and occasional frontal recessional moraines of more pronounced relief.

2. SITE DESCRIPTION

The proposed project is located east of the BP Cherry Point Refinery within BP property boundaries. The BP Refinery and surrounding land is mainly zoned Heavy Impact Industrial and Light Industrial. The project site is entirely contained within the Cherry Point Major Industrial Urban Growth Area/Port Industrial as defined in the *Whatcom County Comprehensive Land Use Plan* (Whatcom County, 1997).

The Cogeneration Project is designed to be an integral part of the refinery by providing the entire refinery electrical requirements (85 MW) and a portion of the refinery steam requirements. The proposed project site is in close proximity to the refinery, in an area south of Grandview Road, north of Brown Road, and east of Blaine Road. The proposed 33.17-acre parcel for the Cogeneration Project and the 36 acres to be used for construction staging are located entirely on BP property.

Currently, the site is undeveloped abandoned grassland pasture with some portions planted with hybrid poplar trees. The historical use of the property was for agriculture, including pasture and fruit trees. There are several man-made drainage ditches that traverse the property. These ditches were most likely used during farming to remove excess water from the soils in winter and spring by increasing runoff rates from adjacent wetlands. These ditches are not functioning as originally intended because they have not been maintained and are vegetated. This vegetation may inhibit surface water flow and decrease the removal of water from surrounding areas. Emergent herbaceous wetlands occupy a large portion of the site, with the exception of a forested portion in the east and a hybrid poplar (*Populus trichocarpa*) crop planted by BP in the east and north areas of the project site.

The site ranges in elevation from approximately 116-feet MSL on the west side adjacent to Blaine Road to approximately 125-feet MSL at the eastern boundary of the project site. Stormwater runoff is generally to the northwest, except where manmade ditches carry water to the north and then intersect ditches draining to the west.

3. METHODS

3.1 Study Objectives

This wetland delineation report was prepared for the Cogeneration Project in accordance with Whatcom County's critical areas ordinance (Whatcom County, 2001) and the U.S. Army Corps of Engineers (USCOE) requirements for wetland delineation and reporting (Environmental Laboratory, 1987). Specific objectives of the study were to:

- Conduct a wetland delineation within the proposed project area using the *Corps of Engineers Wetlands Delineation Manual* (Environmental Laboratory, 1987) (Corps manual) as required by the USCOE, the Washington Department of Ecology's *Washington State Wetlands Identification and Delineation Manual* (Ecology manual), and Whatcom County's critical areas ordinance guidelines for wetlands (Whatcom County, 2001).
- Categorize the wetlands by the U.S. Fish and Wildlife Service (USFWS) classification system (Cowardin et al., 1979) and rate wetlands using Ecology's wetlands rating system (Ecology, 1993).
- Assess wetlands using the *Methods for Assessing Wetland Functions. Vol. 1: Riverine and Depressional Wetlands in the Lowlands of Western Washington* (Ecology, 1999).

3.2 Review of Existing Information

Before undertaking onsite observations, a literature review was performed to identify records of wetlands within the project area. The following information was collected and examined:

- U.S. Geological Survey (USGS) topographic map of Blaine quadrangle (USGS, 1972)
- National Wetlands Inventory map of project area (USFWS, 1987)
- *Soil Survey of Whatcom County* (USDA, 1953 and 1992)
- Whatcom County Municipal Code Title 16, Critical Areas Ordinance
- *Washington State Wetlands Identification and Delineation Manual* (Ecology, 1997)
- *Hydric Soils of the United States* (NRCS, 1987)
- *Whatcom County Critical Inventory* (Whatcom County, 2000)
- *Wetland Delineation Report (ENSR Consulting and Engineering 1992)*

3.3 Wetland Delineation

A wetland delineation of the project area was performed in accordance with *the Corps Manual* and the Ecology Manual. According to both manuals, an area must exhibit indicators of hydrophytic vegetation, hydric soils, and wetland hydrology to be considered a wetland. These criteria are mandatory and must all be met for an area to be identified as wetland, except under circumstances when a wetland is considered a disturbed area or problem wetland. These criteria are discussed below.

Field conditions were evaluated by walking through the entire project area, including alternative sites, to identify wetland characteristics. Delineation of the southern portion of the plant site was performed on two dates (May 3-4, 2001). Delineation of the northern portion of the plant site was performed on June 11, 2001. Delineation of potential construction staging and assembly (lay down) areas was performed on August 6, 2001. The construction lay down areas were redelineated in January 2002 and additional soil sample verification was conducted in October 2002.

In each area having wetland characteristics, data were recorded on wetland data forms to indicate dominant plant species, soil conditions in test pits, and evidence of hydrologic conditions. Upland areas adjacent to each potential wetland area were also surveyed. Based on the field data, a wetland/nonwetland determination was made for each area examined. Color photographs were taken of representative areas of the site (Appendix A). Observations of all wildlife species were also noted during each site visit.

Potential wetland areas within the project area were identified as distinct vegetation units, to which the three parameters listed above were applied. A vegetation unit is an area having similar physical features or plant characteristics. Features such as species uniformity, dominance, distinct topographic breaks, and obvious similarities in soils of hydrologic indicators are factors that define a vegetation unit. Following the confirmation of all three wetland parameters, wetland boundaries were marked by placing fluorescent flagging along the perimeter. The boundaries were subsequently surveyed by Larry Steel and Associates.

Based on a September 4th and 5th, 2002, field review by the Corps of Engineers, Department of Ecology and consultants to EFSEC they recommended additional field checking of wetland sample sites and surveyed wetland boundaries. Golder and Schott & Associates conducted the field check on October 7, 2002. This review of field soil plots, surveyed boundaries, and an increase in the size of stormwater ponds has resulted in several changes that have a net result of increasing the total impacted wetland acreage within the project area. The primary change to the delineation was the inclusion of a wetland, which was missed by the surveyors. In addition, the boundaries of two wetlands were corrected, where the points were connected incorrectly. The changes to the wetland delineation have been incorporated into the revised wetland delineation.

3.3.1 Vegetation

Plant species are divided into three strata: trees, shrubs, and herbaceous species. Stratum dominance was calculated for each vegetation unit. Dominant species are those plants in each stratum that when ranked in decreasing order of abundance and cumulatively totaled, immediately exceed 50 percent of the total dominance measure for the stratum, plus any additional plant species comprising 20 percent or more of the total dominance for the stratum (Environmental Laboratory, 1987).

Hydrophytic vegetation is defined as macrophytic plant life growing in water, soil, or substrate that is periodically deficient in oxygen. For each plot, the percent areal coverage was estimated for each plant species present, and dominant species were determined. Plants were identified using *Flora of the Pacific Northwest* (Hitchcock and Cronquist, 1973). Species were assigned a Wetland Indicator Status (Reed, 1988 and 1993), which is based on the estimated probability of each plant species' occurrence in wetlands or nonwetland (see Table 1, Wetland Indicator Status).

The indicator status of the dominant species within each vegetative unit (tree, shrub, herb) is used to determine if the plant community of an area is characterized as hydrophytic. If greater than 50 percent of the dominant plants in a unit have an indicator status of OBL, FACW, or FAC, the vegetation is considered to be hydrophytic in both manuals.

3.3.2 Soils

The hydric soils list (Natural Resources Conservation Service [NRCS], 1995) was consulted for the presence of mapped hydric soils within the project area. Soils were assessed in the field using a soil shovel (sharpshooter) to examine soil for hydric indicators to a minimum depth of 18 inches, where possible. Much of the site's soils had a cemented layer, which could not be broken using a shovel, and it proved impossible to obtain information past the cemented layer. Soil characteristics examined include hue, value, and chroma, as identified on a Munsell Soil Color Chart (Munsell Color, 2000). Hydric soil indicators include mottles, low soil chroma, gleying, and high organic content. Mottles are spots or blotches of contrasting color occurring within the soil matrix. Gleyed soils are predominantly neutral gray in color.

During the 1992 wetland delineation, ENSR Consulting and Engineering also conducted an extensive analysis of the soils and concluded that some of the soils in the vicinity of the project including the project site were misclassified (See Section 4.1.2).

3.3.3 Hydrology

Wetland hydrology is defined as permanent or periodic inundation or soil saturation, to within 12 inches of the soil surface, for a significant period (usually a week or more) during the growing season (Environmental Laboratory, 1987). Where positive indicators of wetland hydrology are observed, it is assumed that wetland hydrology occurs for a significant period of the growing season. Direct indicators of wetland hydrology include areas of ponding or soil saturation. Indirect indicators include dry algae on bare soil, water marks on soil or leaves, drift lines, oxidized root channels associated with living roots and rhizomes, sediment deposits, and drainage patterns.

Duration of inundation and/or soil saturation for the Ecology Manual is based on 5 percent of the growing season, which is based on the number of days the soil temperature is at least

5 degrees Centigrade. The growing season in the project area is approximately 225 days from April through September (USDA, 1953). Within the project area, direct and indirect indicators of wetland hydrology were recorded and described on data sheets.

3.4 Wetland Classification and Rating

Cowardin et al. (1979) devised a classification system based on physical wetland attributes (i.e., vegetation, soils, and water regime) that has been adopted by the USFWS. This Cowardin classification system was used to identify wetland types in the project area.

The Department of Ecology's rating system was used to rate wetlands in the project area. Ecology has developed a four-tiered wetland rating system based on wetland vegetation types, wetland acreage, and number of wetland classes (Ecology, 1993). The four categories of wetlands identified by Ecology are hierarchical: category I wetlands exhibit more valuable wetland features, and category IV wetlands exhibit less valuable attributes. Table 2 depicts Ecology's wetland rating system for Western Washington. Whatcom County has not established a wetland classification or rating system. Wetland rating data sheets can be found in Appendix B.

3.5 Wetland Functional Assessment

Methods to complete a functional assessment of wetlands typically involve the identification and evaluation of physical attributes that provide predictive rather than direct measurement of specific ecological functions of concern. Whatcom County has not established a wetland functional assessment, but Whatcom County Code (Whatcom County, 2001) states the following:

The county shall utilize the best-suited and most scientifically valid functional rating system for purposes of determining applicable wetland, stream, or river buffer adjustments or mitigation requirements. Any functional assessment utilized by the county shall address the following functional attributes:

- Erosion control and shoreline stabilization;
- Fish habitat;
- Ground water recharge and base flow maintenance;
- Storm water attenuation;
- Water quality improvement; and
- Wildlife habitat.

The functional assessment was performed by Golder (Golder, September 2001) using Ecology's *Methods for Assessing Wetland Function Volume 1 – Riverine and Depressional Wetlands in the* Lowlands *of Western Washington* (Ecology, 1999). Typical functions assessed included: natural biology (wildlife), hydrology, erosion control, nutrient and sediment removal, flood storage, groundwater recharge, water quality, native plant richness, and potential for primary production.

4. AFFECTED ENVIRONMENT

The following section presents the results of the wetland delineation for the Cogeneration Project, including a description of existing information that was reviewed and an analysis of wetland conditions observed within the project area vicinity.

4.1 Analysis of Existing Information

Information gathered from published sources, maps, and agency correspondence was reviewed to assess the historical and current presence of wetlands within the project area. Significant findings are summarized below.

4.1.1 Water Resources

The project site is located in an area of continental glacial scouring where a cemented layer of soil is within 12 inches of the surface. Precipitation moves slowly through the soils and accumulates in areas where the consolidated material is nearer the surface. Annual rainfall within the area is 40.7 inches (Goldin, 1992). There are several east to west and south to north drainage ditches that are located within the plant site footprint. The main east to west running ditch is approximately five to six feet wide and collects water moving in a northwesterly direction. Because the site is relatively flat, there is minimal drainage within the ditches in the drier months, but significant water flow within the plant site and construction lay down areas during the fall and winter. Water was observed flowing from the site through the ditches, moving first westerly to Blaine Road, then northerly in ditches to the Grandview Road fence line. Storm water then left the site via roadside ditches and a culvert under Grandview Road and continued along the east side of Blaine Road discharging into Terrell Creek approximately 0.5-mile from the site.

The ditches transecting the project site and others in the study area were used historically to drain excessive water from the area during the winter months and periods of heavy rain. The ditches that are currently visible were most likely intended to be permanent drainage channels. Annually shallow radial drainage ditches would be constructed to further increase water runoff, but only the permanent ditches would be maintained on an annual basis. These farmland drainage practices are still used by farmers in the surrounding area. Beginning from the period when the land use designation was changed to Heavy Impact Industrial and the land purchased for construction of the refinery the ditches have not been maintained. Based on a comparison of a wetland delineation conducted in 1990/1991 (See Section 4.1.2 Soils) and the delineation conducted in 2001/2002 the amount of wetlands has increased significantly. This increase in wetland area appears to be the result of the deteriorating ability of the ditches to drain water from the area.

The National Wetlands Inventory (NWI) map indicates that the area contains a mosaic of wetland types that encompass the entire site with the exception of an area in the middle northern portion of the site near Grandview Road (see Figure 3). The wetland types listed within the area are palustrine emergent temporarily flooded (PEMA), palustrine emergent seasonally flooded (PEMC), and palustrine open water permanently flooded excavated ($POWH_x$).

Whatcom County includes wetlands as critical areas, and the functions of wetlands are protected under Title 16 of the Whatcom County Municipal Code (January, 2001).

4.1.2 Soils

The Whatcom County Soil Survey (Goldin, 1992) indicates that western Whatcom County has scoured glacial areas with exposed sedimentary rocks underlain by clay till (USDA, 1953). Soils in the project area and surrounding vicinity fall within several soil series including Birch Bay, Kickerville, Labounty, Tromp, and Whitehorn (Figure 4, Whatcom County Soil Survey). A detailed description of each soil series within the project area follows.

Soils within the Birch Bay Series are located within the plant site footprint and the construction lay down areas. These soils are on wave-reworked glaciomarine drift plains and consist of very deep, moderately drained soils formed in an admixture of loess and volcanic ash over glaciofluvial deposits and glaciomarine drift. Soils in the upper layers are dark brown (10YR 3/3) silt loams to dark yellowish brown (10YR 4/4) silt loams. Slopes are 0 to 3 percent and annual precipitation within areas containing these soils is 30 to 40 inches. These soils are within hydrologic group C.

Soils within the Kickerville Series are located in the northern portion of the plant site (Figure 4). Soils within the Kickerville silt loam complex are on outwash terraces and composed of loess and volcanic ash over glacial outwash. These soils occur within areas that have 0 to 15 percent slopes and 35 to 55 inches of annual precipitation. Soils are dark brown (10YR 3/3) to yellowish-brown in color (10YR 5/4). Kickerville silt loams have rapid drainage and moderate moisture-holding capacity. These soils are located just north of the proposed plant site footprint. Soils within this series are within hydrologic group B.

Soils within the Labounty Series are identified in close proximity to the plant site. These soils are on wave-reworked glaciomarine drift plains and consist of poorly drained soils formed in loess and glaciomarine drift. Slopes are 0 to 3 percent and annual precipitation for areas containing this soil type is 35 to 55 inches. Soils are dark brown (10YR 3/2) silt loams in the upper horizon. Soils within this series are listed on the National Hydric Soils List (NRCS, 1987) and the Washington State Hydric Soils List (NRCS, 1995), although they are not listed as hydric in the Whatcom County Hydric Soils List (NRCS, 2000).

Soils within the Whitehorn Series are identified within the project area in the plant site footprint and construction lay down areas. These soils are on wave-reworked glaciomarine drift plains and consist of very deep, poorly drained soils formed in volcanic ash, loess, glaciofluvial deposits, and glaciomarine drift. Slopes are 0 to 2 percent and annual precipitation for areas containing this soil type is 30 to 40 inches. Soils are very dark brown (10YR 2/2) silt loams or dark grayish brown (10YR 4/2) with fine granular structure. Canopy vegetation within this series includes Douglas fir, white fir, spruce, and cedar. Other vegetation within this soil series includes alder, big leaf maple, willow, birch, hybrid poplar, bracken, blackberry, salmonberry, thimbleberry, and red huckleberry. Soils of the series have been used for crops and agriculture.

In 1990 the ARCO Petroleum Products Company (now BP West Coast Products) initiated a long-range refinery modernization plan. During the first stages of the modernization plan, Whatcom County officials rejected the permit applications due to potential impacts to wetlands. Permits for some of the construction was delayed while wetlands in the proposed construction areas were investigated. However, the Refinery also initiated an extensive study of the wetlands on land surrounding the refinery industrial complex and under their ownership to determine the extent and significance of the wetlands.

To meet the objectives of the study the investigators (ENSR Consulting and Engineering)[1] utilized the Federal Manual for Identifying and Delineating Jurisdictional Wetlands (1989) (Manual). Because of the complexity of the wetland regime the study approach, as described in the Manual, included examining soils to determine the hydric/non-hydric boundaries, followed by identifying plant communities, and then investigating hydrology.

During the initial stages of the investigation it became apparent that hydrology data would be a critical factor and would have to be collected at the beginning of the growing season. To collect the hydrology data water levels were measured through construction of shallow wells and pits at or near the location of the soil pits.

The wetland investigation included delineating the wetlands south of Grandview Road, north of Brown Road and east of Blaine Road (includes the proposed site for the Cherry Point Cogeneration Project). In addition, the delineation covered other areas, including:

- The area south of Brown Road and East of Blaine Road (wetland reconnaissance evaluation for the proposed project);
- The land north of Grandview Road, east of Jackson Road, and west of the Burlington Northern Santa Fe railroad tracks (includes the site of the proposed mitigation area for the Cogeneration Project), and
- The area west of Blaine Road and South of Grandview Road (designated for the proposed project lay down area).

The soils and hydrology investigation was conducted between December 1990 and May of 1991. Wetland mapping was done at a 1:3,600 and a 1:200 scale depending on the complexity of the wetlands.

The wetland study included:

- Examining and describing soils at 247 locations within the study area, and
- Collecting water level data at over 100 locations within the study area.
- The soil study concluded there were a significant difference between actual field findings and the soil identified and mapped as Whitehorn (SCS 1984). The soils mapped as Whitehorn are "somewhat poorly drained" rather than "poorly drained." Water moves out of the soil too rapidly for the soil to be considered "poorly

[1] Mr. Jim Nyenhuis, certified professional soil scientist/soil classifier (ARCPACS #2753); Mr. Dale Snyder, certified professional soil scientist (ARCPACS #1988); and Dr. Ted Boss, Wetland Scientist

drained." The hydrologic records collected for those soils support that conclusion. The consequence is that the hydric soil criteria 2.a are met rather than 2.b.2.

The soils study also concluded that the differences are in the classification according to Soil Taxonomy and the hydric status classification. The Natural Resources Conservation Service (NRCS), formerly the Soil Conservation Service, classified Whitehorn soils as Typic Umbraqualfs. That classification requires a predominance of low chromas in some horizon below 20-inches of the ground surface; such soils met the criteria for hydric soils. Morphological examinations during the study, coupled with testing for anaerobic conditions and site hydrology studies lead to the conclusion that low chromas observed in soils classified and mapped as Whitehorn, are the result of leaching of iron and manganese oxides from the soil by lateral movement of water through the relatively pervious subsoil.

Hydrologic data demonstrated water permeability rates in excess of 0.60 inch per hour in soils with gravelly sandy loam and gravelly loamy sand horizons. The use of Rhodamine WT dye in wells reinforced the observation that water moves laterally and at significant rates in these soils. The use of a-a-dipyridil also gave no indication of reducing conditions in these soils.

The scientists also based their conclusions that a soil like Whitehorn, classified as an Umbraqualf, requires the accumulation of translocated clay in a subsurface (agrillic) horizon. The soils classified as Whitehorn in the study area do not have sufficient amounts of translocated clay to justify recognition as an agrillic horizon. The findings indicated that a layer with higher clay content is commonly found at depths of 20 to 30 inches of nearly all the soils in the study area, including Whitehorn, but that the layer is the result of geologic, glaciomarine, deposition, and not soil forming processes (Easterbrook 1971).

The conclusions of the soil and hydrology studies included:

- The Whitehorn soils should be classified as Typic Dystrochrepts or Typic Haplorthods;
- Whitehorn soils are complexes of Whitehorn-like soils and soils of the LaBounty series, with some Birch bay soils intermingled;
- Soils mapped as Whitehorn consociation (hydric) is actually a mixture of non-hydric and hydric soils;
- Soils mapped as Birch bay, LaBounty, and Kickerville have the correct hydric status, and
- Soils of the Clipper and Hale series are classified as hydric by the NRCS, but are also "somewhat poorly drained" and are not hydric.

Based on the wetland delineations conducted in 1990-91 the wetlands in the project area were a mosaic of wetlands/uplands that were also affected by man-made (prior to construction of the refinery) ditches to drain the farmland.

Soils within the Whitehorn series are listed on the National Hydric Soils List (NRCS, 1987) and the Washington State Hydric Soils List (NRCS, 1995), although they are not listed as hydric in the Whatcom County Hydric Soils List (NRCS, 2000). The hydrologic group for these soils is D. Table 3 shows soils groups and corresponding infiltration rates.

Soils within the Tromp Series are identified in close proximity to the plant site. Soils of the Tromp series occur primarily on outwash terraces and consist of very deep, moderately well drained soils that formed in a mixture of volcanic ash and loess over glacial outwash. Slopes are 0 to 2 percent and precipitation within these areas is 40 to 55 inches per year. Soils of this series have a dark-brown (10YR3/3) to light yellowish brown (10YR6/4) surface soil and are relatively dry. The hydrologic soils group for the Tromp Series is C.

4.2 Analysis of Site Conditions

The plant site footprint and construction lay down areas were examined for plant communities that are indicative of wetlands (see Figures 5 and 6). An herbaceous wetland complex extends and fragments into a forested area southeast of the plant site. The site has relatively little relief but undulates smoothly. Several artificial drainages traverse the site. These drainages are in an east-west orientation and serve to drain the site in a northwesterly direction. The construction lay down areas consist mostly of palustrine emergent wetlands with facultative grasses dominating the vegetation.

Table 4 lists the plant species observed in both upland and wetland plant communities within the project area, identified according to stratum and listed by common and scientific names along with wetland indicator status. Representative photographs of both upland and wetland plant communities within the project area are presented in Appendix A.

4.3 Southern Half of the Cogeneration Plant Site – May 3rd and 4th Delineation

4.3.1 Upland Plant Communities

The upland portion of the southern half of the plant site occurs mainly in perimeter areas containing blackberry thickets along the southern and southwestern border of the parcel (see Figures 5 and 6). These areas are higher in elevation than the rest of the site, which is composed almost entirely of palustrine emergent wetlands. There is an old overgrown road that diverts north from Brown Road directly adjacent to the Cherry Point Refinery. It appears that an orchard may have existed on the upland corner of the site. There are several pear and walnut trees surrounded by Himalayan blackberry thickets just west of the abandoned road. The broader, flatter areas appear to have been under cultivation historically.

The vegetation within the blackberry-dominated upland sites includes Himalayan blackberry, walnut, pear, stinging nettle, Canada thistle, colonial bent grass, reed canary grass, vetch, rye grass, birds-foot trefoil, bull thistle, evergreen blackberry, alder, and horsetail. The soils range from loams to silty clay loams (7.5 YR 3/3 and 7.5 YR 3/4). These soils are deeper above the cemented hardpan and are better drained than the adjacent wetlands. These areas had no indicators of wetland hydrology.

In addition to the uplands along the southern and southwestern perimeters of the project area, mosaic uplands occur within the forested portion of the site, which is outside of the plant footprint (Figures 5 and 6). These areas are dominated by cedar, Douglas fir, Himalayan blackberry, twinberry, salmonberry, ocean spray, Indian plum, stinging nettle, bleeding heart, sword fern, and piggyback plant.

4.3.2 Wetland Plant Communities

The wetlands observed during the survey of the plant site and construction lay down areas are dominated by herbaceous grasses including red top, velvet grass, colonial bent grass, and meadow foxtail. There is little difference in plant communities of wetlands and adjacent uplands with the exception of invading facultative upland and upland species including vetch, plantain, and thistle. See Figure 7a for delineated wetlands and impacted wetlands.

Based on the extent of the wetlands, upland areas were delineated within the extensive wetland system. The vegetation, soils, hydrology, functions, and classification of the areas are described below. The completed wetland determination data forms are provided in Appendix C. Corresponding soil plot data locations are shown with wetlands in Figure 7b.

4.4 Northern Half of the Site – 6/11/2002 Delineation

4.4.1 Upland Plant Communities

The upland portion of the northern half of the plant site is interlaced with palustrine emergent wetland areas. The upland areas are dominated by blackberry thickets that occur in areas that are slightly raised in elevation relative to adjacent wetland areas. Some Douglas fir saplings have been planted by BP in these areas as well. Upland vegetation within the northern portion of the site is similar to that of the southern half of the site.

4.4.2 Wetland Plant Communities

Wetlands within the northern portion of the site are primarily palustrine emergent systems that are dominated by clumps of soft rush and creeping buttercup. Creeping buttercup communities do not exist on the southern portion of the property. Data sheets for the northern wetland and upland communities are presented in Appendix C.

4.5 Potential Construction Lay down Areas – 8/6/2001 and 1/22& 23/2002 Delineation

4.5.1 Upland Plant Communities

The upland areas within the construction lay down sites occur primarily along the northern perimeter of the site (Figures 5 and 6). Some immature Douglas-fir communities exist the upland areas with an understory of facultative grasses that appear frequently in wetland areas. The Douglas fir was planted about 1990 as part of a harvestable forestry effort in some of the old agriculture fields. However, most of the Douglas fir did not survive. These areas are slightly raised in elevation and appear to have been significantly disturbed due to the presence of sandy soils and gravel that are not reflective of native conditions. In addition, Himalayan blackberry is beginning to invade the upland areas along the fringes.

4.5.2 Wetland Plant Communities

Wetlands within the proposed construction lay down areas are primarily palustrine emergent systems that are dominated by clumps of soft rush, reed canary grass, colonial bent grass, and meadow foxtail. Several small patches of willow, consisting of approximately three or four shrubs each, occur in the northern portion of the proposed lay down areas. Relatively unhealthy Douglas fir trees occur within the wetland/upland transition zone and approximately 15 uprooted, wind-thrown trees were observed on the site. These trees had very shallow root systems and appeared to have been stunted in their growth. Planting plans indicate the trees were planted in 1989-1991 and they are smaller than they should be at this time (see Figure 8). Approximately nine mature hybrid poplars occur north of Wetland I, which is a ditch that will not be used for lay down (not impacted). The understory within the hybrid poplar area is dominated by reed canary grass. Data sheets for the proposed construction lay down areas are in Appendix C.

4.6 Wildlife within the Wetland Components

The emergent wetland component serves as habitat for field mice, voles, and various small rodents. Several mice were observed within the emergent complex on field visits. The hybrid poplar planting areas serve as higher quality habitat relative to the emergent complex. The emergent complex area was most likely agricultural habitat based on former land uses. No reptiles or amphibians were observed within this habitat. Animals observed or that may potentially occur within the agricultural area include coyote, American robin, song sparrow, Canada geese, red-tailed hawk, quail, black-tailed deer, rabbit, and rodent and insectivore species.

The forested wetland/upland mosaic area is classified within the Fraser Lowland Ecological Zone (Johnson and O'Neil, 2001). Although the forested area is relatively small in size (approximately 15 acres) and will not be impacted by the proposed Cogeneration Project, wildlife most likely use the emergent wetlands within the proposed plant site to move in and out of the forested areas. One black-tailed deer was observed crossing Brown Road (south of the proposed plant) during a spring field visit. Animals observed or that may potentially occur within the forested component include woodpeckers, red-tailed hawks, small mammals including rodents, insectivores, squirrels, chipmunks, and possibly bats within downed logs and trees.

5. DELINEATIONS

The Cogeneration Project will impact a total of approximately 35.37-acres of low value wetlands, as indicated in Table 5. The wetlands described below are generally divided into Palustrine Emergent (Wetlands B, C,D,F,G,H,J,&K) and Forested or Planted Trees (Wetlands A, E, & I).

5.1 Palustrine Emergent Wetlands

The herbaceous wetland systems encompass a large portion of the both the plant site and construction lay down areas. Figure 7 shows the wetlands that were surveyed; including the proposed plant site footprint and construction lay down areas 1-4, with impacted wetland areas shaded.

5.1.1 Wetland B

Wetland B consists of three wetlands (B1-B3) north of the main east-west drainage ditch within the plant site footprint. All of wetland B would be impacted and it totals approximately 3.39 acres in size. These wetlands were grouped together based on their close proximity, relatively small sizes, similar vegetation, similar topography, and similar hydrology in the form of high seasonal groundwater.

5.1.1.1 Wetland Vegetation

The vegetation species reported within these herbaceous wetlands include, but are not limited to, rough bluegrass, velvet grass, bull thistle, tall fescue, Baltic rush, spike rush, and meadow foxtail. The buffers to wetlands B1-B3 consist primarily of herbaceous grasses of an abandoned grassland pasture and Douglas-fir/blackberry thicket areas.

Based on a dominance of species rated facultative or wetter, vegetation in the systems is considered hydrophytic.

5.1.1.2 Soils

The soils mapped for this site include soils within the Birch Bay and Whitehorn Soil Series in the upper 16 inches (Goldin, 1992).

The soils sampled in the wetland data plots were reported as very dark grayish brown/black (10YR 3/2; 10 YR 4/1) silty clays with dark yellowish brown (10 YR 3/4) few, fine and both faint and distinct mottles from the surface to a depth of 12 inches. These soils were considered hydric due to a low chroma and the presence of mottles. The structure in the top 8 inches was granular and most often subangular and blocky below that depth. Wetlands within the B complex were delineated in June and soil saturation, although occurring in the upper 12 inches, was significantly less than that of Wetland D, located south of Wetlands B1-B3, which was delineated in early May.

Soil pit locations are shown on Figure 7. Numbers shown on data sheets (Appendix C) correspond to pit locations.

5.1.1.3 Hydrology

Wetland hydrology within the wetlands composing Wetland B results from high seasonal groundwater due to precipitation and the impermeable nature of the soils within the area. During winter months, there is lateral flow from adjacent areas contributing to the hydrology of the wetland, but this is seasonal and does not occur regularly in the spring and summer. Precipitation contributes greatly to the hydrology, as the soils were significantly wetter in the late spring than in early to mid summer. These wetlands are slightly depressed topographically and nearby ditches contribute to inflow and outflow in the wetlands.

5.1.1.4 Classification and Rating

According to the wetland classification system established by the USFWS (Cowardin et al., 1979), Wetland B, including B1-B3, would be classified as a palustrine emergent (PEM) wetland. Ecology would most likely rate these wetlands as Category III wetlands based on the results of the wetland rating field form (Appendix B). The wetlands within the B complex are not rare or unique and do not contain irreplaceable or rare wetland types.

5.1.2 Wetland C

5.1.2.1 Wetland Vegetation

Wetland C is located within the eastern portion of the project area and is approximately 4.25 acres in size. However, only 0.88 acres would be impacted. Hybrid poplar farming areas are located directly east of the wetland. The vegetation species reported within this herbaceous wetland include, but are not limited to, creeping buttercup, velvet grass, rough bluegrass, Baltic rush, and meadow foxtail. Adjacent buffer vegetation is dominated primarily by invasive species including Himalayan blackberry and bull thistle. Planted Douglas fir upland knolls also occur in the vicinity of Wetland C. Based on a dominance of species rated facultative or wetter within Wetland C, vegetation in this system is considered hydrophytic.

5.1.2.2 Soils

The soils mapped for this site include soils within the Birch Bay and Whitehorn Soil Series in the upper 16 inches (Goldin, 1992).

The soils sampled in the wetland data plots were reported as dark gray and very dark gray (10YR 3/1; 10 YR 4/1) sandy clay and silty clay loams with dark yellowish brown (10 YR 3/4) many, common, distinct mottles from the surface to a depth of 12 inches. In addition, gleying occurs at approximately 9 inches (5GY 5/1). These soils were considered hydric due to a low chroma and the presence of mottles. The structure in the top 8 inches was granular and most often subangular and blocky below that depth. Wetland C was delineated in June and soil saturation, although occurring in the upper 12 inches, was significantly less than that of Wetland D, located south of Wetland C, which was delineated in early May.

5.1.2.3 Hydrology

Wetland hydrology within Wetland C is due to precipitation and the perched condition of the groundwater table in addition to topographic depression and impermeable soils. Precipitation contributes most greatly to the hydrology, as the soils were significantly wetter in the late spring than in early to mid summer.

5.1.2.4 Classification and Rating

According to the wetland classification system established by the USFWS (Cowardin et al., 1979), Wetland C would be classified as a palustrine emergent (PEM) wetland. Ecology would most likely rate these wetlands as Category III wetlands based on the results of the wetland rating field form (Appendix B). The wetland is not rare or unique and does not contain irreplaceable or rare wetland types.

5.1.3 Wetland D

Wetland D includes the large wetland complex south of the main east-west ditch that runs through the proposed plant footprint (Figure 7). Total area delineated was approximately 39.33 acres, but the total area impacted is 5.92 acres.

5.1.3.1 Wetland Vegetation

Wetland D is located within the southern portion of the plant site footprint. The surveyed portion of Wetland D is approximately 39.33 acres, although the wetland extends to the east, but this area was not completely delineated. The wetland extends into the hybrid poplar planting area to the east and then breaks up into mosaic wetland/upland areas.

Ecology's wetland rating forms (Appendix B) score wetlands for several components, one of which is size. Size categories are as follows: <0.10, 0.10-1, 1-5, 5-10, 10-40, 40-200 and >200 acres. Wetland D falls under the 40-200 acre category. Since Wetland D is not likely larger than 200 acres, the incomplete survey would not affect the score for this component and, therefore, would likely not affect the wetland rating. The vegetation species observed within this herbaceous wetland include, but are not limited to, vernal sweet grass, velvet grass, soft rush, slough sedge, colonial bent grass, reed canary grass, Kentucky bluegrass, birds-foot trefoil, giant horsetail, Canada thistle and Himalayan blackberry along the upland/wetland transition zone. Adjacent upland vegetation is dominated primarily by Himalayan blackberry. Based on a dominance of species rated facultative or wetter within Wetland D, vegetation in the systems is considered hydrophytic.

5.1.3.2 Soils

The soils mapped for this site include soils within the Birch Bay and Whitehorn Soil Series in the upper 16 inches (Goldin, 1992).

The soils sampled in the wetland data plots varied slightly but were generally reported as dark gray and very dark grayish brown (10YR 3/1; 10 YR 2/2) silty loams and silty clay loams with grayish brown, brown, and dark reddish brown (2.5Y 5/2, 10 YR 5/2, 7.5 YR

2.5/2) common, distinct mottles from the surface to a depth of 12 inches. These soils were considered hydric due to a low chroma and the presence of mottles. The structure throughout the soils was generally granular.

Many of the sample plots occurred in areas with a restrictive hardpan of cemented soil occurring between 6 and 16 inches. Some areas contained mixed soils with decomposing gravel and a few rhizospheres. Charcoal pieces were observed in several of the soil samples and gleying of some soils occurred at approximately 12 inches. Most soil pits within Wetland D filled with water within 3 inches of the soil surface and all pits contained saturated soil at the surface.

Wetland D was delineated in early May and soil saturation and surface inundation was evident in most areas within the large complex. Less surface inundation occurred in areas adjacent to the ditches.

5.1.3.3 Hydrology

Wetland hydrology within Wetland D is due to precipitation, lateral flow in the winter months and the restrictive nature of the soils within the area. Precipitation contributes most greatly to the hydrology, as the soils were much wetter in the late spring than in early to mid summer. Water moves laterally toward the main east-west ditch and is then carried via the main north-south ditch toward Grandview Road. The soils prevent rapid movement of water through a cemented hardpan layer of compressed clay. Therefore, percolation is extremely slow. This regime is typical of areas that have been formed by glacial movement. Wetland D was delineated in early May and areas of shallow inundation were observed.

5.1.3.4 Classification and Rating

According to the wetland classification system established by the USFWS (Cowardin et al., 1979), Wetland D would be classified as a palustrine emergent (PEM) wetland. Ecology would most likely rate this wetland at the high end of a Category III wetland based on the results of the wetland rating field form (Appendix B). The wetland is not rare or unique, although it is of significant size, and does not contain irreplaceable or rare wetland types.

5.1.4 Wetland F

Wetland F is approximately 13.41 acres is size and is located within construction lay down area 2 (Figure 7). These wetlands were delineated in January 2002 and the entire wetland area will be impacted.

5.1.4.1 Wetland Vegetation

The dominant vegetation species within Wetland F are herbaceous grasses including colonial bent grass, meadow foxtail, and velvet grass. Soft rush occurs in the most saturated areas of the wetland. Five small patches of willow, consisting of Pacific willow and Scouler's willow, occur within the northwestern portion of the property. These patches contain approximately three to five shrubs, each with an understory of soft rush. A small area (approximately 0.6 acres) of young, immature hybrid poplar trees with average dbhs of approximately 2-3 inches, occurs within a portion of Wetland F near the northwest corner of the existing contractor's parking lot (Figure 7). Adjacent upland vegetation features patches of Douglas fir that occur on slightly raised knolls throughout the property. These firs were planted in 1989–1991, and have had little success in the area due to the wetland hydrologic regime that dominates the area. Based on a dominance of species rated facultative or wetter in Wetland F, vegetation in the wetland is considered hydrophytic.

5.1.4.2 Soils

The soils mapped for this site include soils within the Birch Bay and Whitehorn Soil Series in the upper 16 inches (Goldin, 1992).

The soils sampled in the wetland data plots were generally very dark brown (10 YR 2/2) to dark brown (10YR 3/1) with common mottles varying from reddish yellow (7.5 YR 6/6) to yellowish brown (10YR 5/4). Grayish green gleying also occurred in some areas (5GY 5/2). The soils were primarily silty clay loams and were saturated in most pits. Structurally, the soils were generally granular throughout or granular to 8 inches and subangular blocky at depths beyond 8 inches. Surface inundation was common throughout the wetland system.

5.1.4.3 Hydrology

Wetland hydrology within Wetland F is attributed to the relatively impermeable nature of the soils within the area and the topographically depressed nature of the site. Lateral flow is not as evident in these areas because there are less pronounced east-west ditches within the Refinery boundaries and more land disturbance due to roads and paved areas.

5.1.4.4 Classification and Rating

According to the wetland classification system established by the USFWS (Cowardin et al., 1979) and the NWI mapping, Wetland F would be classified as a palustrine emergent wetland (PEM) with a small shrub-scrub (SS) component in the form of the immature stand of hybrid poplars. Ecology would most likely rate this wetland component at the high end of a Category III wetland based on the results of the wetland rating field forms (Appendix B). The wetlands are not rare or unique and do not contain irreplaceable or rare wetland types.

5.1.5 Wetland F

Wetland F is approximately 13.66 acres is size and is located within construction lay down area 2 (Figure 7). These wetlands were delineated in January 2002 and 13.41 acres will be impacted. The Northwest portion of the wetland has been reserved fro a stormwater detention pond and is included in the wetland impacts, however, the sizing of the retention pond may have to be increased due to revised State of Washington stormwater retention design criteria currently being proposed. To account for this potential impact the mitigation plan includes an additional 0.25 acres.

5.1.6 Wetland G

Wetlands G is located within construction lay down Area 3 and is bordered to the east and west by roads and to the north and south by gravel parking lots. The entire isolated patch of vegetation is wetland and is approximately 5.46 acres in size.

5.1.6.1 Wetland Vegetation

The dominant vegetation species reported within Wetland G are herbaceous grasses including reed canary grass, meadow foxtail, velvet grass, and colonial bent grass. English plantain and thistle species including bull and Canada were observed and comprised a low percentage of the total plant species. Based on a dominance of species rated facultative or wetter, vegetation in the wetland is considered hydrophytic.

5.1.6.2 Soils

The soils mapped for this site include soils within the Whitehorn Soil Series in the upper 16 inches (Goldin, 1992).

The soils sampled in the wetland data plots were very dark grayish brown (10 YR 3/2) with few, if any, mottles in the upper 6 inches. Below 6 inches, soils generally changed to dark grayish brown (2.5 Y 4/2) and grayish brown (2.5 Y 5/2) with many different colors of mottles including, but not limited to, olive brown (2.5Y 4/4), grayish brown (2.5YR 5/2) and dark yellowish brown (10YR 3/4). Mottles were most often common and distinct. Gleying (10Y 5/1) occurred in some soil plots below 12 inches. Soils were saturated at the time of the site visit and inundation occurred over approximately 40 percent of the property. Soils contained rhizospheres and were silt loams with granular structure to 6 inches and subangular blocky structure below 6 inches.

5.1.6.3 Hydrology

Wetland hydrology within Wetland G is due to precipitation that is perched at approximately 10 inches. This perching is due to the relatively impermeable nature of the soils within the area.

5.1.6.4 Classification and Rating

According to the wetland classification system established by the USFWS (Cowardin et al., 1979) and the NWI mapping, Wetland G would be classified as a palustrine emergent (PEM) wetland. Ecology would most likely rate this wetland component as a Category III wetland based on results of the wetland rating field forms (Appendix B). The wetland is not rare or unique and does not contain irreplaceable or rare wetland types.

5.1.7 Wetland H

Wetland H is separated from Wetland G by a road and is located in the proposed access road corridor from the Refinery to the proposed plant site (see Figure 7). The wetland was visited on January 30, 2002 when approximately 10 inches of snow covered the ground. A complete delineation of the entire wetland was not performed because of these conditions, but was estimated to be approximately 8 acres. Soils were sampled within the proposed access road corridor and were found to be black (7.5YR 2.5/1) and very dark brown (10YR 2/2) silt loams with grayish brown (2.5Y 5/2) few, medium, distinct mottles. These soils exhibited hydric characteristics and therefore the entire corridor was assumed to have wetland characteristics. The surveyed area of this portion of Wetland H is approximately 0.23 acres. The total area of Wetland H is estimated to be approximately 8 acres.

5.1.8 Wetland J

Wetland J is located in construction lay down area 1 (see Figure 7) and is approximately 4.39 acres in size. The wetland is bordered on all sides by roads or gravel walkways. Several pipes serve to drain the wetland on its northern boundary. A slight rise in elevation occurs in the southern portion of the parcel. This elevation was likely caused by the placement of fill material. The elevated area provides sufficient drainage and does not exhibit wetland characteristics.

5.1.8.1 Wetland Vegetation

The vegetation species observed within this herbaceous wetland include colonial bent grass, meadow foxtail, and red top, with some areas that are comprised exclusively of reed canary grass. Vetch and Kentucky bluegrass occur in the upland/wetland transition zone in the southern portion of the site. Based on a dominance of species rated facultative or wetter within Wetland J, vegetation in the system is considered hydrophytic.

5.1.8.2 Soils

The soils mapped for this site include soils within the Whitehorn Soil Series in the upper 16 inches (Goldin, 1992).

The soils sampled in the wetland data plots were very dark grayish brown (10YR 3/2) and brown (10YR 4/3) in the upper 4 inches. Below 4 inches, soils were dark grayish brown (10YR 3/2) and dark gray (2.5Y 4/1) with many, faint, light yellowish brown (10YR 6/4) mottles. A gleyed layer (10Y 5/1) was observed below 8 inches with many, medium, distinct, dark yellowish brown (10YR 4/4) mottles. Generally, soils were granular silty loams in the upper 4 inches and subangular blocky silty clay loams below that depth. Soils were saturated at 3 inches. These soils were considered hydric due to a low chroma, gleying, and the presence of mottles.

5.1.8.3 Hydrology

Wetland hydrology within Wetland J is due to primarily to precipitation and runoff from adjacent walkways and roads. Approximately 65 percent of the wetland was inundated at the time of the field visit (January 2002).

5.1.8.4 Classification and Rating

According to the wetland classification system established by the USFWS (Cowardin et al., 1979), Wetland J would be classified as a palustrine emergent (PEM) wetland. Ecology would most likely rate this wetland as a Category III wetland based on the results of the wetland rating field form (Appendix B). The wetland is not rare or unique, and does not contain irreplaceable or rare wetland types.

5.1.9 Wetland K

Wetland K is a long narrow 0.62-acre wetland adjacent to Grandview Road north of the project site. The wetland was delineated using Corps of Engineers methods. The wetland is associated with the drainage ditch along side Grandview Road and a depressional area formed by the construction of a natural gas pipeline in 1990. The wetland will not be impacted by project construction.

5.1.9.1 Wetland Vegetation

This wetland is dominated by herbaceous plants including reed canary grass, juncus, creeping buttercup, bent grass, and bluegrass species. Based on a dominance of species rated facultative or wetter, vegetation in the wetland is considered hydrophytic.

5.1.9.2 Soils

The soils mapped for this site include Whitehorn Soils in the upper 16 inches (Goldin, 1992).

5.1.9.3 Hydrology

Water was covering or adjacent to the site during all of the field surveys. The wetland is associated with a large drainage ditch adjacent to Grandview Road.

5.1.9.4 Classification and Rating

The wetland was not classified or rated. However, since it has the characteristics of other wetlands in the vicinity it would likely be placed as a Category III.

5.2 Wetlands Containing Forests or Planted Hybrid Poplars

5.2.1 Wetland A

Wetland A is located south of Grandview Road in the northwest corner of the project site. This wetland location will be impacted by the project stormwater pond, security fencing and project equipment. The wetland has a total of 1.69 acres. The wetland system consists of palustrine emergent wetlands with planted hybrid poplars that will eventually be harvested for pulpwood. It is unlikely that this wetland system would be considered forested because the hybrid poplar trees were planted for harvest.

5.2.1.1 Wetland Vegetation

The system is dominated by hybrid poplars in the canopy and the primary understory is creeping buttercup, bent grass, and bluegrass species. Based on a dominance of species rated facultative or wetter, vegetation in the wetland is considered hydrophytic.

5.2.1.2 Soils

The soils mapped for this site include soils within the Birch Bay and Whitehorn Series of clay till soils in the upper 16 inches (Goldin, 1992). This wetland was delineated in June, approximately one month after the delineations performed for Wetlands D and E and hydrology reflected the change in season. Soils were considerably less saturated and no freestanding water was evident in the soil pits. Due to the low chroma and mottling that occurs within this area, soils are considered hydric.

5.2.1.3 Hydrology

Wetland hydrology within Wetland A is due to the restrictive nature of the soils within the area in association with the upgradient watershed and precipitation.

5.2.1.4 Classification and Rating

According to the wetland classification system established by the USFWS (Cowardin et al., 1979) and the NWI mapping the planted hybrid poplar portion of the Wetland A would likely be classified as a palustrine emergent (PEM) wetland. Ecology would most likely rate this wetland as a Category III wetland based on the results of the wetland rating field form (Appendix B).

5.2.2 Wetland E

The herbaceous Wetland D extends into a forested area, Wetland E, on the southeast corner of the parcel. This area is approximately 15 acres in size and is a mosaic of uplands and wetlands. The amount of wetland habitat within the area is estimated at 1.25 acres (Figure 5). Several large trees have been uprooted by the wet conditions, creating upland habitat where they fell. This wetland will not be impacted by the proposed project.

5.2.2.1 Wetland Vegetation

The dominant vegetation species reported within the forested wetland include Himalayan blackberry and small patches of birch, cedar, piggyback plant, spike rush, twinberry, hardhack, ocean spray, hybrid poplar, and slough sedge. Based on a dominance of species rated facultative or wetter, vegetation in the wetland is considered hydrophytic.

5.2.2.2 Soils

The soils mapped for this site include Whitehorn Soils in the upper 16 inches (Goldin, 1992).

The soils sampled in the wetland data plots were similar to those described within the herbaceous wetland component, although there was a higher amount of organic soils from decomposition within the forested habitat. Several soil pits resulted in refusal at approximately 4 inches because of tree and shrub roots. Due to the dense forested environment, several soil plot locations within Wetland E were not located and therefore, not included on the survey map (Figure 7).

5.2.2.3 Hydrology

Wetland hydrology within the wetland portions of the forested area is also due to the impermeable nature of the soils within the area. Additionally, the upland mounds within the forested area contribute to runoff as water moves into the depressions of the wetland system.

5.2.2.4 Classification and Rating

According to the wetland classification system established by the USFWS (Cowardin et al., 1979) and the NWI mapping, the wetlands within the forested portion of the project area would be classified as a forested (F) wetland. Ecology would most likely rate this wetland component as a Category II/III wetland based on results of the wetland rating field forms (Appendix B).

5.2.3 Wetland I

Wetland I is a forested area associated with a ditched channel that bisects the construction lay down areas in an east/west direction and will not be impacted by construction or operation of the proposed Cogeneration Project. This area is different from the other wetland areas in that it is a riverine flow-through wetland, not a depressional outflow wetland. It is associated with a deeper channel that runs north to south and functions at a higher level in regard to amphibian habitat and biomass export. The channel is intermittent and flows during winter and spring and during times of high precipitation. Some areas of the channel are scoured and saturated, while others are completely vegetated with slough sedge. A gravel walking trail runs parallel to the channel and then crosses by means of a bridge. Wetland J is directly south of the channel and drainage pipes divert excess water (moving downgradient in a northwesterly direction) from the herbaceous area into the channel. Wetland I is approximately 0.15 acre in size (see Figure 7).

5.2.3.1 Wetland Vegetation

The dominant vegetation species reported within the forested/channelized wetland include alder, hybrid poplar, willow, and an herbaceous understory of slough sedge, Baltic rush, and soft rush. Hardhack and evergreen blackberry comprise the shrub layer of the wetland. Based on a dominance of species rated facultative or wetter, vegetation in the wetland is considered hydrophytic.

5.2.3.2 Soils

The soils mapped for this site include soils within the Birch Bay Soil Series in the upper 16 inches (Goldin, 1992).

The soils sampled in the wetland data plots were dark brown (7.5 YR 3/2) with light olive mottles (2.5YR 6/2). Soils were moist on the wetland banks of the channel at the time of the site visit, but not saturated. Soils within the channel were saturated, providing an appropriate moisture regime for the obligate wetland species, slough sedge.

5.2.3.3 Hydrology

Wetland hydrology within the channel banks of the forested area is due to the relatively impermeable nature of the soils within the area. Hydrology within the channel is due to both precipitation and collected runoff from the refinery that is culverted under facility roads.

5.2.3.4 Classification and Rating

According to the wetland classification system established by the USFWS (Cowardin et al., 1979) and the NWI mapping, the wetlands within the ditched area would be classified as a palustrine emergent (PEM)/forested (F) wetland. The forested portion of this small wetland complex contains mature hybrid poplar trees that do not appear to have been planted according to BP's planting plan (Figure 8). Ecology would most likely rate this wetland component as a Category III wetland based on results of the wetland rating field forms (Appendix B).

6. THREATENED, ENDANGERED AND PRIORITY SPECIES

A list of threatened or endangered species of plants and animals and priority habitats and species lists were requested from the USFWS, the Natural Heritage Program (NHP), and the Washington Department of Fish and Wildlife (WDFW).

In a response dated July 2, 2001, the NHP responded that there are no known rare, threatened, or endangered species of plants or high quality ecosystems within the project area. The USFWS responded on June 27, 2001 and in November 2001. The response indicated that several listed wildlife species may occur within the project vicinity. These species include wintering bald eagles (*Haliaeetus leucocephalus*), bull trout (*Salvelinus confluentus*), and foraging marbled murrelets (*Brachyramphus mamoratus*). Although these species may occur near Lake Terrell, approximately 1.5 miles southeast of the project area, it is unlikely that these species utilize the area due to the existing industrial character of adjacent properties. Bull trout do not utilize the area and would not be affected by the project.

The WDFW responded to a request for priority species and priority habitat (June 25, 2001). The WDFW indicates that portions of the area are considered priority habitats because they are "wetlands on the flat coastal area from Cherry Point/Lake Terrell, draining north; this area is 'pocked' with hundreds of wetlands, many too small to record" (WDFW, 2001). Bald eagle breeding locations were identified within two miles of the delineated wetlands. Additionally, Terrell Creek runs north and east of the site and Lake Terrell is located southeast of the project area. The Terrell water systems contain several priority species including winter steelhead and coho salmon, although use is limited.

Although listed species of salmonids do not occur within the project area, potential impacts to fish and wildlife species are addressed in a Biological Evaluation (BE) prepared for the BP Cherry Point Cogeneration Project (Golder, 2002b) and within a wildlife section of the Energy Facility Site Evaluation Council Application for Site Certification (Golder, 2002c). Should threatened or endangered species be found within the area, an addendum to the BE will be made and the proper agencies will be notified.

7. REFERENCES

Cowardin, L.M., V. Carter, F.C. Golet, and E.T. LaRoe. 1979. *Classification of Wetlands and Deepwater Habitats of the United Sates*. FWS/DBS – 79/31. U.S. Fish and Wildlife Service. Washington, D.C.

Environmental Laboratory. 1987. *Corps of Engineers Wetlands Delineation Manual*. Technical Report Y-87-1, U.S. Army Engineer Waterways Experiment Station, Vicksburg, MS.

Golder Associates Inc. 2002b. *Biological Evaluation for the BP Cherry Point Cogeneration Project.*

Golder Associates Inc. 2002c. *Application for Cite Certification for the BP Cherry Point Cogeneration Project.*

Goldin, A. 1992. Soil survey of the Whatcom County Area, Washington. U.S. Department of Agriculture, Soil Conservation Service.

Hitchcock, C.L., and A. Cronquist. 1973. *Flora of the Pacific Northwest*. Univ. of Washington Press, Seattle.

Johnson, D. H., and T. A. O'Neil (eds.). 2001. *Wildlife-Habitat Relationships in Oregon and Washington*. 736 pp.

Munsell Color. 2000. *Munsell Soil Color Charts*. Kollmorgen Instruments Corp., Baltimore, MD.

Natural Resources Conservation Service. 1987. *Hydric Soils of the United States*. In cooperation with the National Technical Committee for Hydric Soils. Natural Resources Conservation Service, Washington, D.C.

Natural Resources Conservation Service. 1995. *Hydric Soils of the State of Washington*. U.S. Department of Agriculture, Natural Resources Conservation Service, Washington, D.C.

Natural Resources Conservation Service. 2000. *Hydric Soils List for Whatcom County Area, Washington.*

Reed, P.B., Jr. 1988. *National List of Plant Species that Occur in Wetlands: National Summary*. U.S. Fish and Wildlife Service, Washington, D.C. Biol. Rpt. 88(24). 244 p.

Reed, P.B., Jr., D. Peters, J. Goudzwaard, I. Lines, and F. Weinmann. 1993. Supplement to list of plant species that occur in wetlands: Northwest (Region 9). U.S. Fish and Wildlife Service, Supplement to Biological Report 88(26.9), Washington, D.C.

USDA. 1953. *Soil Survey of Whatcom County*, *Washington*. Soil Conservation Service.

USFWS. 1987. National Wetlands Inventory Maps for Blaine Quadrangle, Washington.

USGS. 1972. Topographic Quadrangle for Blaine, Washington.

Washington State Department of Ecology. 1993. *Washington State Wetlands Rating System - Western Washington*. Publication #93-074. Washington State Department of Ecology. Olympia, Washington.

Washington State Department of Ecology. 1997. *Washington State Wetlands Identification and Delineation Manual*. Publication #96-94. Washington State Department of Ecology. Olympia, Washington.

Washington Department of Ecology. 1999. *Methods for Assessing Wetland Functions, Volume I: Riverine and Depressional Wetlands in the Lowlands of Western Washington*. Publication # 99-115. Washington State Department of Ecology. Olympia, Washington.

Whatcom County. 2001. Whatcom County Municipal Code, Title 16 – Critical Areas. January 2001.

TABLES

TABLE 1

Wetland Indicator Status

Wetland Indicator Status	Description	Estimated Probability of Being Found in a Wetland
OBL	Obligate: species that almost always occur in wetlands under natural conditions.	>99%
FACW	Facultative Wet: species that usually occur in wetlands but are occasionally found in nonwetlands.	67% - 99 %
FAC	Facultative: species that are equally likely to occur in wetlands or nonwetlands.	34% - 66%
FACU	Facultative Upland: species that usually occur in nonwetlands but are occasionally found in wetlands.	1% - 33%
UPL	Obligate Upland: species that almost always occur in nonwetlands under normal conditions.	< 1%
NL	Not Listed: species that are not listed and are presumed to be upland species.	
NI	No Indicator Status: species that have not yet been evaluated.	

(Adapted from Reed, 1988.)

TABLE 2

The Department of Ecology's Wetland Rating
System for Western Washington

Wetland Category	Criteria for Categorization
Category I	• Wetlands that have documented occurrences of Threatened or Endangered species of plant, wildlife, or, fish species recognized by federal or state agencies. • The wetland is already on record with the Washington Natural Heritage Program as a high quality native wetland. **OR** • There is no significant evidence of human-caused changes to topography or hydrology of the wetland (significant changes include clearing, grading, filling, logging of the wetland or its immediate buffer, or culverts, ditches, dredging, diking, or drainage of the wetland). **AND** • There are no populations of non-native plants that are currently present and appear to be invading. **AND** • There is no significant evidence of human-caused degradation of the water quality of the system. • Wetlands that are documented as regionally significant waterfowl or shorebird concentration areas. • Wetlands with irreplaceable ecological functions (i.e., bogs and fens)
Category II	A wetland is considered Category II if it meets none of the Category I criteria and it meets any one of the following five criteria: • Documented occurrences of sensitive species of plant, animal, or fish recognized by federal or state agencies. • Wetlands with significant functions, which may not be adequately replicated through creation or restoration. • Documented priority habitats and species recognized by state agencies. • Freshwater wetlands with significant habitat value (greater than or equal to 22 points). • Wetlands of Local Significance.
Category III	A wetland is considered Category III if it meets none of the Category I or Category II criteria and meets any one of the following three criteria: • Wetlands in which the habitat score for significant habitat value is less than or equal to 21 points. • Wetlands identified as Category III wetlands of local significance; • Estuarine wetlands less than 1 acre.
Category IV	• Wetlands less than 1 acre and hydrologically isolated and comprised of one vegetated class that is dominant (> 80% areal cover) • Wetlands less than two acres and hydrologically isolated and with one vegetated class > 90% of areal cover. • Wetlands that are ponds smaller than 1 acre and excavated from uplands, without a surface water connection to streams, lakes, rivers, or other wetlands.

TABLE 3

Soils Groups and Corresponding Minimum Infiltration Rates

Group	Minimum Infiltration Rate		Soil Description
	In./hr	mm/hr	
A	0.30-0.45	7.6-11.4	Soils having a high infiltration rate. They are chiefly deep, well-drained sands and gravels or deep loess, or aggregate soils. They have low runoff potential.
B	0.15-0.30	3.8-7.6	Soils having a moderate infiltration rate when thoroughly wet. They are chiefly moderately deep, well-drained soils of moderately fine to moderately coarse texture such as shallow loess and sandy loam.
C	0.05-0.15	1.2-3.8	Soils having a slow infiltration rate when wet. They are soils with a layer that impedes downward movement of water, and soils of moderately fine-to-fine texture such as clay loams, shallow sandy loams, soils low in organic content, and soils high in clay content.
D	0.00-0.05	0.00-1.2	Soils having a very slow infiltration rate. They are chiefly clay soils with a high swelling potential, soils with a permanent high water table, soils with a clay pan at or near the surface, shallow soils over nearly impervious material, heavy plastic clays, and certain saline soils. They have high runoff potential.

TABLE 4

Plant Species Observed at the Cherry Point Cogeneration Project area
in Whatcom County, Washington

Vegetation Layer	Common Name	Scientific Name	Wetland Indicator Status[a]
Tree			
	Alaska cedar	*Chamaecyparis nootkatensis*	FAC
	Douglas-fir	*Pseudotsuga menziesii*	FACU
	Western red cedar	*Thuja plicata*	FAC
	Black cottonwood	*Populus trichocarpa*	FAC
	Walnut	*Juglans* spp.	NI
	Pear	*Crataegus* spp.	NI
	Red alder	*Alnus rubra*	FAC
	Paper birch	*Betula papyrifera*	FAC
	Pacific silver fir	*Abies amabilis*	FACU
	Vine maple	*Acer circinatum*	FAC-
Shrub	Salmonberry	*Rubus spectabilis*	FAC+
	Twinberry	*Lonicera involucrata*	FAC+
	European red elderberry	*Sambucus racemosa*	FACU
	Ocean spray	*Holodiscus discolor*	NI
	Hardhack	*Spiraea douglasii*	FACW
	Snowberry	*Symphoricarpos albus*	FACU
	Sitka willow	*Salix sitchensis*	FACW
	Scouler's willow	*Salix scouleriana*	FAC
	Indian plum	*Oemleria cerasiformis*	FACU
	Himalayan blackberry	*Rubus discolor*	FACU
	Evergreen blackberry	*Rubus laciniatus*	FACU+
	Devil's club	*Oplopanax horridus*	FAC+
Herb			
	Canada thistle	*Cirsium arvense*	FACU+
	Piggy-back plant	*Tolmiea menziesii*	FAC
	Red clover	*Trifolium pratense*	FACU
	Creeping buttercup	*Ranunculus repens*	FACW
	Curly dock	*Rumex crispus*	FAC+
	Bleeding heart	*Dicentra formosa*	FACU
	Chickweed	*Stellaria media*	FACU
	Sword fern	*Polystichum munitum*	FACU
	Slough sedge	*Carex obnupta*	OBL
	Stinging nettle	*Urtica dioica*	FAC+
	Quack grass	*Agropyron repens*	FAC-
	Common catsear	*Hypochaeris radicata*	NI
	Hardstem bulrush	*Scirpus acutus*	OBL
	Colonial bent grass	*Agrostis tenuis*	FAC
	Least spike rush	*Eleocharis acicularis*	OBL

TABLE 4

Plant Species Observed at the Cherry Point Cogeneration Project area
in Whatcom County, Washington

Vegetation Layer	Common Name	Scientific Name	Wetland Indicator Status[a]
	Bluegrass	*Poa pratensis*	FAC
Herb	Bull thistle	*Cirsium vulgare*	FACU
	Rough bluegrass	*Poa trivialis*	FACW
	Orchard grass	*Dactylis glomerata*	FACU
	Meadow foxtail	*Alopecurus pratensis*	FACW
	Sword fern	*Polystichum munitum*	FACU
	Dandelion	*Taraxacum officinale*	FACU
	Lady's thumb	*Polygonum persicaria*	FACW
	Soft rush	*Juncus effusus*	FACW
	Merten's rush	*Juncus mertensianus*	OBL
	Starry false soloman's seal	*Smilacina stellata*	FAC-
	Birds-foot trefoil	*Lotus corniculatus*	FAC
	Reed-canary grass	*Phalaris arundinacea*	FACW
	Tall fescue	*Festuca pratensis*	FACU+
	Baltic rush	*Juncus balticus*	FACW+
	Velvet grass	*Holcus lanatus*	FAC
	Vernal sweet grass	*Anthoxanthum odoratum*	FACU
	Bittersweet nightshade	*Solanum dulcamara*	FAC+
	Tiny vetch	*Vicia hirsuta*	NI
	Iris	*Iris missouriensis*	FACW+
	False Solomon's seal		
	English plantain	*Plantago lanceolata*	FAC
	Common plantain	*Plantago major*	FACU+
	Red top	*Agrostis alba*	FAC
	Rye grass	*Elymus canadensis*	FAC
	Giant horsetail	*Equisetum telmateia*	FACW

[a] See Table 1 for definitions.

TABLE 5

Wetland Acreage and Proposed Impacts Due to Construction of the Proposed Cogeneration Project and Related Facilities

Wetland Area	Wetland Location	Wetland Type	Delineated Wetlands (Acres)	Wetland Impact (Acres)
A	Plant Site	Palustrine emergent with planted hybrid poplars	1.69	1.69
B1	Plant Site	Palustrine emergent	0.14	0.14
B2	Plant Site	Palustrine emergent	1.94	1.94
B3	Plant Site & Lay Down Area 4	Palustrine emergent	1.31	1.31
C	Plant Site	Palustrine emergent	4.25	0.88
D	Plant Site	Palustrine emergent	39.33	5.92
E	No Impact	Forested	1.25	0.0
F	Lay Down Area 1	Palustrine emergent	13.66	13.41
G	Lay Down Area 3	Palustrine emergent	5.46	5.46
H	Access Road 2	Palustrine emergent	8.00	0.23
I	No Impact	Palustrine emergent/forested	0.15	0.0
J	Lay Down Area 1	Palustrine emergent	4.39	4.39
K	No Impact	Palustrine emergent	0.62	0.0
Total			**82.19**	**35.37**

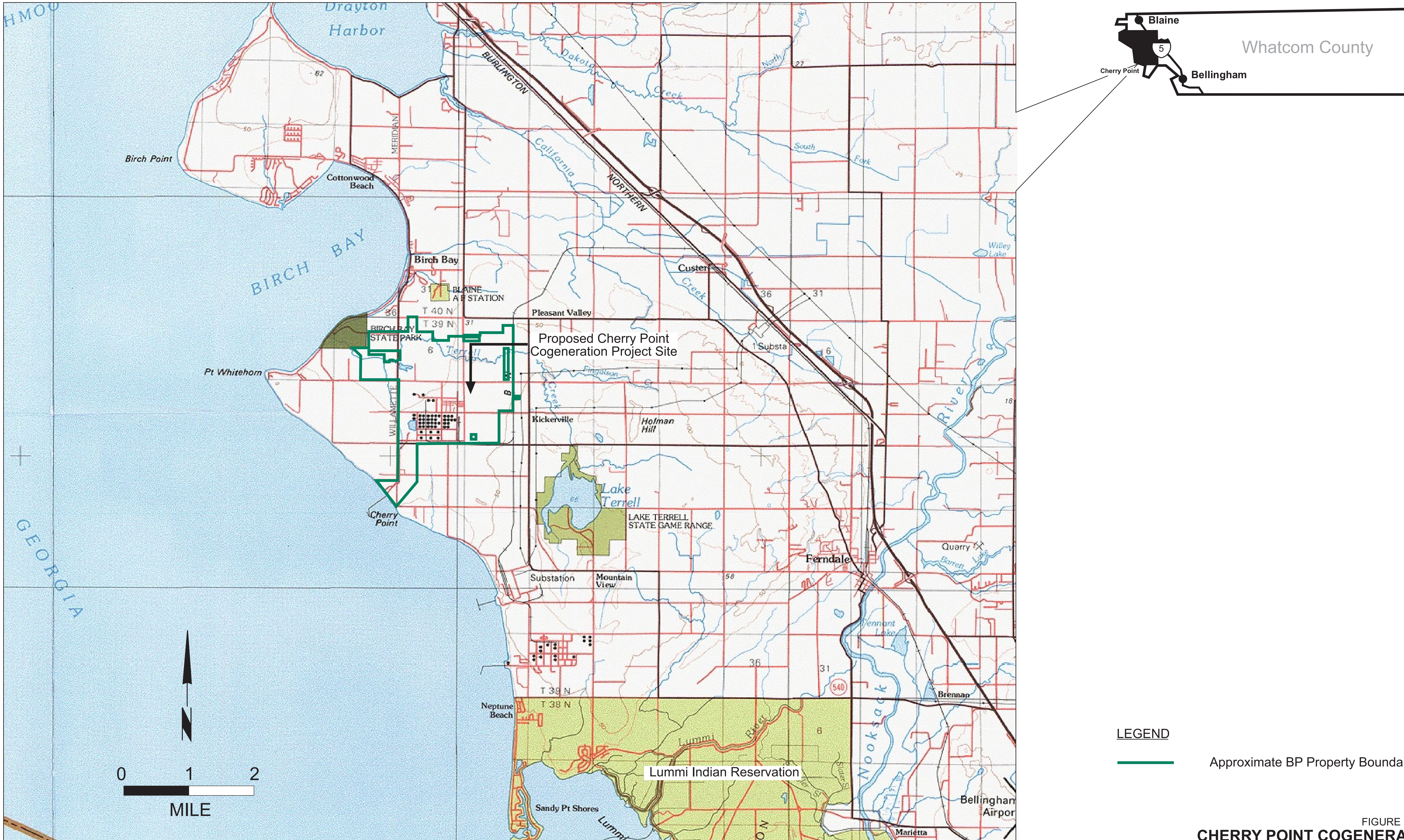
FIGURES

APPENDICES

APPENDIX A

SITE PHOTOGRAPHS

Excerpts of the Technical Report, Wetland Delineation Report BP Cherry Point Cogeneration Project, February 21, 2003, are provided in this EIS. A complete copy of Appendix B, Wetland Rating Field Data Forms, and Appendix C, Project Area Wetland Data Forms, is available from EFSEC upon request.



LEGEND

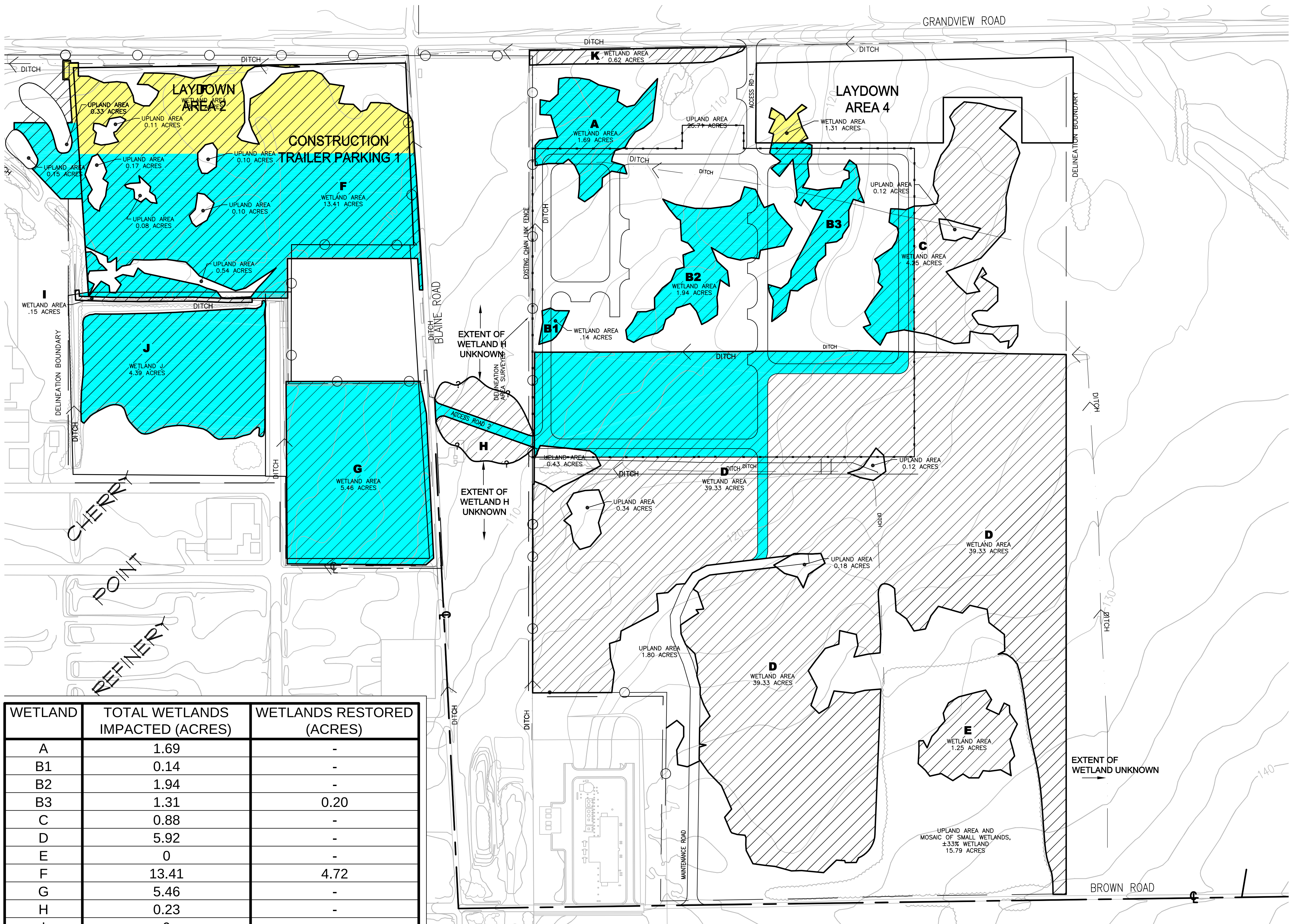
Approximate BP Property Boundary

FIGURE 1-1
CHERRY POINT COGENERATION PROJECT LOCATION MAP
BP/COGENERATION PROJECT/WA

Prepared by: Golder Associates

DRAWING NO. 0131421001008fg01.fh9 DATE 02/18/03 DRAWN BY EL

Golder Associates



WETLAND	TOTAL WETLANDS IMPACTED (ACRES)	WETLANDS RESTORED (ACRES)
A	1.69	-
B1	0.14	-
B2	1.94	-
B3	1.31	0.20
C	0.88	-
D	5.92	-
E	0	-
F	13.41	4.72
G	5.46	-
H	0.23	-
I	0	-
J	4.39	-
K	0	-

TWP. 39N, R. 1E, W.M.

NW 1/4 SECTION 8
TOWNSHIP 39 NORTH, RANGE 1 EAST
WHATCOM COUNTY, WASHINGTON

Reference: Larry Steel & Associates Land Surveyors
Topography and existing features provided by Anvil Corp.

N

0 300 600
FEET

LEGEND

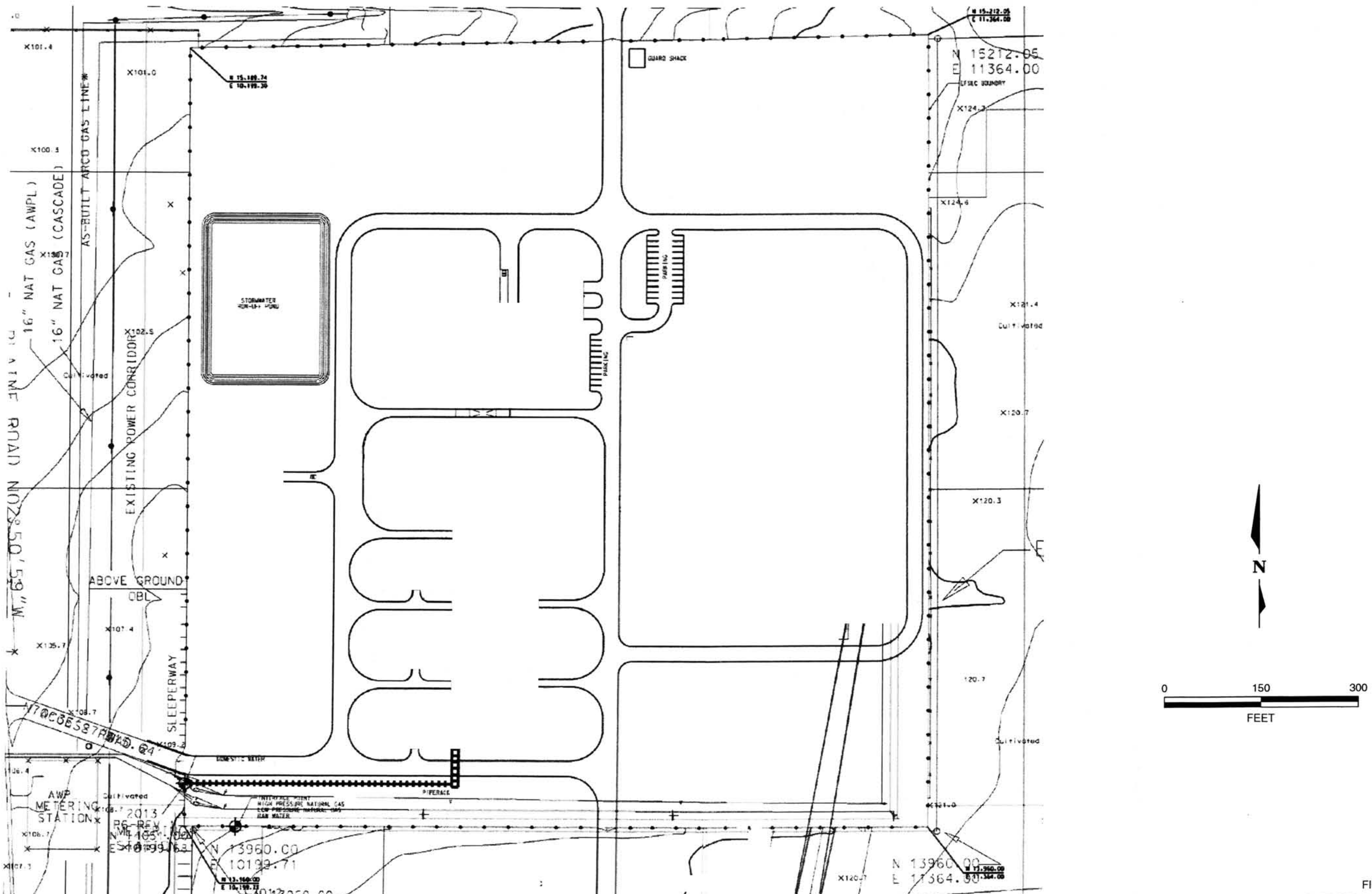
- WETLAND AREA DELINEATED
- PERMANENT IMPACTED WETLAND AREA
- RECLAIMED IMPACTED WETLAND AREA

NOTE: IMPACTS CAUSED BY THE INSTALLATION OF THE TRANSMISSION LINE AND ASSOCIATED FOOTINGS HAVE BEEN PREVIOUSLY PERMITTED (COE PERMIT # 1998-4-02349)

FIGURE **1-2**
DELINEATED AND IMPACTED WETLANDS
BP/CHERRY POINT/WA

Golder Associates

Drawing file: 0131421001008F17.dwg Mar 13, 2003 – 3:17pm

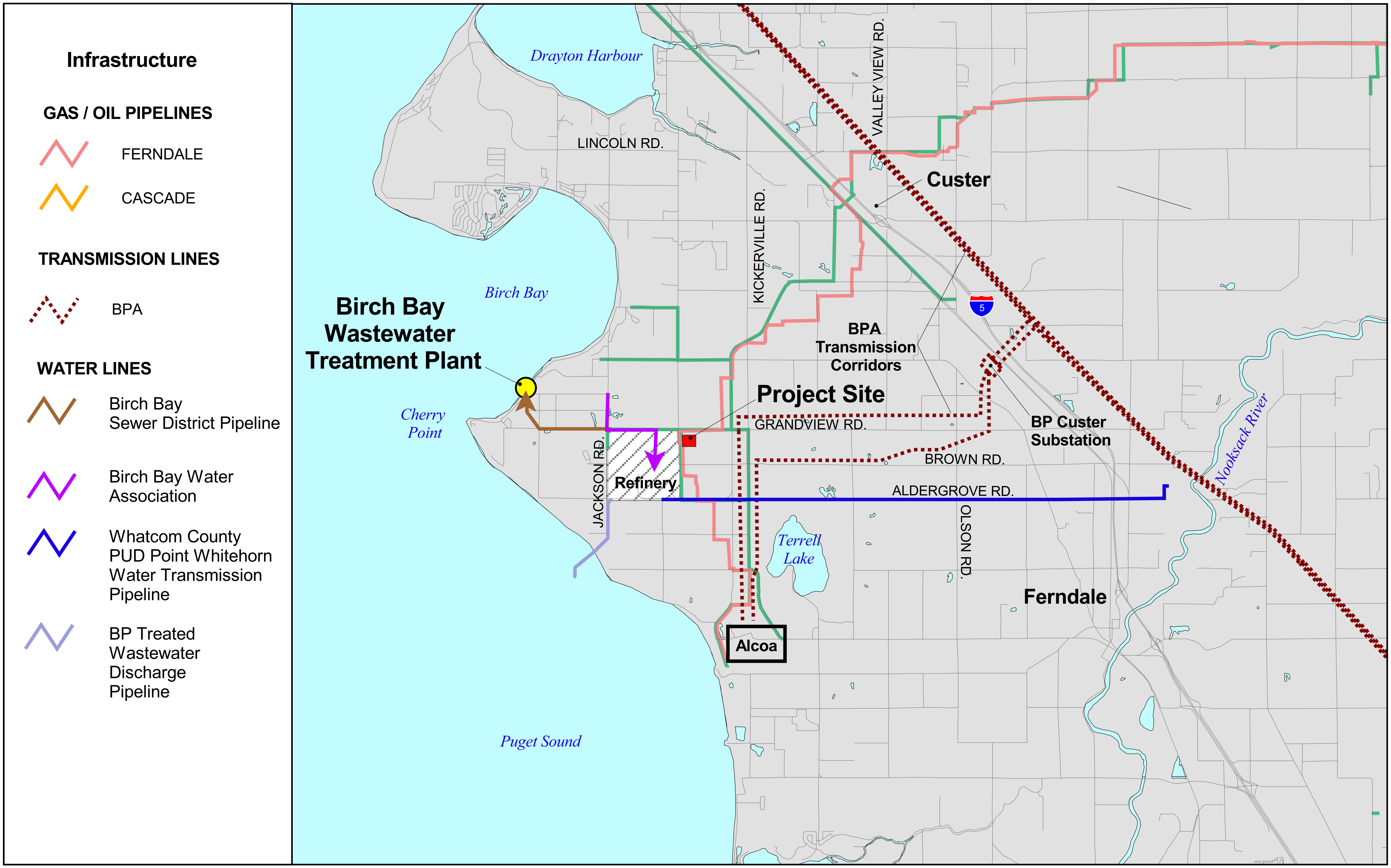


SOURCE: CHERRY POINT REFINERY, GENERAL REFINERY
UNIT 43 CO-GENERATION SITE LOCATION PLAN.

FIGURE **1-3**
PROJECT SITE PLAN
BP/COGENERATION PROJECT/WA

Drawing file: 0131421001013F01.dwg Mar 14, 2003 – 12:48pm

Golder Associates



Legend

- Proposed Project Site
- Water
- BP Cherry Point Refinery

N

0 2

Scale 1" = 2 Miles

Map Projection: UTM, NAD27, Zone 10, Meters

Source: Whatcom County GIS, WSDOT, WSDOE, Golder Associates Inc.

Prepared by: Golder Associates

CHERRY POINT COGENERATION PROJECT
EXISTING UTILITY INFRASTRUCTURE

BP CHERRY POINT COGENERATION PROJECT

Drawn: GKL	App'd:	Date: Feb 18, 2003	Figure: 1-4

0131421x001800_021803.apr

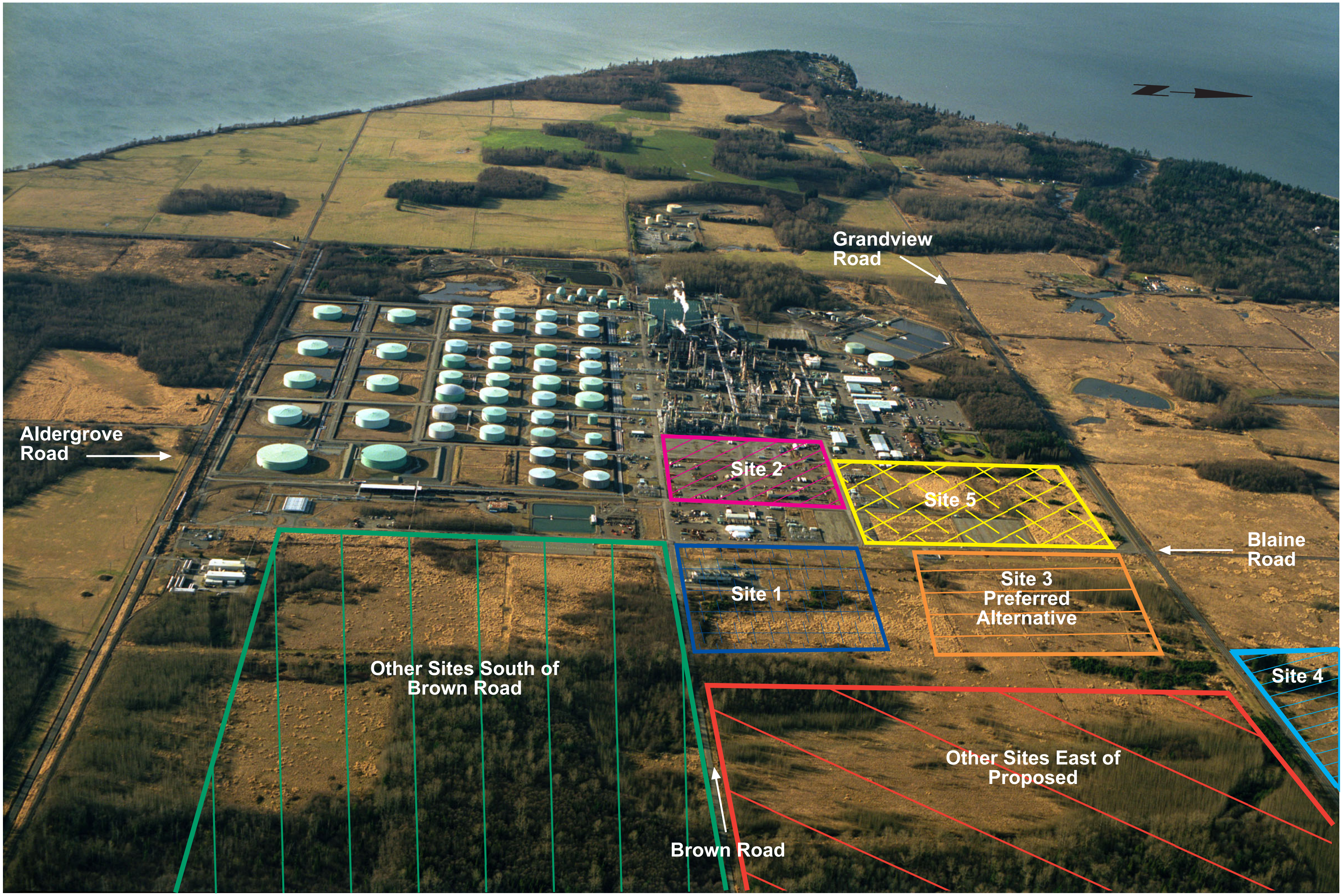
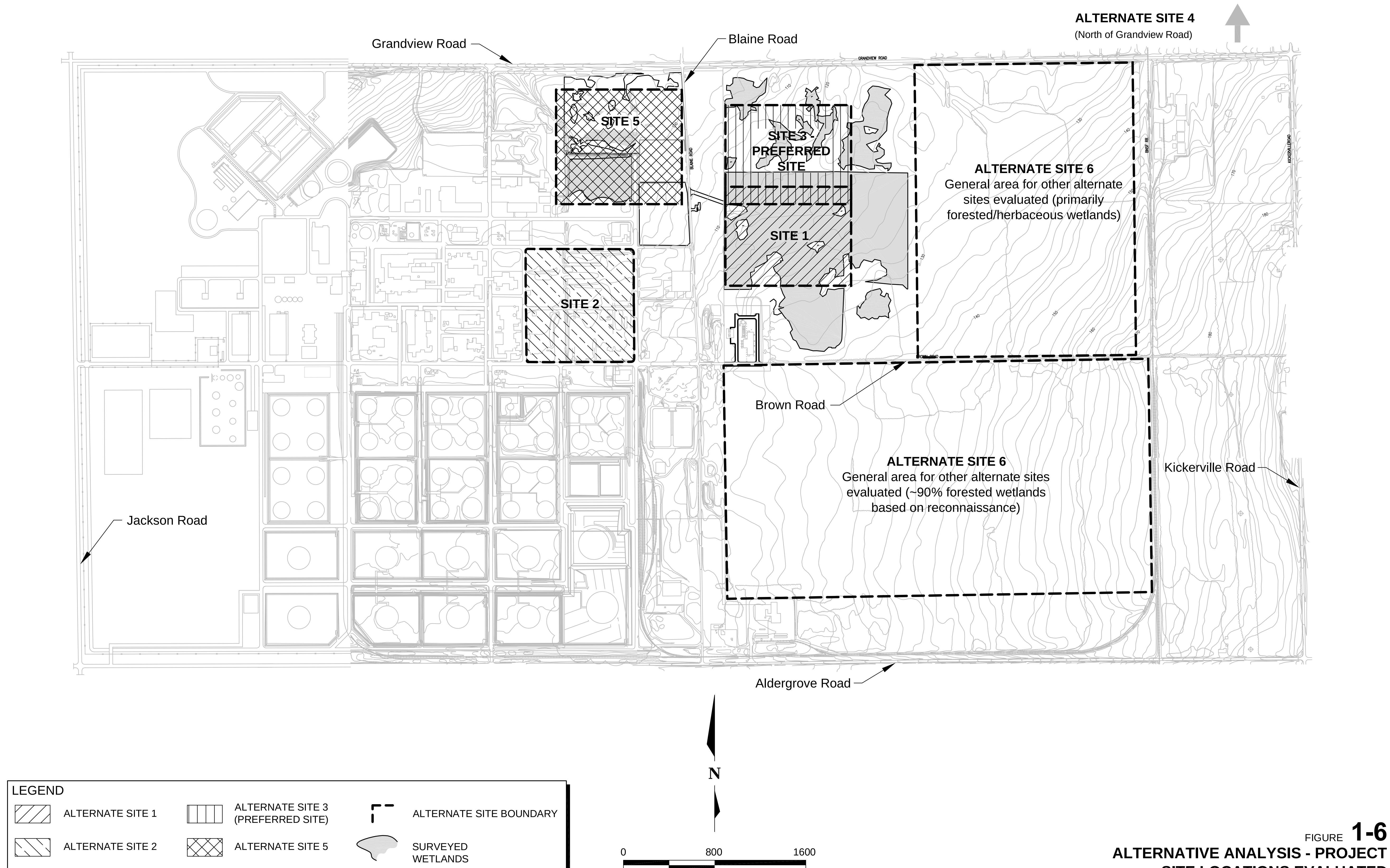


FIGURE **1-5**
ALTERNATE SITE LOCATIONS
BP/CHERRY POINT/WA

DRAWING NO. 0131421001008fg02.fh9 DATE 02/18/03 DRAWN BY EL

Golder Associates



Prepared by: Golder Associates

FIGURE **1-6**

ALTERNATIVE ANALYSIS - PROJECT SITE LOCATIONS EVALUATED

BP/CHERRY POINT/WA

Drawing file: 0131421001008F03.dwg Mar 13, 2003 – 3:19pm

Golder Associates

FIGURE **1-7**

PREFERRED AND ALTERNATIVE CONSTRUCTION LAYDOWN (STAGING AND ASSEMBLY) AREAS

BP/CHERRY POINT/WA

DRAWING NO. 0131421001008fg03.fh9 DATE 02/18/03 DRAWN BY EL

Golder Associates

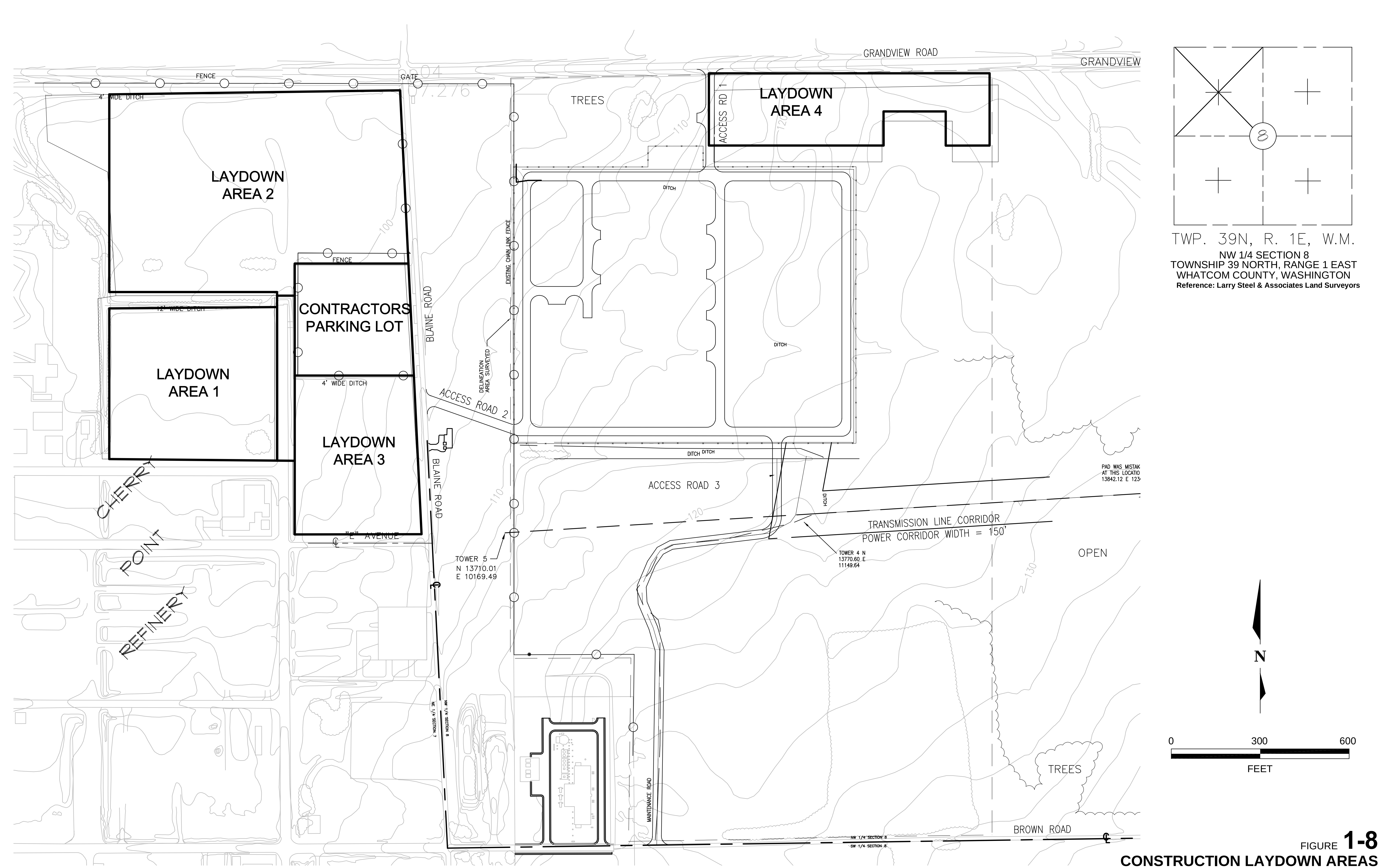


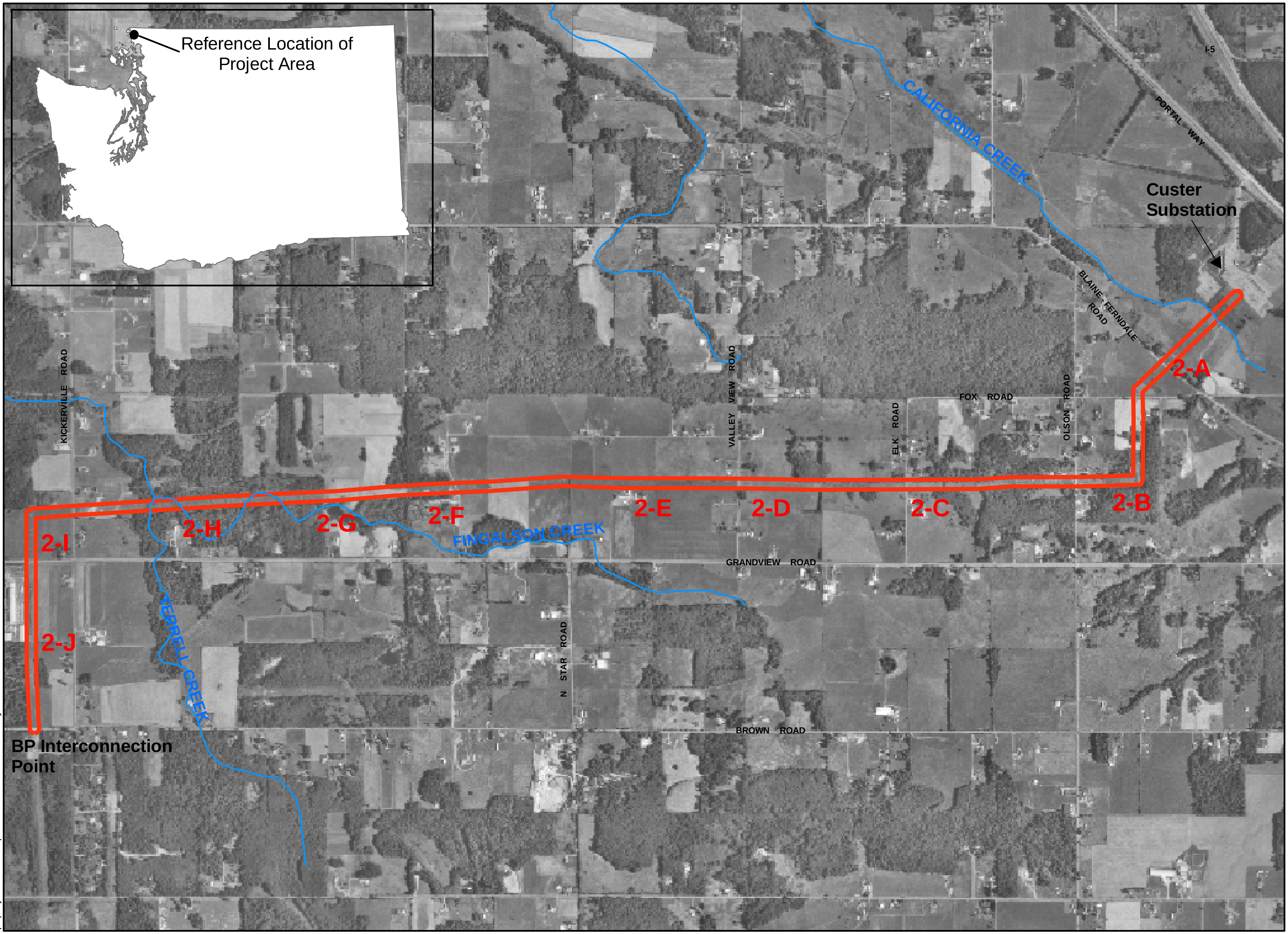
FIGURE **1-8**

CONSTRUCTION LAYDOWN AREAS

BP/CHERRY POINT/WA

Drawing file: 0131421001008F02.dwg Mar 13, 2003 – 3:21pm

Golder Associates



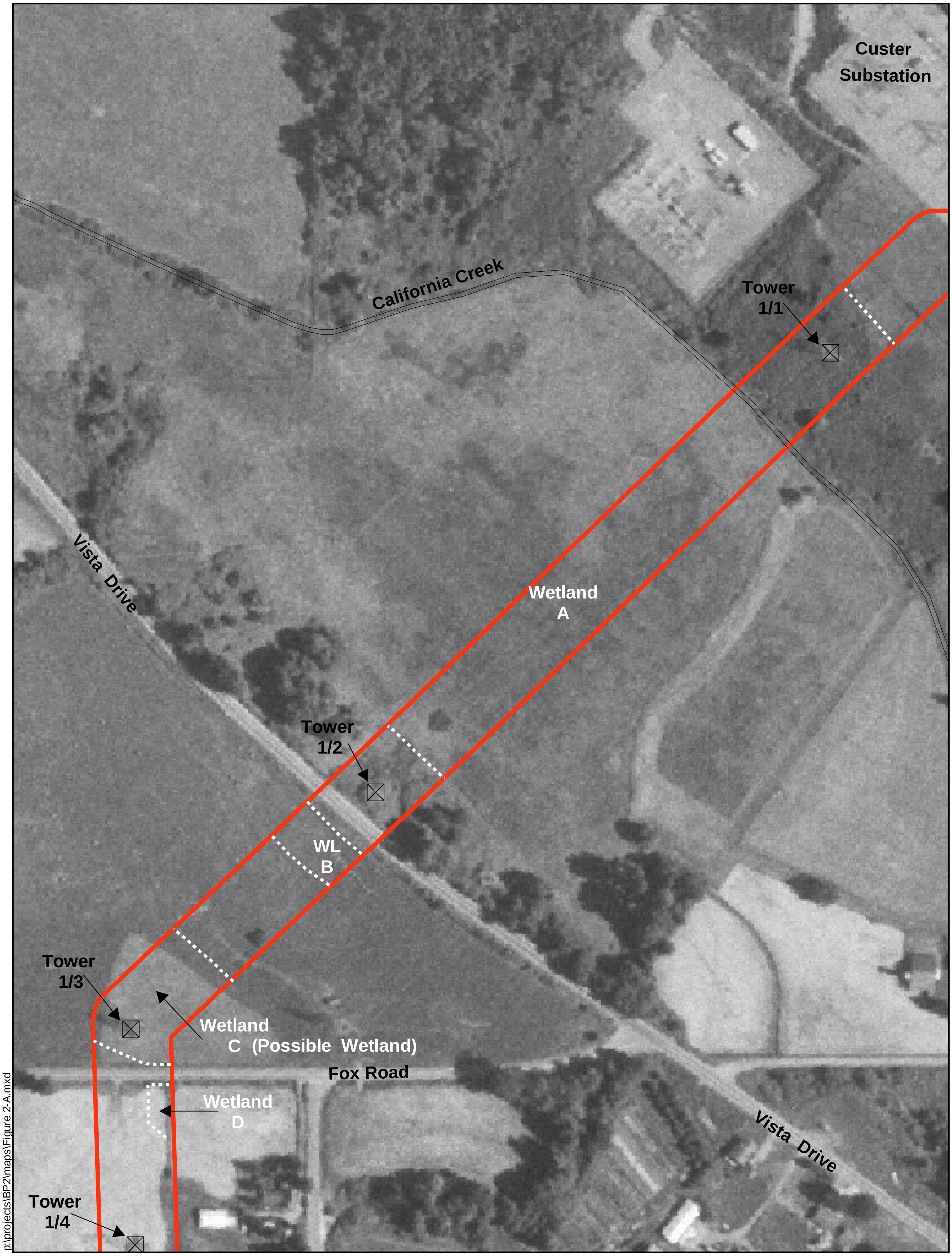
Note: Numbers along right-of-way refer to corresponding figures.

0 0.125 0.25 0.5 0.75 1
Miles
1 inch equals 2,000.000000 feet

URS
NAD 1927 UTM Zone 10 North

Figure 1

Transmission Line Right-of-Way Study Area



Legend

- Transmission tower
- W Open water
- Approximate wetland boundary
- Approximate creek location
- Transmission line right-of-way boundary

0 125 250 500 Feet

1 inch equals 250 feet

Figure 2-A

Legend

- Transmission tower
- W Open water
- Approximate wetland boundary
- Approximate creek location
- Transmission line right-of-way boundary

0 125 250 500
Feet
1 inch equals 250 feet

Figure 2-B


Elk Road
Tower 2/3
Tower 2/2
Tower 2/1
unnamed creek
unnamed creek
Wetland M
Wetland N
Wetland L
Wetland K
p:\projects\BP2\map\Figure 2-C.mxd
Legend
Transmission tower
W Open water
Approximate wetland boundary
Approximate creek location
Transmission line right-of-way boundary
0 125 250 500
Feet
1 inch equals 250 feet

Figure 2-C

Legend

Transmission tower

W Open water

Approximate wetland boundary

Approximate creek location

Transmission line right-of-way boundary

0 125 250 500

Feet

1 inch equals 250 feet

Figure 2-D

Legend

⊠	Transmission tower
W	Open water
(dotted band)	Approximate wetland boundary
(double line)	Approximate creek location
(red line)	Transmission line right-of-way boundary

0 125 250 500
Feet
1 inch equals 250 feet

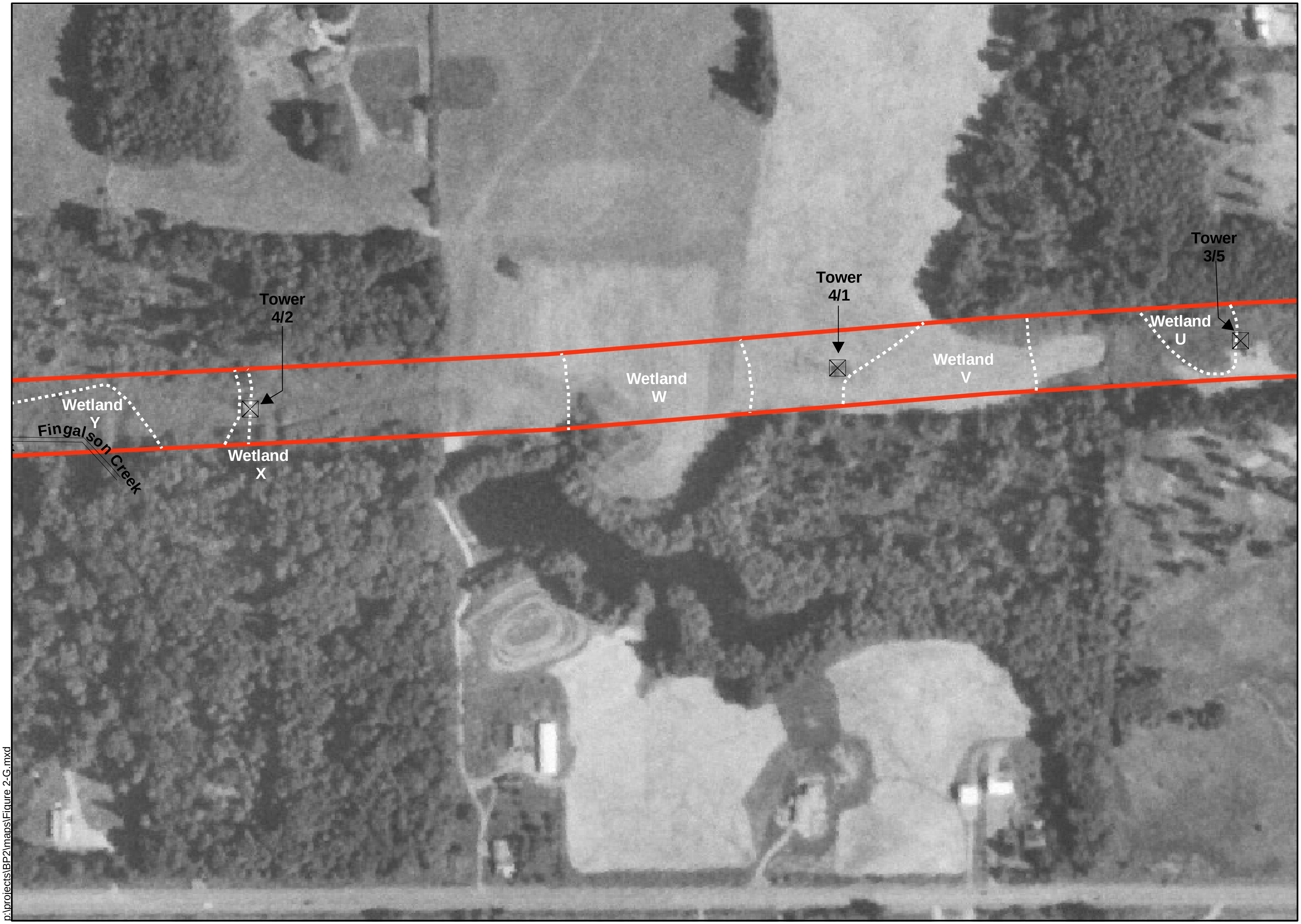
Figure 2-E

Legend

⊠	Transmission tower
W	Open water
	Approximate wetland boundary
	Approximate creek location
	Transmission line right-of-way boundary

0 125 250 500
Feet
1 inch equals 250 feet

Figure 2-F



Legend

⊠	Transmission tower
W	Open water
(dotted line)	Approximate wetland boundary
(double line)	Approximate creek location
(red line)	Transmission line right-of-way boundary

0 125 250 500
Feet
1 inch equals 250 feet

Figure 2-G

Legend

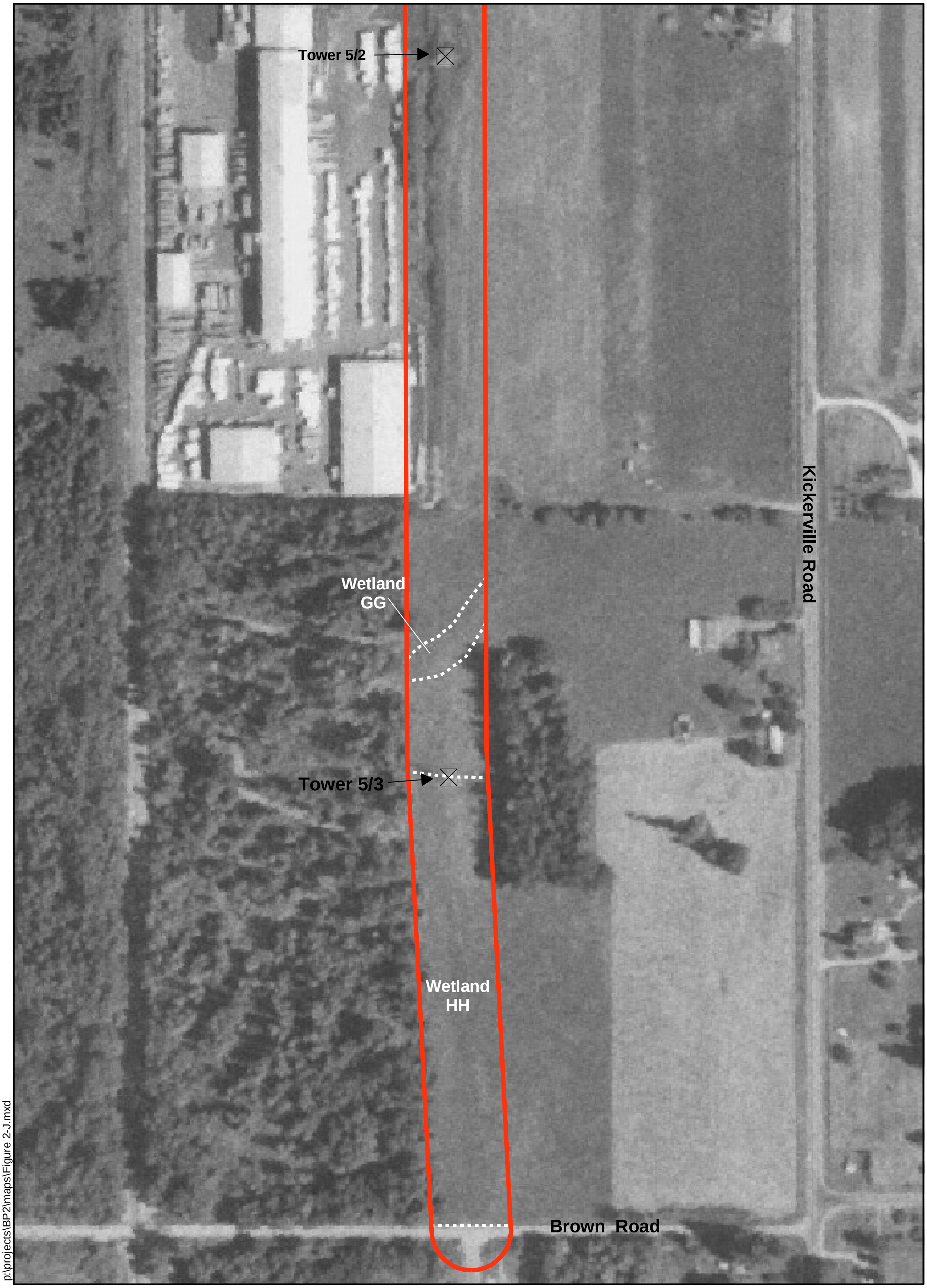
- ⊠ Transmission tower
- W Open water
- Approximate wetland boundary
- Approximate creek location
- Transmission line right-of-way boundary

0 125 250 500
Feet
1 inch equals 250 feet

Figure 2-H


Kickerville Road
Tower 4/5
Tower 5/1
Wetland DD
Wetland CC
Wetland BB
Wetland EE
Grandview Road
Wetland FF
p:\projects\BP2\maps\Figure 2-I.mxd
Legend
Transmission tower
W Open water
Approximate wetland boundary
Approximate creek location
Transmission line right-of-way boundary
0 125 250 500
Feet
1 inch equals 250 feet

Figure 2-I


Tower 5/2
Wetland
GG
Tower 5/3
Wetland
HH
Kickerville Road
Brown Road
p:\projects\BP2\maps\Figure 2-J.mxd

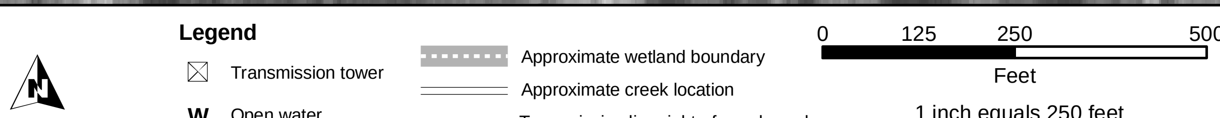
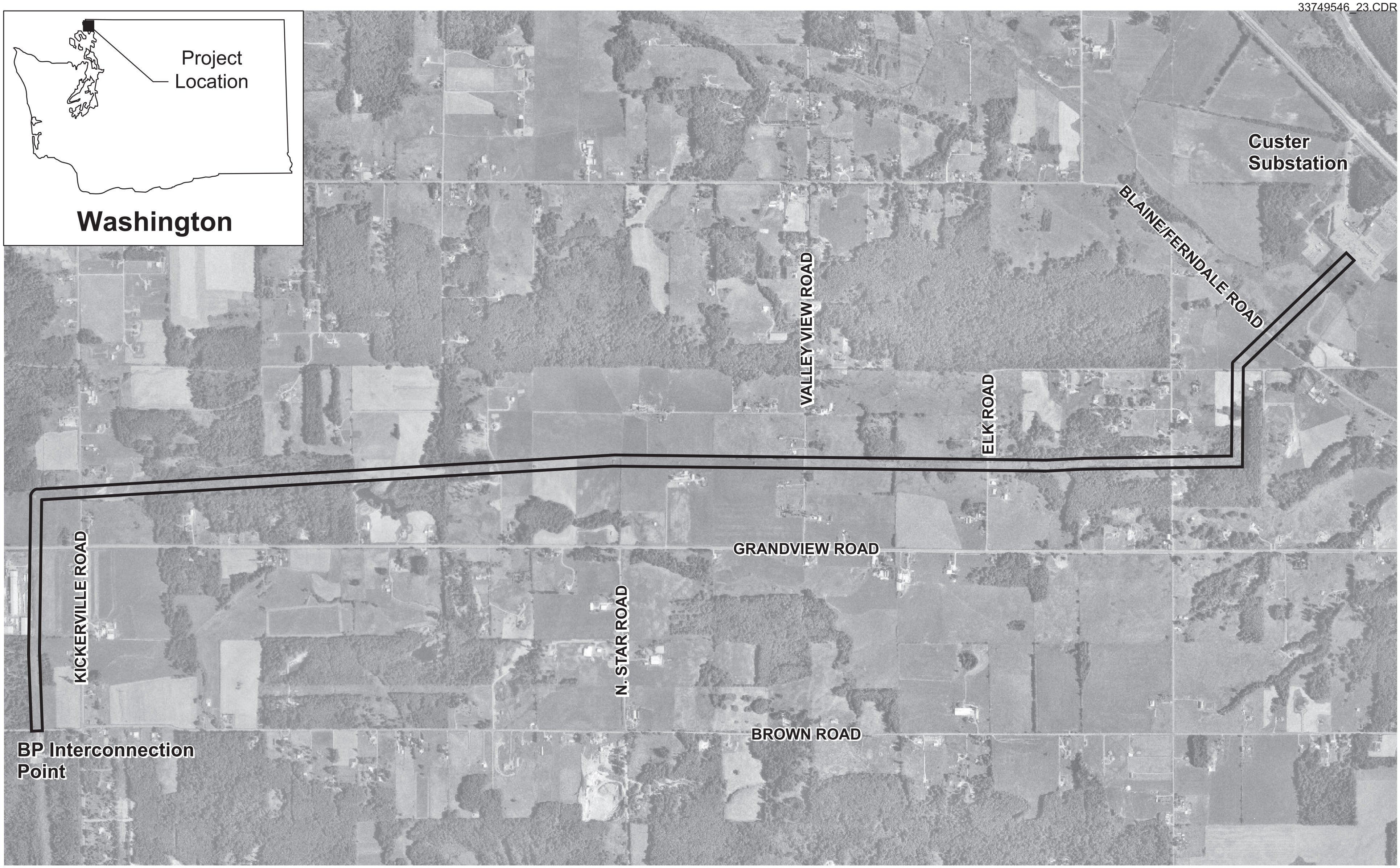

Legend
Transmission tower
W Open water
Approximate wetland boundary
Approximate creek location
Transmission line right-of-way boundary
0
125
250
500
Feet
1 inch equals 250 feet

Figure 2-J

33749546_23.CDR



NOTE: Map from Environmental Resources Report, May 2003

0 0.5 1.0

Scale in Miles

Job No. 33749546

Figure A-1

Transmission Line Right-of-Way Study Area

URS

Visual Resources Report
BPA Transmission Line Brown Road to Custer Substation
June 2003

Looking east at Custer Substation from Blaine/Ferndale Road

Looking east near edge of Bannerman property

Figure A-2

Photographs (Existing Conditions)

Looking west near edge of Bannerman property

Looking north from Grandview Road near Kickerville Road

Figure A-3

Photographs
(Existing Conditions)

Looking east at Custer Substation from Blaine/Ferndale Road

Looking east near edge of Bannerman property

Figure A-4

Visual Simulations (Build Alternative)

33749546_04.PMD

Looking west near edge of Bannerman property

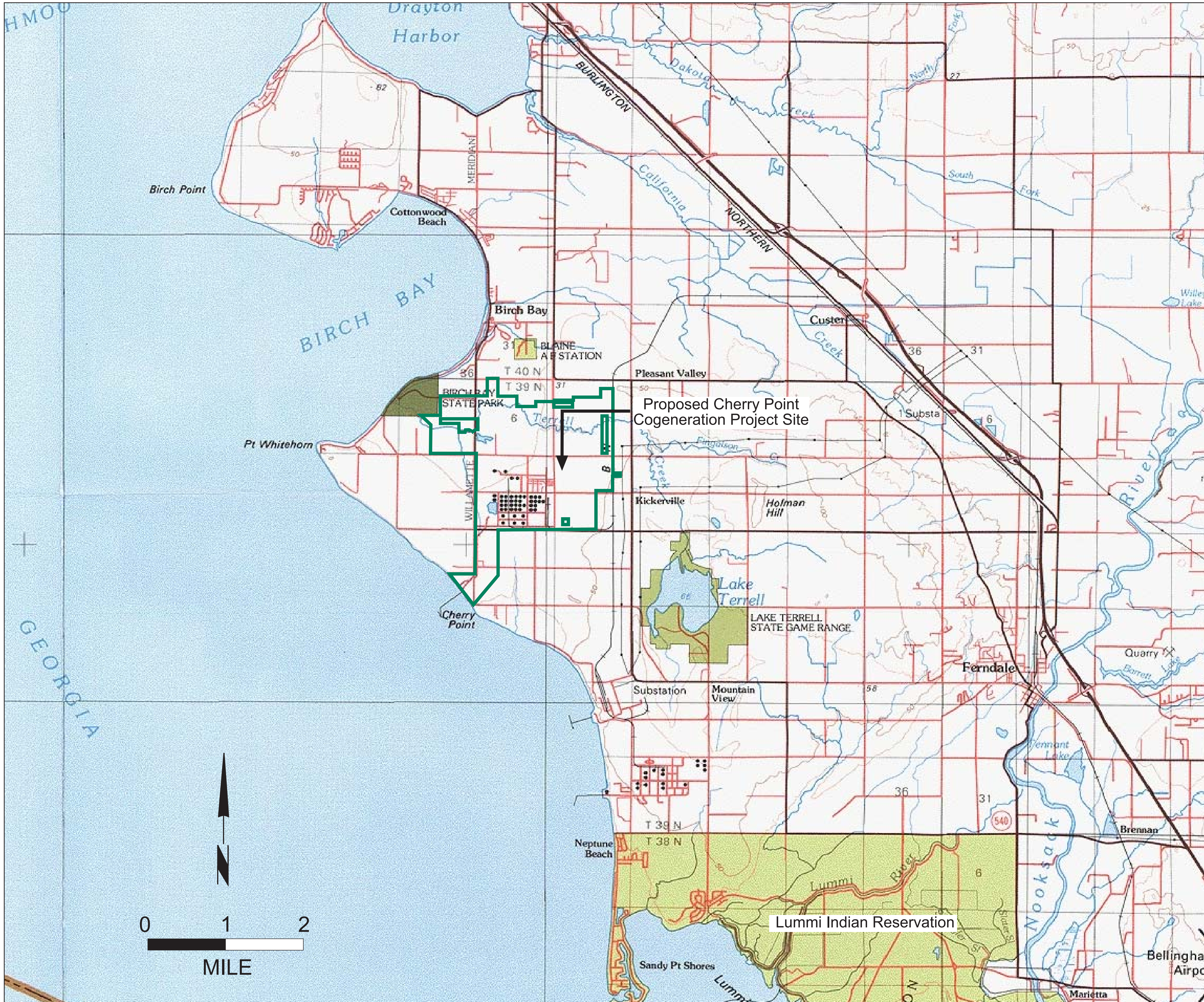
Figure A-5

Visual Simulations (Build Alternative)

Job No. 33749546

URS

Visual Resources Report
BPA Transmission Line Brown Road to Custer Substation
June 2003



LEGEND

Approximate BP Property Boundary

FIGURE 1

CHERRY POINT COGENERATION PROJECT LOCATION MAP

BP/COGENERATION PROJECT/WA

Prepared by: Golder Associates

DRAWING NO. 0131421001005fg02.fh9 DATE 10/17/02 DRAWN BY DC

Golder Associates

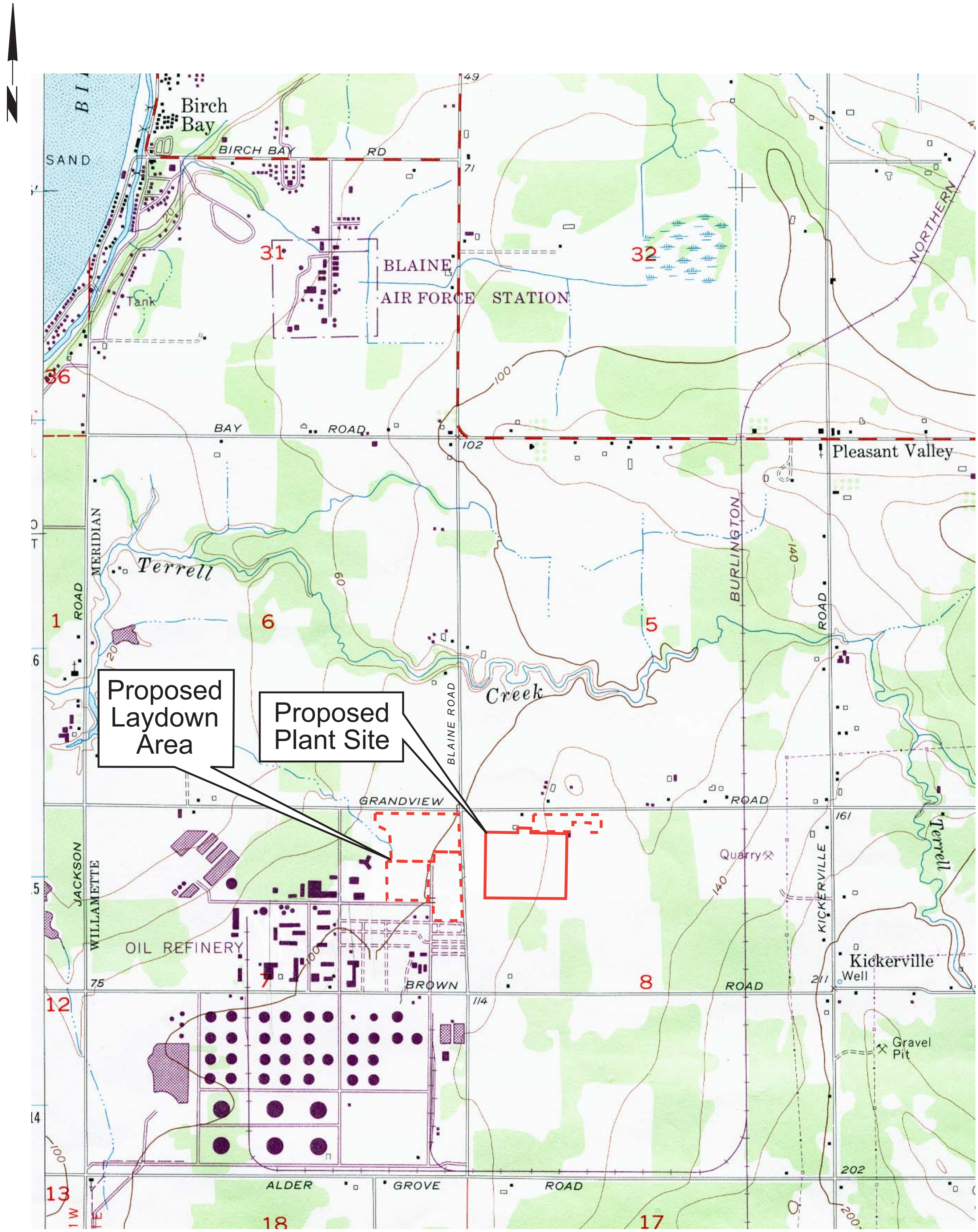
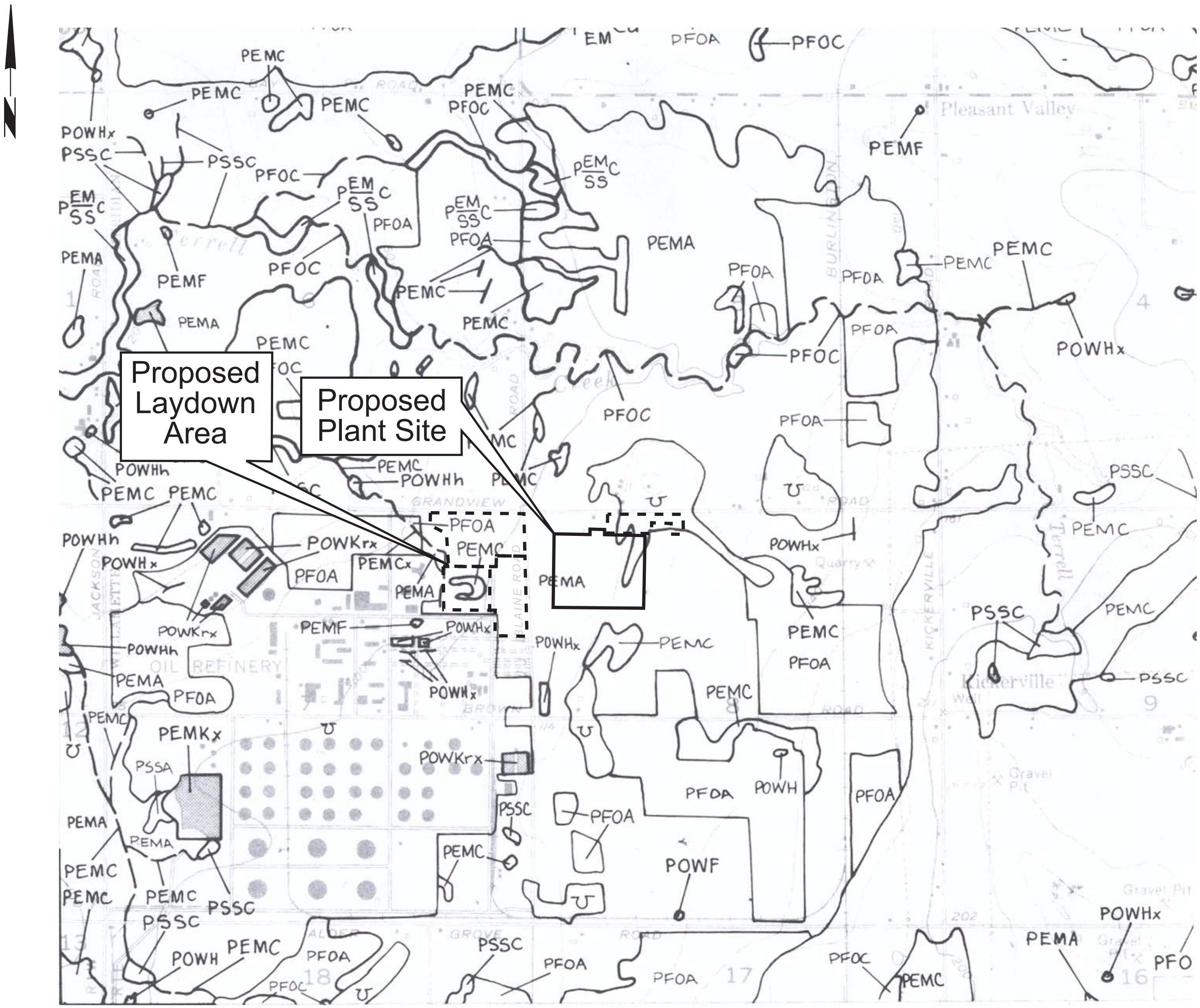


FIGURE 2
BLAINE, WASHINGTON USGS QUAD STUDY AREA
BP/COGENTERATION PROJECT/WA

Prepared by: Golder Associates

DRAWING NO. 0131421541afg02.fh9 DATE 06/05/02 DRAWN BY DC



WETLAND ACRONYM LEGEND

Ʊ	Upland Areas
$POWH_x$	Palustrine Open Water Permanently Flooded Excavated
PEMC	Palustrine Emergent Seasonally Flooded
PFOA	Palustrine Forested Temporarily Flooded
PEMA	Palustrine Emergent Temporarily Flooded

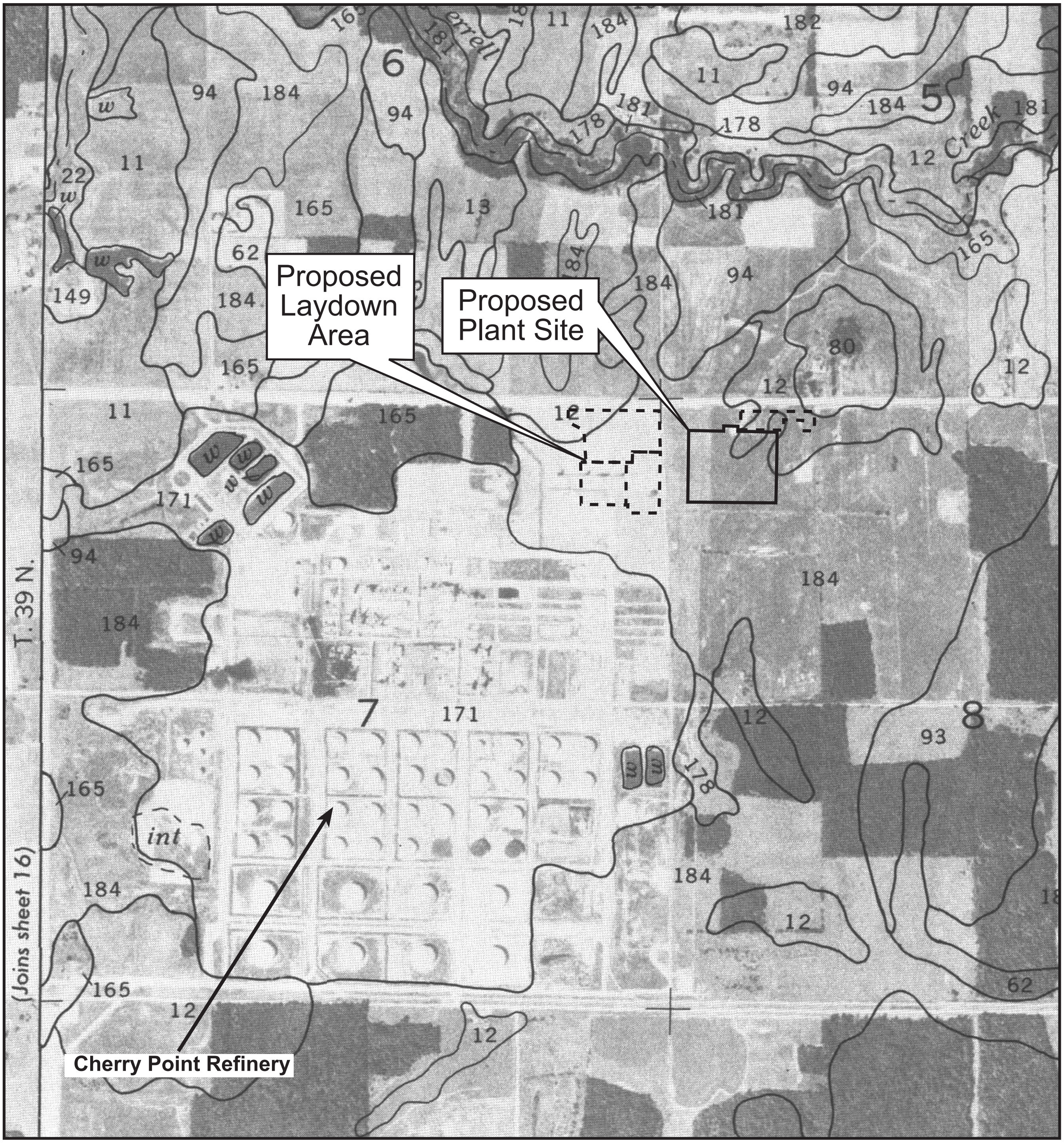
FIGURE 3

NWI MAP FOR STUDY AREA (BLAINE, WASHINGTON QUAD)

BP/COGENERATION PROJECT/WA

Prepared by: Golder Associates

DRAWING NO. 0131421541afg03.fh9 DATE 06/05/02 DRAWN BY DC



LEGEND

12	Birch Bay Soil Series
80	Kickerville Soil Series
165	Tromp Soil Series
184	Whitehorn Soil Series

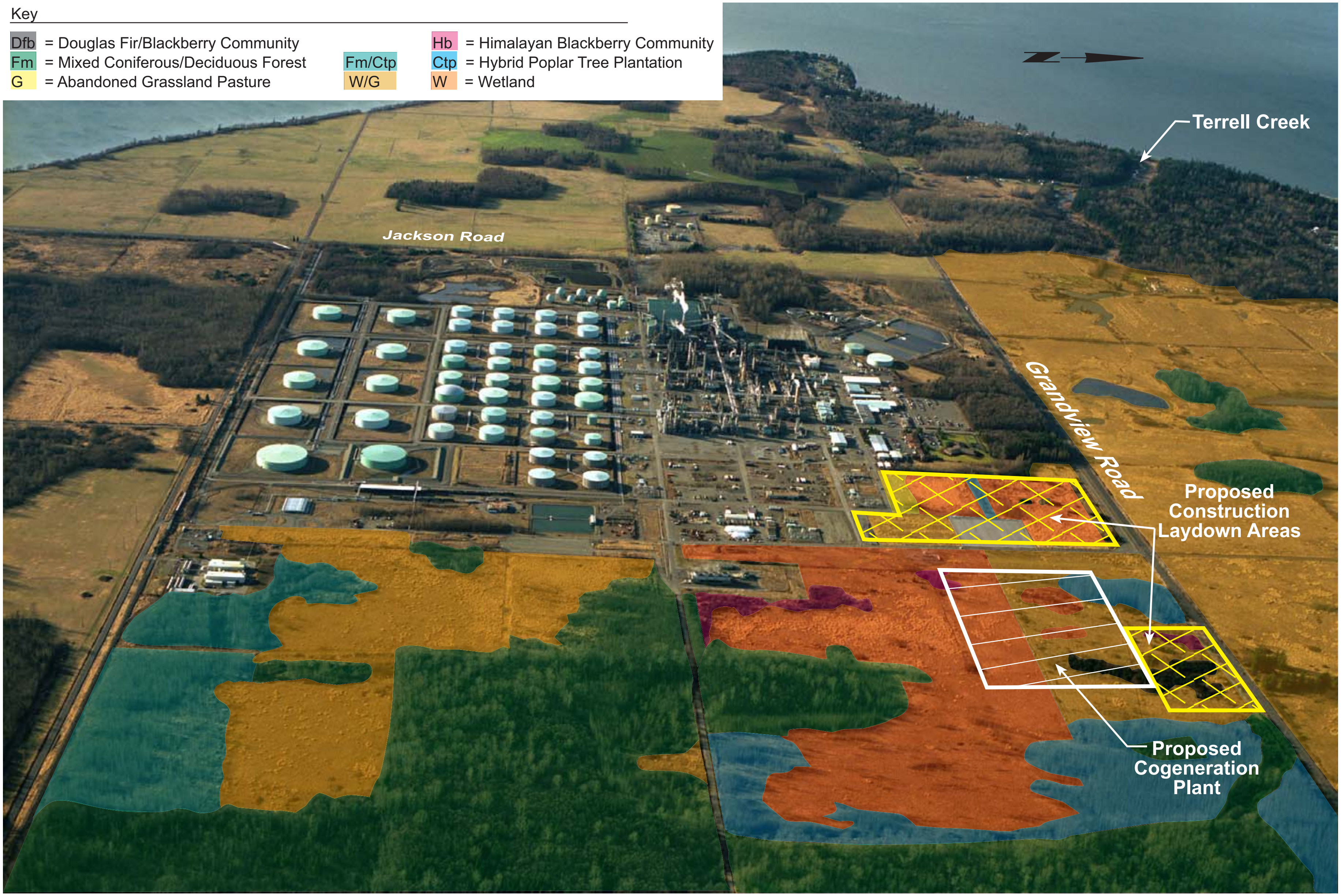
FIGURE **4**

WHATCOM COUNTY SOIL SURVEY

BP/CHERRY POINT COGENERATION PLANT/WA

Prepared by: Golder Associates

DRAWING NO. 0131421541afg04 DATE 06/04/02 DRAWN BY EL



Note:
This figure is for representational purposes only.

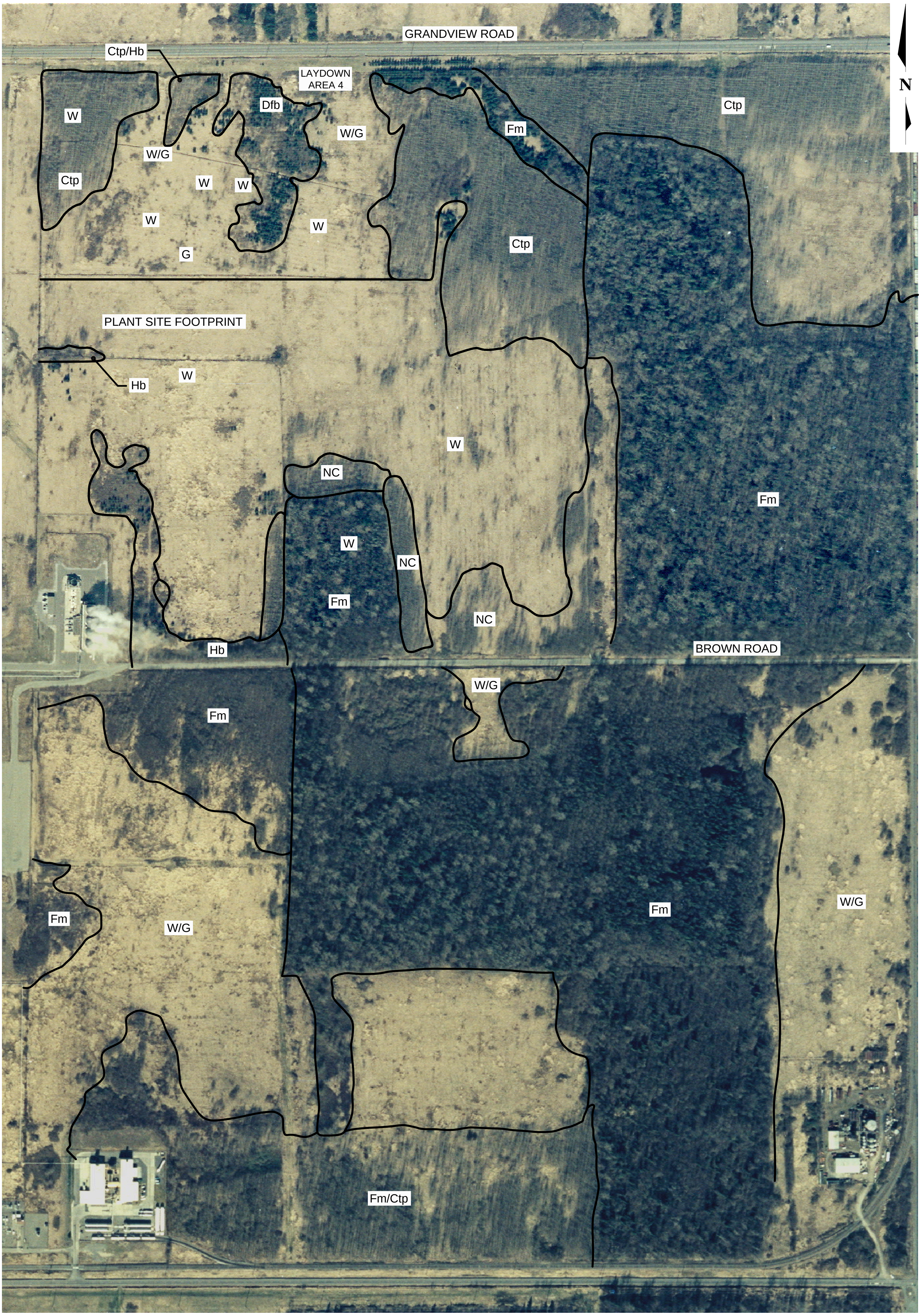
FIGURE 5

BP CHERRY POINT REFINERY PROPOSED COGENERATION PROJECT SITE AND SURROUNDING AREAS VEGETATION/HABITAT MAP (VIEW 1)

BP/CHERRY POINT/WA

DRAWING NO. 0131421541afg05 DATE 06/04/02 DRAWN BY EL

Golder Associates



LEGEND

NC	MIXED DECIDUOUS
Dfb	DOUGLAS FIR/BLACKBERRY COMMUNITY
Fm	MIXED CONIFEROUS/DECIDUOUS FOREST
G	ABANDONED GRASSLAND PASTURE
Hb	HIMALAYAN BLACKBERRY COMMUNITY
Ctp	HYBRID POPLAR TREE PLANTATION
W	WETLAND

0 400 800

FEET

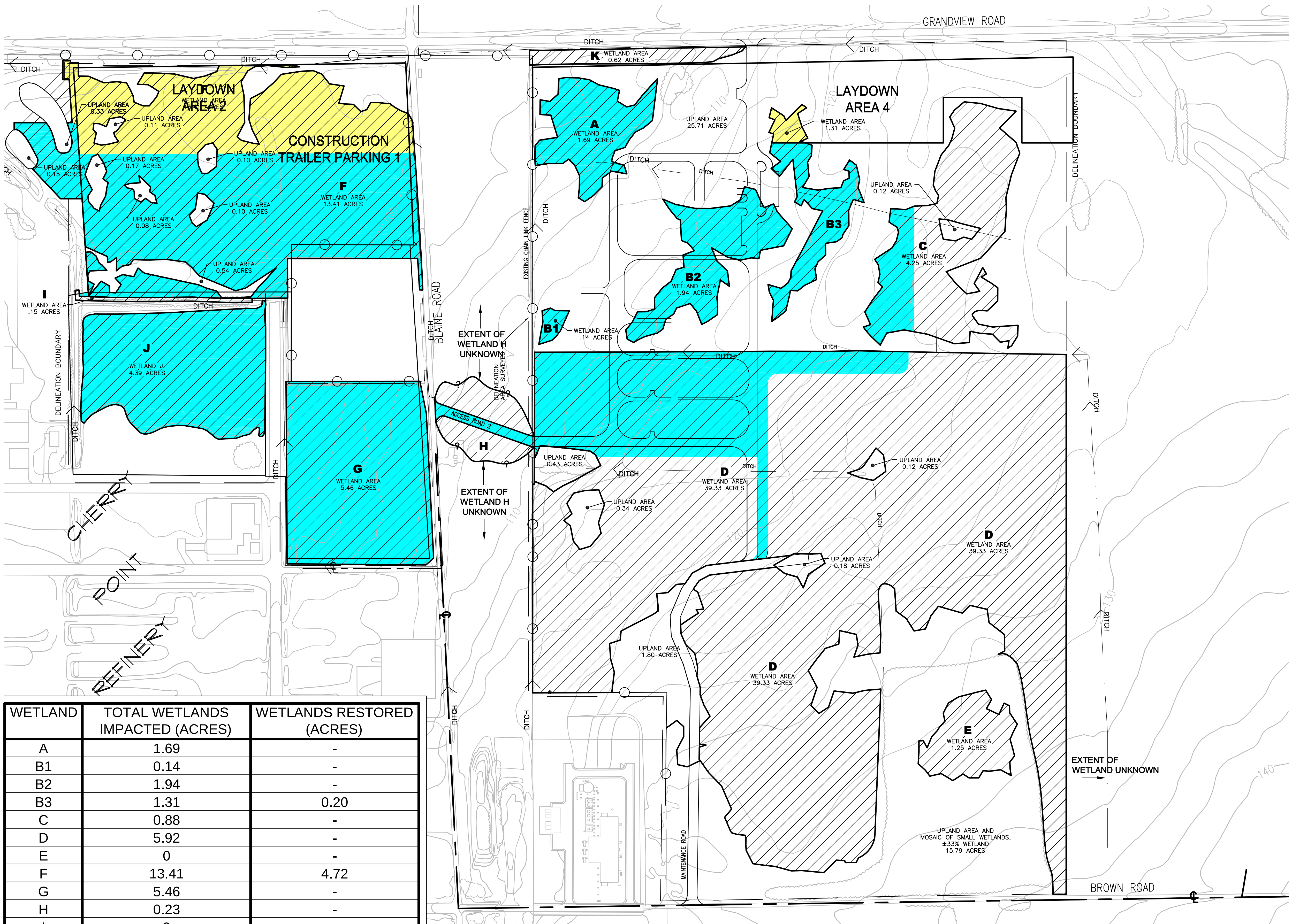
FIGURE **6**

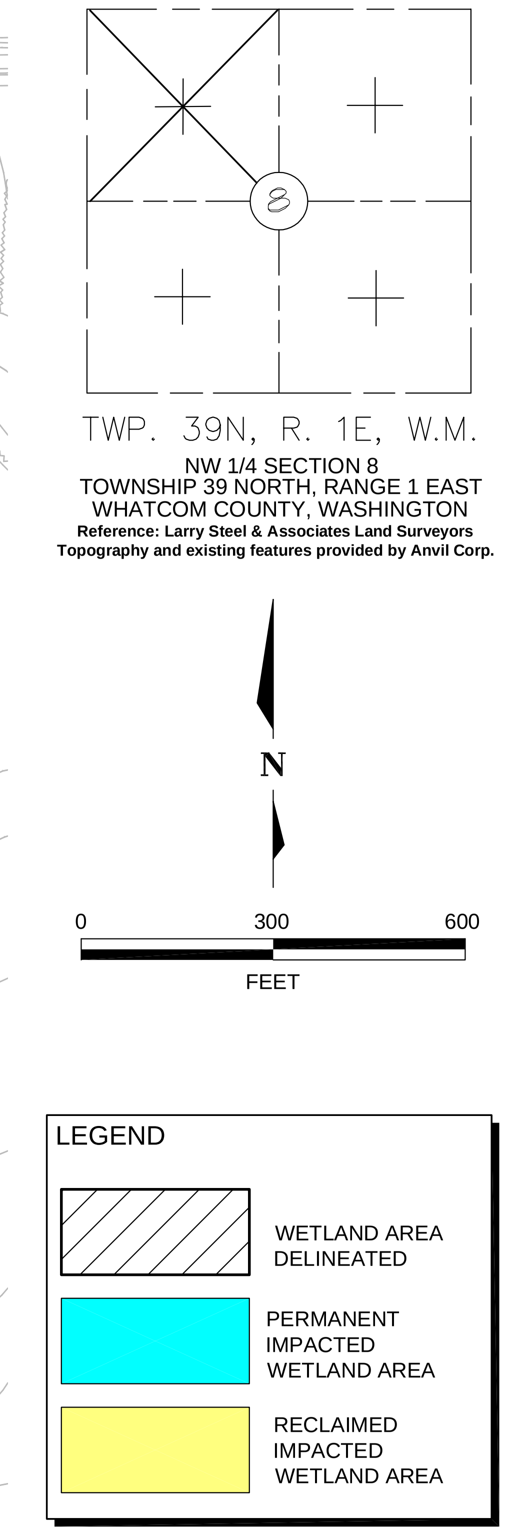
BP CHERRY POINT REFINERY
PROPOSED COGENERATION PROJECT
SITE VEGETATION MAP (VIEW 2)

BP/CHERRY POINT/WA

DCabe|K:\Projects\2001\0131421\541a\0131421541aF01.dwg|6-6-2 13:16|x:Xr-Site,Xr-Base,Xr-Wetland|i:BPSite.tif

Golder Associates





WETLAND	TOTAL WETLANDS IMPACTED (ACRES)	WETLANDS RESTORED (ACRES)
A	1.69	-
B1	0.14	-
B2	1.94	-
B3	1.31	0.20
C	0.88	-
D	5.92	-
E	0	-
F	13.41	4.72
G	5.46	-
H	0.23	-
I	0	-
J	4.39	-
K	0	-

NOTE: IMPACTS CAUSED BY THE INSTALLATION OF THE TRANSMISSION LINE AND ASSOCIATED FOOTINGS HAVE BEEN PREVIOUSLY PERMITTED (COE PERMIT # 1998-4-02349)

FIGURE **7a**

DELINEATED AND IMPACTED WETLANDS

BP/CHERRY POINT/WA

Drawing file: 0131421001005F17.dwg Apr 02, 2003 – 10:04am

Golder Associates

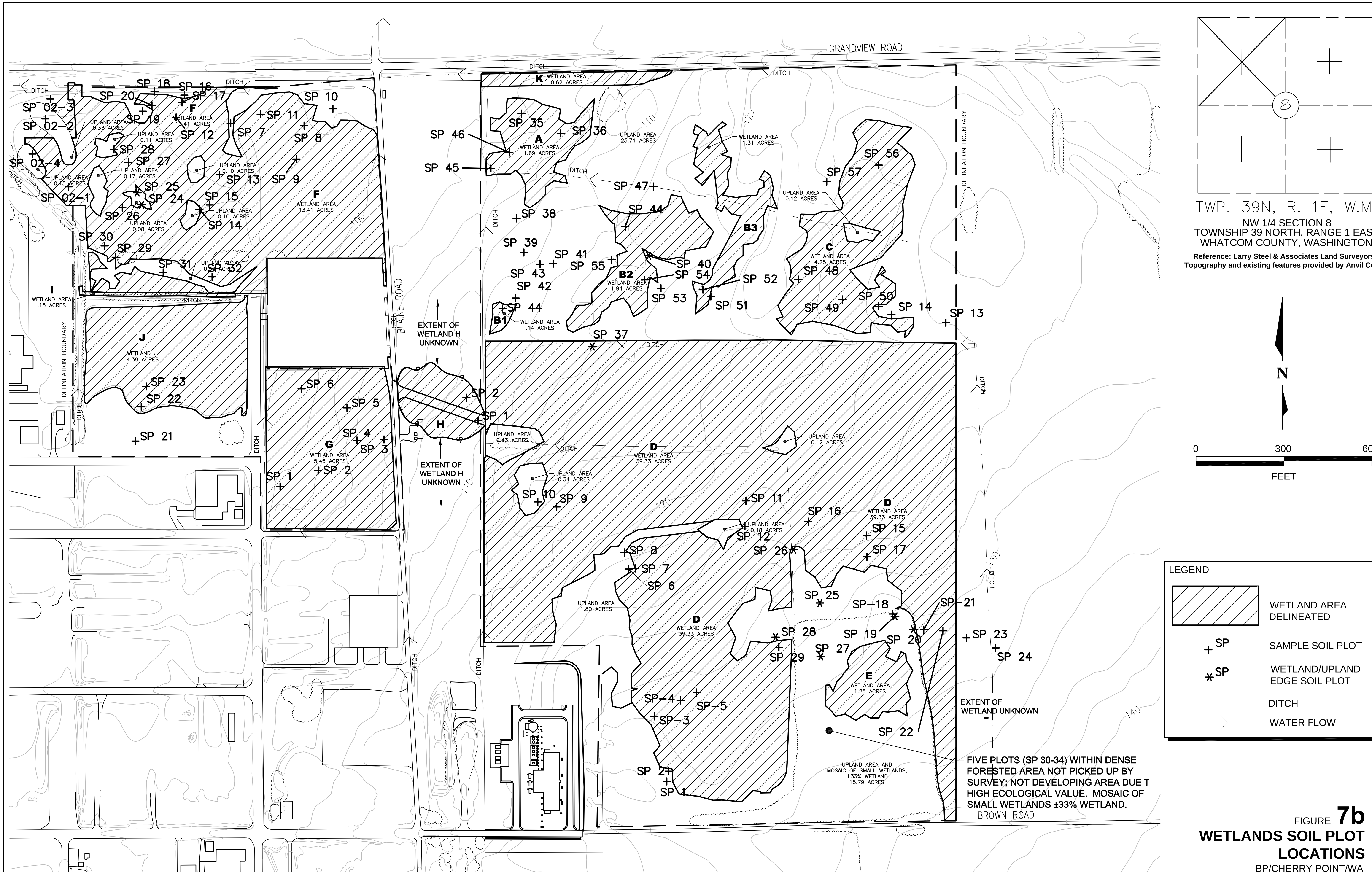


FIGURE **7b**

WETLANDS SOIL PLOT LOCATIONS

BP/CHERRY POINT/WA

Drawing file: 0131421001005F18.dwg Apr 02, 2003 – 10:06am

Golder Associates

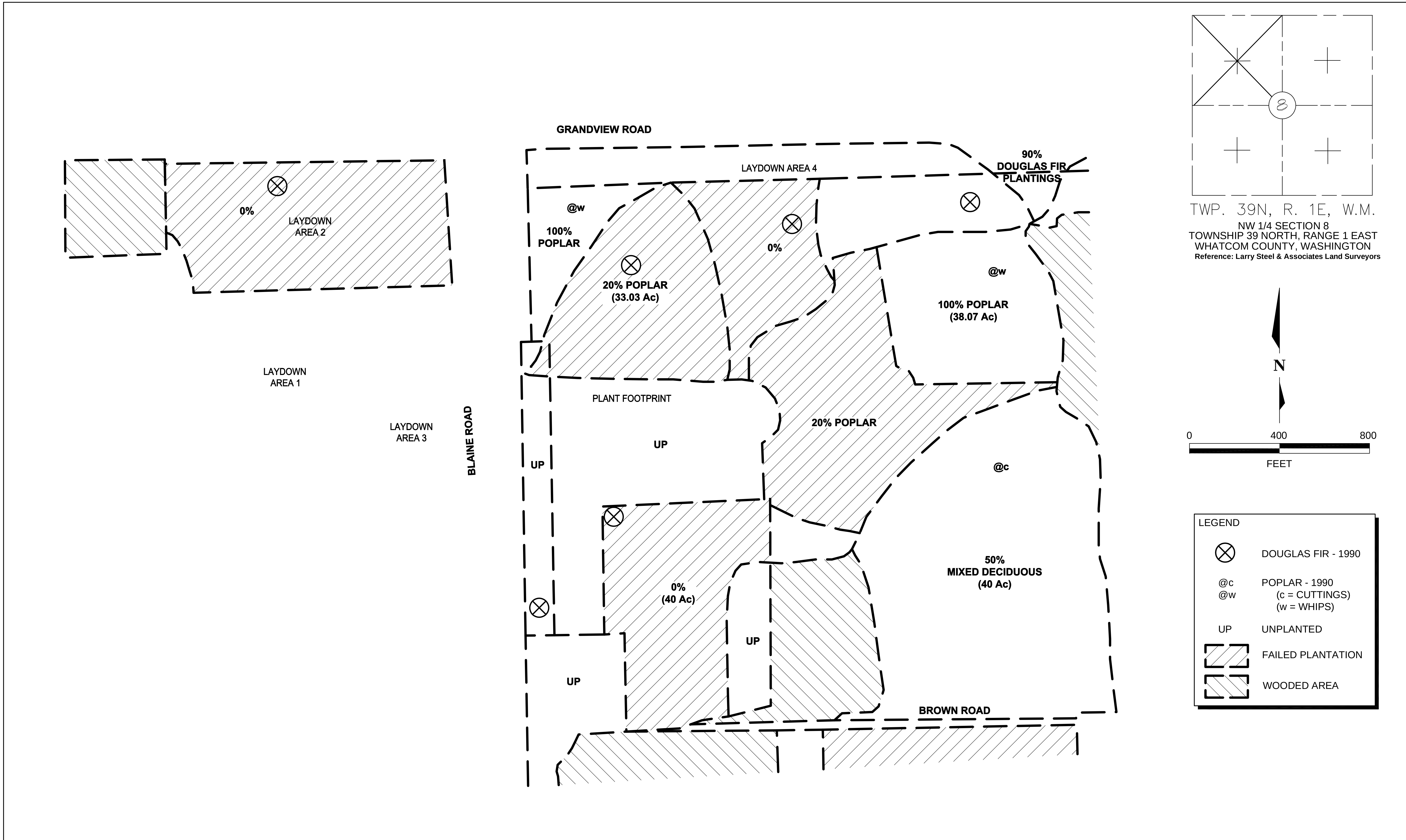


FIGURE 8
PLANTINGS AND PLANTATION STATUS (1992)
BP/CHERRY POINT/WA

Photo 1. Emergent wetland complex with blackberry thicket fringe.

Photo 2. Emergent wetland complex.

SITE PHOTOGRAPHS
BP/COGENERATION PROJECT/WA

PROJECT NO. 013 1421_540   DRAWING NO. 92451   DATE 06/08/00   DRAWN BY EL

Golder Associates

Photo 3. Reed and canary grass area within emergent wetlands.

Photo 4. Emergent wetlands showing forested patch.

SITE PHOTOGRAPHS
BP/COGENERATION PROJECT/WA

Photo 5. Emergent wetlands extending into adjacent blackberry upland thickets.

Photo 6. Emergent wetlands with upland/wetland forested mosaic.

SITE PHOTOGRAPHS
BP/COGENERATION PROJECT/WA

Photo 7. Upland/wetland forested mosaic.

Photo 8. Uprooted tree within forested area.

SITE PHOTOGRAPHS
BP/COGENERATION PROJECT/WA

Golder Associates