Draft Environmental Impact Statement for the COB Energy Facility

DOE/EIS–0343

Bonneville Power Administration

November 2003

BONNEVILLE POWER ADMINISTRATION

PDX/022750008.DOC

COB Energy Facility Project
Draft Environmental Impact Statement
DOE/EIS-0343

Lead Agency: U.S. Department of Energy, Bonneville Power Administration (BPA)

Cooperating Agency: U.S. Department of Interior, Bureau of Land Management (BLM)

Title of Proposed Project: COB Energy Facility

State Involved: Oregon

Abstract: COB Energy Facility, LLC, a subsidiary of Peoples Energy Resources Corporation (PERC), proposes to construct a 1,160-megawatt (MW) natural gas-fired, combined-cycle electric generating plant in Klamath County, Oregon, near the city of Bonanza. Electric power from the Energy Facility would enter the regional grid at BPA's Captain Jack Substation via a proposed 7.2-mile 500-kilovolt (kV) transmission line. BPA has prepared this Environmental Impact Statement (EIS) pursuant to the National Environmental Policy Act (NEPA) for its decision regarding this proposed interconnection.

The proposed electric transmission line would cross federal lands under the jurisdiction of BLM, which must decide whether to grant the necessary rights-of-way for this line on approximately 44 acres of BLM land. Accordingly, this EIS will also be used by BLM for this decision.

The major reason for this proposal is to provide electrical consumers in the Pacific Northwest and western states with increased power generation to serve increasing demand, and high-voltage transmission service to deliver that power.

Two alternatives are being considered: the proposed action and the No Action Alternative. In the No Action Alternative, BPA would decide not to provide a connection to the regional electric power transmission grid for the proposed Energy Facility or BLM would decide not to grant the electric transmission line rights-of-way. In the proposed action, BPA would provide a connection to the regional grid for the Energy Facility at the Captain Jack Substation and BLM would grant the requested rights-of-way.

Contact Information:

For additional information, contact:
Tom McKinney (KEC-4), Project Environmental Lead
Bonneville Power Administration
P.O. Box 3621
Portland, Oregon 97208
Telephone: (503) 230-4749
Email: tcmckinney@bpa.gov

Send comments to:

COB Energy Facility Comments
BPA Communication Office—KC-7
P.O. Box 14428
Portland, OR 97293-4428

For more copies of this document, please call 1-800-622-4520 and ask for the document by name. The document is also available on the Internet at: www.bpa.gov.

For additional information on DOE NEPA activities, please contact Carol Borgstrom, Director, Office of NEPA oversight, EH-25, U.S. Department of Energy, 1000 Independence Avenue S.W., Washington D.C. 20585, phone: 1-800-472-2756.

CLOSE OF COMMENT PERIOD IS FEBRUARY 13, 2004

Contents

Chapter **Page**

Chapter **Page**

Chapter

Figures *(located at the end of their respective chapter or section)*

Summary

Proposed Federal Action

COB Energy Facility, LLC, a subsidiary of Peoples Energy Resources Corporation (PERC), proposes to construct a natural gas-fired, combined-cycle electric generating plant near Bonanza, Oregon. The Energy Facility would have a nominal generation capacity of 1,160 megawatts (MW). Electric power from the Energy Facility would enter the regional grid at the Bonneville Power Administration's (BPA's) Captain Jack Substation via a proposed 7.2-mile electric transmission line. BPA must decide whether to grant the interconnection required to connect this proposed transmission line to the Captain Jack Substation. In addition, the proposed transmission line would cross some Federal lands. The Bureau of Land Management (BLM) must decide whether to grant the necessary rights-of-way for the transmission line on approximately 44 acres of BLM land. Accordingly, BPA as the lead agency and BLM as the cooperating agency have prepared this environmental impact statement (EIS) to fulfill the requirements of the National Environmental Policy Act (NEPA).

Purpose and Need for Action

Electrical consumers in the Pacific Northwest and western states need increased power generation to serve increasing demand, and high-voltage transmission service to deliver that power. BPA will grant the interconnection if it will help to provide an adequate and reliable power supply for the region, consistent with BPA's environmental, social, and economic responsibilities. BPA intends to act consistently with its Open Access Transmission Tariff in considering the interconnection request. BLM will grant the rights-of-way if they will authorize appropriate uses of public land consistent with applicable planning documents.

Related State Actions

Oregon does not have a state law equivalent to NEPA. Instead, environmental review is conducted through the state's energy facility siting procedures. Before construction of an energy facility is approved in Oregon, the Energy Facility Siting Council (EFSC) must find that the proposed project meets certain standards, including environmental standards, pursuant to Oregon Administrative Rule (OAR) Chapter 345, Division 21, Section 045. If satisfied that a proposed project meets the standards, EFSC issues a site certificate that permits the project to be built. The EFSC process is a "one-stop" permitting process that folds in other major state approvals, which in this case include a groundwater right for the project's water supply. A site certificate application (SCA) was filed for the proposed project on September 5, 2002. On April 30, 2003, the SCA was deemed complete. On July 25, 2003, Amendment No. 1 to the SCA was filed, and on October 15, 2003, Amendment No. 2 was filed.

Scope of the Environmental Impact Statement

This EIS contains an evaluation of two primary alternatives: the proposed action and the No Action Alternative. In the No Action Alternative, BPA would decide not to provide a connection to the regional electric power transmission grid for the proposed Energy Facility, or BLM would decide not to grant the electric transmission line rights-of-way. In the proposed action, BPA would provide a connection to the regional grid for the Energy Facility at the Captain Jack Substation, and BLM would grant the requested rights-of-way on approximately 44 acres of BLM land. Without access to the power grid, the proposed Energy Facility would not be feasible; therefore, under the No Action Alternative, the Energy Facility would not be built. A summary of the predicted performance of the proposed action and the No Action Alternative in accordance with technical, economic, and environmental decision factors is provided in Table S-1.

TABLE S-1
Performance Summary

Decision Factor	Proposed Action	No Action
Technical Performance	The proposed Energy Facility would generate 1,160 MW of electric power.	No electric power would be generated.
Economic Performance	The proposed Energy Facility would generate electric power at a lower unit cost than existing plants using older technology.	No economic costs or benefits would be created.
Environmental Performance	No significant adverse environmental effects would result.	No change in existing conditions.

The EIS describes the project using the assumption that the Energy Facility would be constructed in one phase. However, based on conditions of the electric power market following EFSC's approval of the SCA, COB Energy Facility, LLC (the project proponent) may decide to construct the Facility in one or two phases, as follows:

- One Phase: If the Energy Facility is constructed in one phase, it would consist of two blocks of a two-on-one configuration in combined-cycle operation. A block would consist of two General Electric (GE) model 7 FA (or equivalent) combustion turbine generators (CTGs), two heat recovery steam generators (HRSGs), and one steam turbine generator (STG). The nominal generating capacity at average annual conditions is estimated at 1,160 MW. The heat rate on a higher heating value (HHV) basis would be approximately 7,391 British thermal units per kilowatt hour (Btu/kWh) when supplemental duct firing is used and 6,842 Btu/kWh without supplemental duct firing.
- Two Phases: If the Energy Facility is constructed in two phases, each phase would be a combined-cycle operation consisting of a single block of a two-on-one configuration. Each phase would have a nominal generating capacity of 580 MW at average annual conditions. The base load capacity is approximately 450 MW and supplemental duct firing adds up to 130 MW at average annual conditions for each 580-MW phase. For the first 580-MW phase, the heat rate on a HHV would be approximately 7,391 British Btu/kWh when supplemental duct firing is used and 6,842 Btu/kWh without supplemental duct firing.

Components of the Proposed Action

The principal components of the proposed action are as follows:

- A new 1,160-MW gas-fired, combined-cycle electric power generation plant located near Bonanza, Oregon
- A new 7.2-mile transmission line to deliver electricity from the Energy Facility to BPA's Captain Jack Substation
- A new 4.1-mile natural gas pipeline to deliver fuel to the proposed Energy Facility site
- A water supply well system consisting of three wells and a 2.8-mile water supply pipeline

In addition, process wastewater would be managed by one of three alternatives:

- Beneficial use of the water for a 31-acre irrigated pasture
- Evaporation in a 20-acre, onsite lined evaporation pond
- Temporary storage onsite and hauling to a wastewater treatment plant (WWTP) for offsite disposal

Major Conclusions

The proposed Facility would have no significant adverse effect on the environment with the implementation of mitigation measures. Many impact avoidance and minimization measures have been incorporated into the design of the Facility. Additional mitigation measures have been proposed to compensate for any unavoidable impacts. In addition, mitigation measures recommended for vegetation and wildlife, land use, and health and safety would, if implemented, further minimize impact. The proposed project would permanently disturb 108.7 acres of land during the 30-year operating life of the Energy Facility (128.5 acres if an evaporation pond is used for wastewater disposal). The proposed project would restore and improve approximately 236 acres of fallow agricultural land consisting of heavily grazed, degraded juniper woodland. The following paragraphs summarize the factors leading to these conclusions.

Geology, Soil, and Seismicity

The proposed Facility would be located in a subbasin of the Klamath Basin. Two landslide areas have been observed in the vicinity of the proposed electric transmission line, and the transmission towers have been sited away from them. Earthquakes are likely within the basin; however, the risk to human safety and the destruction of improvements would be minimized through the design and construction of the facilities, so impacts would be low. The Energy Facility would cause the permanent removal of approximately 13.1 acres of nonirrigated, high-value soil; however, this land is not considered prime farmland soil by the Natural Resources Conservation Service (NRCS) because it is not irrigated. Construction and operation of the Facility could cause wind and water erosion; however, the implementation of best management practices (BMPs) and the National Pollutant Discharge

Elimination System (NPDES) permits during construction and operation would minimize those impacts.

Hydrology and Water Quality

The only perennial surface water body in the Facility vicinity is the Lost River. Intermittent seasonal drainages and irrigation canals also exist within the area. Shallow and deep aquifers underlie the area. Construction and operation of the Facility would draw water from the deep basalt aquifer, which testing indicates is not hydraulically connected to the shallow aquifer and surface water features. Two pump tests have been conducted at the Babson well, which intersects the deep aquifer system. Within 5 minutes of the test's conclusion, water levels in the deep zone had recovered to the pretest water level, suggesting that the volume removed is not significant relative to the rate of recharge to the deep system, and that long-term pumping would not substantially impact deep zone water levels.

Protective measures would be incorporated into the water supply well system design to prevent migration of groundwater from the shallow zone aquifer into the deep basalt aquifer. These measures would include casing and sealing the Babson well and two additional water supply wells through the shallow zone aquifer to a depth of approximately 1,500 feet below the ground surface (bgs).

Three alternatives for managing process wastewater are proposed: 1) beneficial use of the water for irrigated pasture, 2) evaporation in an onsite, lined evaporation pond, or 3) temporary storage onsite and hauling to a WWTP for offsite disposal. Sanitary wastewater from Energy Facility operations would be treated and managed using an onsite septic drainfield. There would be no discharge of process water or wastewater to surface water or groundwater.

Vegetation and Wildlife

Through the construction of a power generating facility, natural gas pipeline, water supply pipeline, and electric transmission line (collectively referred to as the Facility), the proposed Facility would permanently alter approximately 108.7 acres during the 30-year operating life of the Energy Facility.

Impacts to Wildlife Habitat

Based on Oregon Department of Fish and Wildlife (ODFW) categorized habitat, there would be no impacts to Category 1 habitat, 46 acres of permanent disturbance to Category 2 habitat, 29.9 acres of permanent disturbance to Category 3 habitat, 32.8 acres of permanent disturbance to Category 4 habitat, and no permanent disturbance to Category 5 and Category 6 habitats. Most of the impacts to the higher value habitats are related to the electric transmission line, including almost 31.6 acres of Category 2 habitat and 25.7 acres of Category 3 habitat. For the process wastewater management alternative involving beneficial use of the water for irrigated pasture, constituents in the process wastewater would not be expected to be toxic to wildlife.

Impacts to Agricultural Land

The Energy Facility site would be located on approximately 50.6 acres (including the stormwater infiltration basin) of a fallow agricultural field that has minimal habitat value.

However, a portion of the field is mapped by Klamath County as high-density mule deer winter range and accordingly 13.9 acres of the fallow agricultural lands are classified conservatively as Category 2 by ODFW. The soil is of poor quality. Non-native species such as intermediate wheatgrass have been planted in some areas as forage. In addition, the water supply wells system would be located on 0.3 acre of pasture, and transmission towers and access roads would be located on 2.1 acres of unimproved pasture and 0.8 acre of fallow agricultural field.

Temporary Impacts

Approximately 256.7 acres would have temporary construction impacts, including 121.6 acres at the Energy Facility site, 19.4 acres related to the water supply pipeline, 43.8 acres related to the natural gas pipeline, 1.3 acres related to the water supply well system, 64.9 acres related to construction of the electric transmission line, 0.5 acre for an access road to the irrigated pasture area, and 5.2 acres for the irrigation pipeline. Temporary impacts would include 94.9 acres of Category 2 habitat, 41.0 acres of Category 3 habitat, 117.2 acres of Category 4 habitat, and 3.6 acres of Category 6 habitat. Temporary construction impacts on habitat or agricultural lands would be mitigated after construction is completed. Impacts on construction laydown areas, pipelines, and transmission lines would be mitigated as well. A number of mitigation measures would be used, including backfill with native soil and replanting with native species.

Mitigation for Permanent Disturbance

To the extent practicable, the Energy Facility site, natural gas pipeline, water supply pipeline, and electric transmission line would be located in disturbed areas or in areas with minimal habitat value. As mitigation for the permanent disturbance during the 30-year life of the Energy Facility, the proposed project would establish and restore approximately 236 acres of fallow agricultural field and degraded juniper woodland habitat north and northwest of the Energy Facility (see Figure 2-2).

Biological Assessment

Construction and operation of the proposed Facility could have the potential to affect bald eagles in the area. A Biological Assessment (BA) has been prepared to address effects on eagles and their habitat and is included as Appendix C to this EIS. The BA also addresses the shortnose sucker and the Lost River sucker, which are found in the Lost River watershed in proximity to the project area.

Fish

Surface waters within the project area support various species of fish. Two federally and state-listed endangered fish species, the shortnose sucker and Lost River sucker, are endemic to the Upper Klamath Basin of southern Oregon and northern California. Both species have been reported in the Lost River above Harpold Reservoir, approximately 4 miles south of the Energy Facility site, and at Big Springs in Bonanza, Oregon, approximately 3 miles north of the Energy Facility site. As noted in the Hydrology and Water Quality section above, water from the project would be taken from a deep aquifer, which testing indicates is not hydraulically connected to the shallow aquifer and surface water features. Because there would be no withdrawals of or discharges to surface water, construction and operation of the proposed Facility would not affect fisheries resources in the area.

Traffic and Circulation

Potential effects of the proposed Energy Facility on traffic and circulation would be increased traffic congestion, damage to state highways or county roads, increased traffic hazards, or impairment of access owing to construction activities. Impacts during construction would be temporary and localized. The proposed project would result in up to an additional 420 PM peak-hour vehicle trips during construction and an additional 29 PM peak-hour trips during operation if the offsite trucking of wastewater alternative is selected, and 20 PM peak-hour vehicle trips if an onsite disposal of wastewater is selected. These additional trips would have no significant adverse impacts on area road traffic and circulation.

Air Quality

The proposed Energy Facility would use advanced combined-cycle gas turbine technology, clean-burning natural gas, and high-efficiency air emission control technology. Air quality modeling was conducted for the project using standard U.S. Environmental Protection Agency (EPA) modeling techniques and meteorological data collected at the site. Impacts for all of the criteria pollutants were well below the applicable ambient air quality standards. Therefore, it was concluded that no significant air quality impacts would occur as a result of the proposed Energy Facility.

Cumulative impact analysis indicated that emissions from the Energy Facility, combined with those of other existing sources in the area, would not result in concentrations above the federally mandated National Ambient Air Quality Standards (NAAQS) or Prevention of Significant Deterioration (PSD) increment levels for the criteria pollutants analyzed. In addition, the analysis identified no cumulative impacts to visibility in Class I areas resulting from Energy Facility emissions combined with those of other power generating and related facilities in the area.

Scenic and Aesthetic Values

The project area for visual quality and aesthetics covers a 30-mile radius from the proposed Energy Facility stacks and from the southernmost tower of the electric transmission line. This is a predominantly undeveloped area devoted to forests and farming. A number of aesthetic and scenic resources surround the proposed Energy Facility. The elements of the proposed Energy Facility that could affect the visual and aesthetic quality of the environment would be four stacks and 38 electric transmission towers. The stacks would be painted tan to blend in with their surroundings. The Energy Facility would use nonglare, low-impact lighting with shielded or cutoff fixtures, and the lighting would be directed downward. The proposed Energy Facility would not degrade or obstruct any scenic or aesthetic resources designated in pertinent state and local plans.

Cultural Resources

Three cultural resource sites have been identified in the area of the proposed Energy Facility, but would be avoided during construction, operation, and retirement of the Facility. No impacts would occur. Consultation took place with The Klamath Tribes during field surveys to ensure that any concerns would be addressed. In addition, an oral history and ethnography study was also prepared based on interviews with members of The Klamath Tribes. Based on this work, the presence of Traditional Cultural Properties, as defined by National Historic Preservation Act (NHPA) criteria, is unlikely.

Land Use Plans and Policies

The proposed Facility would comply with the Klamath County Land Development Code (LDC) and the Klamath County Comprehensive Plan (KCCP). Because of its acreage needs, the Facility would require exceptions to Goals 3 and 4 of the KCCP. Development of the Facility would result in the permanent disturbance during the 30-year operating life of the Energy Facility of 108.7 acres of land from its current use. Of this total, 56.7 acres are zoned for exclusive farmland use (EFU) and 52 acres are zoned for forestry (F) or forestry-range (FR). Approximately 50.7 acres of the total are subject to a Special Resource Overlay designed to protect wildlife. The proposed project has committed to restoring approximately 91 acres of fallow field to habitat conditions and improving approximately 145 acres of habitat for a total of approximately 236 acres.

Socioeconomics

Construction of the proposed Energy Facility during a 23-month period would require an average of 352 workers and a peak of 543 workers. Operation of the Energy Facility would require approximately 30 workers. Given the current unemployment rate, the majority of workers during construction and operation would likely be hired from the local community. If workers were needed from outside the area, sufficient housing opportunities would be provided.

Public Services and Utilities

The proposed Energy Facility would use its own water supply well. The water would be supplied from a deep aquifer zone not used by local residents or irrigation districts.

Three alternatives are being considered for the disposal of process wastewater: 1) beneficial use of the water for irrigated pasture, 2) evaporation in an onsite, lined evaporation pond, or 3) temporary storage onsite and hauling to a WWTP for offsite disposal. If process wastewater is managed by storage and hauling to a WWTP for disposal, the proposed action would have a minor impact on the treatment capacity at the WWTP.

No stormwater from the Energy Facility would enter a public stormwater system. The Facility would take steps to minimize the need for police and fire protection services. The Klamath County Sheriff and the Bonanza Rural Fire Protection District have indicated they would have adequate resources, if needed.

The Energy Facility would not have an adverse impact on the ability of health care providers and educators to provide their services. Utilities and public service providers have adequate capacity to serve existing and new customers.

Health and Safety

The proposed Energy Facility could increase risk to health and safety as a result of using hazardous materials at the Facility and transmitting natural gas in an underground pipeline. However, the Energy Facility would be designed with attention to the reduction of hazards associated with its operation and would meet or exceed state and Federal safety standards in its components. Safety and emergency systems would be included during construction to ensure safe and reliable operation of the proposed Energy Facility. Through continuous monitoring of process variables and a thorough maintenance program, safety and reliability would be further increased. Electric and magnetic fields (EMFs) and noise would increase but would be within allowable limits.

Areas of Controversy

Approximately 150 people attended the public scoping meeting in January 2002, including representatives of BPA, EFSC, and the project proponent. A number of people expressed strong concerns about the Energy Facility's impact on groundwater in the area. Many of the farmers rely heavily on shallow groundwater for irrigating pastures and cropland. The project proponent explained that groundwater would be drawn from a deep aquifer, which testing suggests is isolated from the shallow zone. Two comments were received following the meeting.

To address the concern about impact on groundwater, the project proponent has committed to switching from wet cooling to air cooling. This switch reduces water requirements by 97 percent. On July 25, 2003, an amendment to the SCA was filed documenting the switch to air cooling.

Issues to Be Resolved

The primary purpose of this EIS is to provide BPA and BLM with the environmental information they need to determine whether to allow construction of an electric transmission line on public land and a connection of the Energy Facility to the regional power grid at BPA's Captain Jack Substation. There are no other issues to be resolved.

CHAPTER 1

Introduction

1.1 Proposed Action

COB Energy Facility, LLC (the project proponent) proposes to build and operate a natural gas-fired, combined-cycle electric power generation plant near Bonanza, Oregon. The plant would have a nominal generation capacity of 1,160 megawatts (MW). Electric power from the proposed plant would enter the regional grid at the Bonneville Power Administration's (BPA's) Captain Jack Substation.

Development of the COB Energy Facility requires two Federal actions. First, BPA must agree to provide the necessary connection to the regional electric power transmission grid. The proposed point of connection is Captain Jack Substation. The project proponent would have to construct an electric transmission line from the COB Energy Facility to the Captain Jack Substation. The proposed transmission line crosses Federal lands under the jurisdiction of the Bureau of Land Management (BLM). The second Federal action, therefore, is BLM's agreement to grant the necessary rights-of-way for this transmission line.

To inform BPA and BLM decisionmakers and the public of the potential environmental impacts of the proposed actions by BPA and BLM related to the proposed project, this environmental impact statement (EIS) has been prepared pursuant to the National Environmental Protection Agency (NEPA). Because the actions are integrally related and necessary for ultimate construction of the Facility, they are considered together as one combined proposed action.

The following terms are used in this environmental impact statement (EIS):

- The power generation equipment and other onsite facilities are referred to collectively as the proposed Energy Facility or proposed project.
- The physical location of the Energy Facility is referred to as the proposed Energy Facility site.
- The Energy Facility site and related or supporting facilities (electric transmission line, natural gas pipeline, and water supply pipeline and well system) are referred to as the Facility.
- The site certification applicant, COB Energy Facility, LLC, is referred to as the project proponent.

1.2 Purpose and Need for the Action

1.2.1 Underlying Need for Action

Recent national and regional forecasts project increasing consumption of electrical energy to continue into the foreseeable future, requiring development of new generation resources to satisfy the increasing demand.

The Energy Information Administration[1] provides a National forecast in its report titled *Annual Energy Outlook (AEO) 2003 with Projections to 2025*:

> Total electricity demand is projected to grow by 1.9 percent per year from 2001 through 2020 (the same as in *AEO2002*) and 1.8 percent per year from 2001 to 2025. Rapid growth in electricity use for computers, office equipment, and a variety of electrical appliances in the residential and commercial sectors is only partially offset by improved efficiency in these and other more traditional electrical applications; however, demand growth is expected to slow as regional and national market saturation is reached for air conditioning and some other applications (see Figure 1-1).
>
> Generation from natural gas, coal, nuclear, and renewable fuels is projected to increase through 2025 to meet growing demand for electricity and offset the projected retirement of existing generating capacity, mostly fossil steam capacity being displaced by more efficient natural-gas-fired combined-cycle capacity brought online in the past few years and still being constructed (Figure 1-2). The projected levels of generation from power plants using coal, nuclear, and renewable fuels are higher than in *AEO2002* due to higher projected natural gas prices and uprates and life extensions of nuclear plants.
>
> The natural gas share of electricity generation is projected to increase from 17 percent in 2001 to 29 percent in 2025, including generation by electric utilities, (Independent Power Producers), and (Combined Heat and Power) generators.[2]

The Western Electricity Coordinating Council[3] (WECC) forecasts electricity demand in the western United States. System-wide, according to their most recent 10-year coordinated plan summary, "The 2001-2011 summer peak demand requirement is forecast to increase at a compound rate of 2.5 percent per year."[4] For the Northwest Power Pool Area[5], WECC forecasts:

> For the period from 2001 through 2011, peak demand and annual energy requirements are projected to grow at respective annual compound rates of 2.5 percent and

1 The Energy Information Administration, created by Congress in 1977, is a statistical agency of the U.S. Department of Energy. It provides policy-independent data, forecasts, and analyses to promote sound policy-making, efficient markets, and public understanding regarding energy and its interaction with the economy and the environment.
2 Energy Information Administration, Report # DOE/EIA-0383(2003), January 9, 2003.
3 WECC is one of the 10 electric reliability councils in North America, encompassing a geographic area equivalent to over half the United States. The members, representing all segments of the electric industry, provide electricity to 71 million people in 14 Western states, two Canadian provinces, and portions of one Mexican state.
4 WECC, September 2002. *10-Year Coordinated Plan Summary 2002-2011 Planning and Operation for Electric System Reliability*, p. 16.
5 The Northwest Power Pool Area is comprised of all or major portions of the states of Idaho, Montana, Nevada, Oregon, Utah, Washington, and Wyoming; a small portion of Northern California; and the Canadian provinces of British Columbia and Alberta.

> 1.9 percent. With a significant percentage of hydro generation in the region, the ability to meet peak demand is expected to be adequate for the next ten years. The ability to meet sustained seasonal energy requirements over the 10-year period is dependent on new generation additions.[6] (Refer to Figures 1-3 and 1-4.)

Finally, the Northwest Power Planning Council (NWPPC) regularly prepares a 20-year forecast of electricity demand in the Pacific Northwest. As stated in the May 13, 2003, *Revised Draft Forecast of Electricity Demand for the 5th Pacific Northwest Conservation and Electric Power Plan*, NWPPC's latest long-term forecast found,

> Electricity demand is forecast to grow from 20,080 average megawatts in 2000 to 25,423 average megawatts by 2025 in the medium forecast. The average annual rate of growth in this forecast is just less than 1 percent per year.* * * The most likely range of demand growth (between the medium-low and medium-high forecasts) is between 0.4 and 1.50 percent per year. However, the low to high forecast range recognizes that growth as low as –0.5 percent per year or as high as 2.4 percent per year is possible, although relatively unlikely (see Table 1-1).

Generation resources typically require interconnection with a high-voltage electrical transmission system for delivery to purchasing retail utilities. Bonneville Power Administration owns and operates the Federal Columbia River Transmission System (FCRTS), comprising more than three-fourths of the high-voltage transmission grid in the Pacific Northwest and including extra-regional transmission facilities. BPA operates the FCRTS, in part, to integrate and transmit "electric power from existing or additional Federal or non-Federal generating units."[7] BPA has adopted an Open Access Transmission Tariff for FCRTS consistent with the Federal Energy Regulatory Commission's (FERC) *pro forma* open access tariff.[8] Under BPA's tariff, BPA offers transmission interconnection to the FCRTS to all eligible customers on a first-come, first-served basis, with this offer subject to an environmental review under NEPA. Interconnection with the FCRTS is essential to deliver power from many generation facilities to loads both within and outside the Pacific Northwest.

In summary, electrical consumers served by the Northwest Power Pool and in other western states need increased power production to serve increasing demand, and high-voltage transmission services to deliver that power. In addition, BPA and BLM need to respond to PERC's request for authorizations required from these agencies for PERC to construct the proposed project. More specifically, BPA needs to respond to PERC's request for an interconnection of the proposed project to the FCRTS at BPA's Captain Jack Substation and integration of the power from the project into the FCRTS. BLM needs to respond to PERC's request for a grant of right-of-way across BLM land.

1.2.2 Purpose of the Action

BPA intends to base its decision on the following objectives:

---

6 Ibid., p. 11.

7 16 U.S.C. 838b.

8 Although BPA is not subject to FERC jurisdiction, BPA follows the open tariff as a matter of national policy. This course of action demonstrates BPA's commitment to non-discriminatory access to its transmission system and ensures that BPA will receive non-discriminatory access to the transmission system of utilities that are subject to FERC jurisdiction.

- An adequate, economical, efficient, and reliable power supply to the Pacific Northwest, including FCRTS electrical stability and reliability
- Consistency with BPA environmental and social responsibilities
- Cost and administrative efficiency

As a cooperating agency, BLM intends to base its decision on the following objectives outlined in the Record of Decision (ROD) for the Klamath Falls Resource Area Resource Management Plan (May 22, 1995):

- Where consistent with local comprehensive plan and Oregon's statewide planning goals and rules, BLM-administered land would continue to be available for needed rights-of-way.
- New facilities would be encouraged to locate adjacent to existing facilities to the extent technically and economically feasible.
- New facilities would be limited to the minimum acreage necessary for operation and maintenance.

1.3 National Environmental Policy Act Review

The National Environmental Policy Act (NEPA) was signed into law in 1970 and requires that the environmental consequences of any proposed action by a Federal agency be determined before a final decision on the action is taken. Where the action could have a significant adverse impact on the environment, an EIS must be prepared. The proposed project requires action by two Federal agencies. BPA would need to permit the proposed project to connect with the regional power grid and BLM would need to permit the electric transmission line to cross Federal lands under its jurisdiction. Although BPA has already completed the requisite environmental analysis in its Business Plan EIS (DOE/EIS-0183), BPA is jointly preparing this EIS with BLM at the request and expense of the project proponent.

1.3.1 Public Involvement

NEPA requires that the public be provided an opportunity to participate in the EIS process, both before environmental analysis begins and after a draft EIS is completed. Public comments on the scope of an EIS are solicited before EIS preparation begins. This early solicitation of public comments is referred to as the scoping process.

As required by NEPA, BPA published a Notice of Intent (NOI) to prepare an EIS on the COB Energy Facility in the Federal Register on January 4, 2002. The NOI is presented in Appendix A. The NOI announced the commencement of a 45-day scoping period during which comments from the public would be accepted. It also invited members of the public to a scoping meeting held at Lorella Community Hall on January 15, 2002. The meeting was in the form of an open house structured to provide the community with an overview of the project proponent and the project and an opportunity to comment. After signing in, members of the public were invited to examine exhibits describing the proposed project and to discuss it with representatives of BPA and the project proponent. Overviews of the NEPA and state permitting processes were provided by BPA and the Oregon Department of Energy (ODOE).

To inform the general public of the scoping meeting, paid public announcements were placed in local papers in editions published about 1 week before the meeting. Letters were sent to all landowners with property near the proposed Energy Facility. Also, letters were sent to local, state, and Federal agencies and Native American organizations that might have an interest in the proposed project.

1.3.2 Comments Received

Approximately 150 people attended the scoping meeting in January 2002, including representatives of the Energy Facility Siting Council (EFSC), BPA, and the project proponent. A number of people expressed strong concerns about the Facility's impact on groundwater in the area. Many of the farmers rely heavily on shallow groundwater for irrigating pastures and cropland. The project proponent explained that groundwater would be drawn from a deep aquifer, which testing suggests is isolated from the shallow zone.

To address the concern about impact on groundwater, the project proponent has committed to switching from wet cooling to air cooling. This switch reduces water requirements by 97 percent. On July 25, 2003, the project proponent filed an amendment to the site certificate application (SCA) dated September 5, 2002, documenting the switch to air cooling.

BPA received one letter (U.S. Bureau of Reclamation) and one telephone comment following the meeting. The Bureau of Reclamation wanted to confirm its interest in the project, and one private citizen wanted to confirm the location of the proposed Energy Facility.

1.4 State of Oregon Environmental Review

Oregon does not have a state law equivalent to NEPA. Instead, environmental review is conducted through the state's energy facility siting procedures. Before construction of an energy facility is approved in Oregon, EFSC must find that the proposed project meets certain standards, including environmental standards, pursuant to Oregon Administrative Rule (OAR) Chapter 345, Division 21, Section 045. If satisfied that a proposed project meets the standards, EFSC issues a site certificate that permits the project to be built.

The project proponent submitted an application for a site certificate on September 5, 2002. The SCA was deemed complete on April 30, 2003. On July 25, 2003, an amendment was filed with EFSC to switch to air cooling from wet cooling. Review of the application by state agencies would proceed concurrent with the NEPA review process. EFSC has no involvement with BPA's siting and construction of its transmission lines and appurtenant facilities.

1.5 Scope and Organization of the EIS

Chapter 2 of this EIS describes the proposed Federal actions and their alternatives. The actions are defined comprehensively to include both the Federal actions (allowing connection of the proposed Energy Facility to the regional power grid and allowing construction of the electric transmission line on Federal lands) and construction of the Energy Facility and its related or supporting facilities. The related or supporting facilities include a natural gas pipeline, water supply pipeline, water supply well system, and the electric transmission line.

Chapter 3 describes the affected environment and the environmental consequences of the proposed action. An assessment of the direct, indirect, and cumulative effects of the proposed action on geology, soil, and seismicity, hydrology and water quality, vegetation and wildlife, fish, traffic and circulation, air quality, visual quality and aesthetics, cultural resources, land use plans and policies, socioeconomics, public services and utilities, and health and safety, including noise, is provided in Chapter 3.

Cumulative impacts are the impacts resulting from the incremental impact of the proposed action viewed collectively with the impacts of other past, present, and reasonably foreseeable future actions. Unavoidable impacts are those impacts that are unavoidable and remain significant even with the application of mitigation measures.

Chapter 4 describes how the proposed action would comply with various legal and regulatory requirements. Contributors to the EIS are listed in Chapter 5. Recipients of the EIS are listed in Chapter 6. References, a list of acronyms and terms, and an index are provided in Chapters 7, 8, and 9, respectively.

TABLE 1-1
Forecast Northwest Power Needs

	ACTUAL	FORECAST		GROWTH RATES	
	2000	**2015**	**2025**	**2000-2015**	**2000-2025**
Low	20,080	17,489	17,822	-0.92	-0.48
Medium Low	20,080	19,942	21,934	-0.05	0.35
Medium	20,080	22,105	25,423	0.64	0.95
Medium High	20,080	24,200	29,138	1.25	1.50
High	20,080	27,687	35,897	2.16	2.35

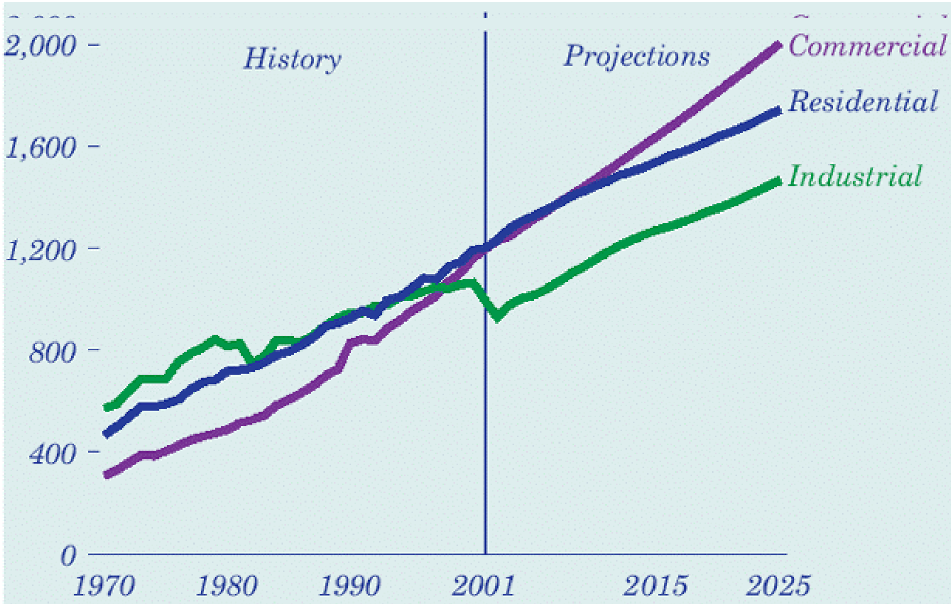


FIGURE 1-1
Annual Electricity Sales by Sector, 1970-2025 (billion kilowatt-hours)

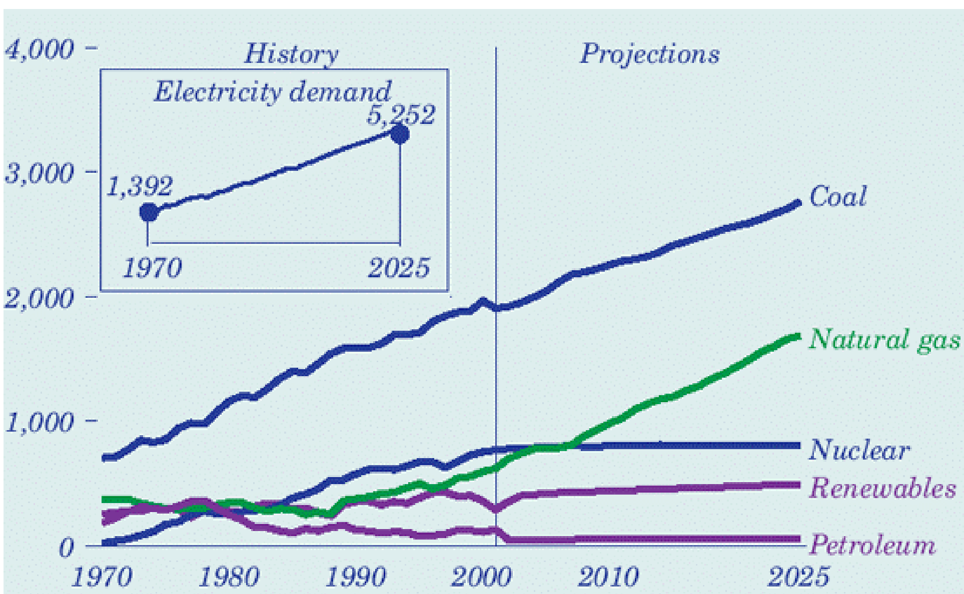
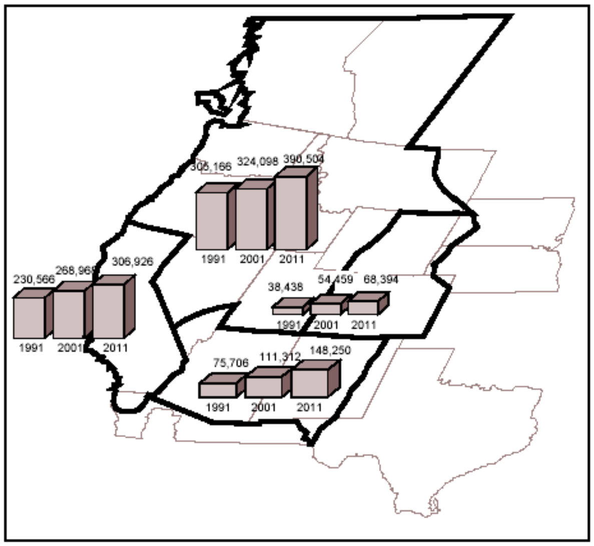


FIGURE 1-2
Electricity Generation by Fuel, 1970-2025 (billion kilowatt-hours)



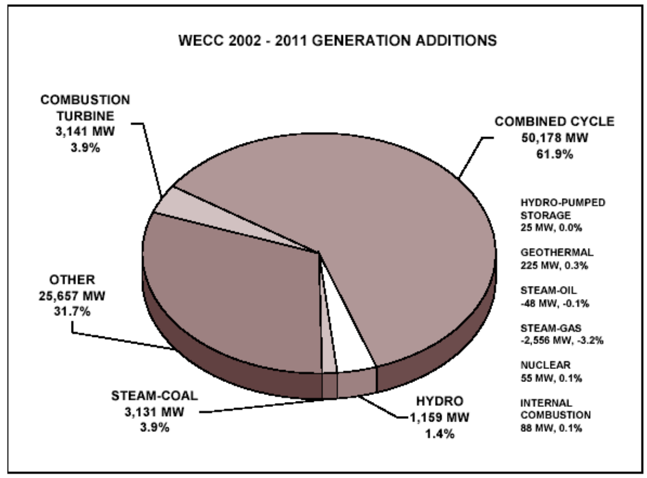


FIGURE 1-3
1991, 2001, and 2011 Annual Energy Loads

Source: WECC

FIGURE 1-4
Summary of Generation Additions 2002-2011 (Summer Capability in megawatts [MW])

CHAPTER 2

Proposed Action and Alternatives

2.1 Introduction

This section contains a description of the two alternatives being considered in this EIS: the Proposed Action and No Action.

2.2 No Action

In the No Action Alternative, BPA would decide not to provide the requested connection to the regional power grid or BLM would decide not to provide an easement for construction of an electric transmission line across Federal lands. Without these approvals, the proposed Energy Facility would not be feasible. Thus, in the No Action Alternative the proposed Energy Facility would not be built.

2.3 Proposed Action

In the proposed action, BPA would provide an interconnection to the regional power grid and BLM would grant an easement allowing the power line to be built on Federal lands. The Energy Facility would be built and operated by the project proponent. It would consist of a 1,160-MW natural gas-fired, combined-cycle power generation plant. Based on the conditions of the electric power market, the project proponent may decide to construct the facility in one or two phases.

A new electric transmission line, approximately 7.2 miles in length, would be built by the project proponent and would deliver electric power from the Energy Facility to the regional power grid at BPA's Captain Jack Substation. The locations of the Energy Facility and its related or supporting facilities are shown in Figure 2-1, and Figure 2-2 shows the BLM-owned parcels.

The proposed Energy Facility would be fueled by natural gas from the existing PG&E Gas Transmission Northwest (PG&E GTN) pipeline and delivered through a 4.1-mile natural gas pipeline that would be constructed from the Bonanza Compressor Station along the rights-of-way of existing Klamath County roads. The natural gas pipeline is expected to be 20 inches in diameter.

Water would be needed by the proposed Energy Facility to generate steam for the combined-cycle operation, and for demineralized water production, potable water and sanitary systems, and service water. The water supply well system would consist of an existing well and two additional water supply wells. The water supply well system would be configured and constructed to withdraw water only from the deep zone aquifer and would be isolated from the shallow zone aquifer and surface water. The existing well, known as the Babson well, was originally drilled to depths exceeding 5,000 feet for oil and gas exploration in the 1920s and has partial obstructions at depths of 1,870 and 2,050 feet.

The Babson well would be sealed through the shallow zone aquifer and through approximately 1,100 feet of nonbearing rock to approximately 1,500 feet below the ground surface (bgs). No other Langell Valley area wells or water rights in the deep aquifer system are known to exist. Two additional water supply wells would be drilled to a depth of approximately 2,000 feet bgs.

Once withdrawn, the water would be pumped through a 2.8-mile water supply pipeline to a raw water storage tank located at the Energy Facility site. Under average annual ambient conditions with supplemental duct firing, approximately 22 gallons per minute of process wastewater would be discharged by the Energy Facility. Three alternatives for disposal of the process wastewater are proposed: 1) beneficial use of the water for irrigated pasture, 2) evaporation in an onsite, lined evaporation pond, or 3) temporary storage onsite and hauling to an offsite wastewater treatment plant (WWTP) for disposal.

The principal components of the proposed action are as follows:

- A new 1,160-MW, air-cooled, natural gas-fired, combined-cycle electric power generation plant located near Bonanza, Oregon, on 50.6 acres of land
- A new 7.2-mile electric transmission line to deliver electricity from the proposed Energy Facility to BPA's Captain Jack Substation
- A new 4.1-mile natural gas pipeline to deliver fuel to the proposed Energy Facility site
- A water supply well system consisting of an existing well and two additional water supply wells
- A 2.8-mile water supply pipeline between the water supply wells the Energy Facility
- A 31-acre irrigated pasture area for beneficial use of process wastewater. Process wastewater would be delivered via a 3,770-foot irrigation pipeline.
- A 20-acre evaporation pond if process wastewater is managed by an onsite, lined evaporation pond
- A 4.7-acre stormwater infiltration basin
- A 1.5-acre stormwater pond

Each of these components is described in greater detail in the next subsections, and a comparison of project impacts is shown in Table 2-1.

2.3.1 Electric Power Generation Facility

2.3.1.1 Site Location

The proposed Energy Facility site is located 3 miles south of Bonanza, Oregon, on the east side of West Langell Valley Road No. 520 in Klamath County. Access to the site would be from Langell Valley Road No. 520 (see Figures 2-1, Site Map, and 2-2, Facility Map). The Energy Facility site is located on 50.6 acres of property totaling 749 acres in Sections 22, 23, 25, and 26 of Township 39 South, Range 11 East. The property is currently undeveloped, and has historically been used for agricultural activities as described below. Figure 2-2 shows BLM-owned parcels.

Specific criteria are considered to determine the location when siting a combined-cycle power plant such as the proposed Facility. Key criteria include proximity to transmission, fuel supply, and water supply. Additional criteria include site size, topography, geotechnical issues, flooding potential, transportation, environmental impacts, and nearby residences.

The project location selected for the proposed Facility had the highest potential for meeting these criteria, as described in the following list:

- **Electric transmission interconnect**. The Energy Facility site would connect to the existing BPA Captain Jack Substation, which is part of the California Oregon Intertie, known as the “Super Highway Crossroads” of Energy for the Pacific Northwest and California.
- **Fuel supply**. The PG&E GTN Bonanza Compressor Station is located 4.3 miles from the Energy Facility site.
- **Water supply**. The Energy Facility would use water from a deep aquifer with no demonstrated connection to the shallow water system.
- **Site size**. The land area fits the proposed Energy Facility dimensions, including construction laydown areas needed during the building process.
- **Topography**. The topography would allow sufficient cut and fill for a level Energy Facility site.
- **Geotechnical**. The soil is expected to be suitable, with sufficient stability and low potential for liquefaction.
- **Flooding potential**. The Federal Emergency Management Agency (FEMA) flood insurance rate map for the proposed Facility (panel number 410109 1250B) shows minimal flooding potential.
- **Transportation.** The Energy Facility site is located approximately 7 miles from the city of Malin, which has suitable rail for the construction and support of the proposed Facility.
- **Environment.** The proposed project would have no significant adverse effect on the environment with the implementation of mitigation measures. Mitigation and habitat improvement practices and measures that would be employed are described in more detail in the EIS and a Habitat Mitigation and Natural Area Revegetation Plan (the Revegetation Plan) that is part of the Biological Assessment (BA) (Appendix C to the EIS).
- **Nearby Residents.** The closest resident to the proposed Energy Facility site is located approximately 5,700 feet northwest of the Energy Facility. However, this resident would not be able to view the Energy Facility because of topography. The closest resident to the Energy Facility with an obstructed view is located approximately 6,700 feet southeast of the Energy Facility. The closest resident to the electric transmission line is located approximately 3,000 feet east of the electric transmission line. The closest resident to the water supply wells is located approximately 3,500 feet southwest of the water supply well site.

Eleven alternative sites were identified by the project proponent as having development potential. None of the alternative sites successfully met the criteria identified above.

2.3.1.2 Power Generation Facilities

The proposed Energy Facility would consist of four General Electric (GE) model 7FA (or equivalent) combustion turbine generators (CTGs), four three-pressure heat recovery steam generators (HRSGs), and two steam turbines. The Energy Facility would be fueled by natural gas used in the combustion turbines. Expanding gases from combustion would turn rotors within the turbines that are connected to electric generators. The hot gases exhausted from the combustion turbines would be used to produce steam in the HRSGs. The steam from two HRSGs would then be expanded through a steam turbine that drives its own electric generator, thus creating additional electrical energy. Spent steam from the HRSGs would be condensed and routed to the air-cooled condensers. Steam from the exhaust of the STG would be condensed in a surface condenser, with the condensate routed back to the HRSGs as boiler feedwater to complete the closed steam cycle.

The CTGs and HRSGs would be outdoor units with thermal insulation and acoustical attenuation. To increase steam-generating capacity, a duct burner system would be included in each HRSG. The duct burner would be single-fuel, using natural gas only. The duct burner would increase both the steam generated in the HRSGs and the CTG electrical output. Additional equipment dedicated to each power block would include surface condensers, air-cooled condensers, generator step-up transformers, electrical distribution gear, and associated ancillary equipment.

2.3.1.3 Site Facilities

Access to the site would be from West Langell Valley Road No. 520. In addition to the combustion turbines, steam turbines, and air-cooled condensers, the site would include a laydown and storage area, administrative/control room building, warehouse/maintenance building, water treatment facilities, raw water and demineralized water storage tanks, process wastewater storage tanks, stormwater pond, septic tank/leach field, and switchyard. If the onsite evaporation pond is used for process wastewater management, the process wastewater tanks would not be required.

The following are the approximate dimensions of major Energy Facility structures and visible features:

- Power generation equipment and systems: approximately 12 acres by 54 feet tall
- Stacks: approximately 150 to 200 feet tall
- Air-cooled condensers: approximately 4.3 acres and 125 feet tall
- Raw water storage tank: 113 feet in diameter and 40 feet tall
- Laydown and storage area: approximately 6.3 acres
- Administration/control room building: approximately 0.2 acre by 22 feet tall
- Warehouse/maintenance building: approximately 0.2 acre by 22 feet tall

- Water treatment facilities
  - Water treatment building—approximately 0.2 acre by 22 feet tall
  - Demineralized water storage tank—approximately 37 feet in diameter by 40 feet tall
- Wastewater alternatives
  - Beneficial use of the water for irrigated pasture: approximately 31 acres
  - Lined evaporation pond alternative: approximately 20 acres with 7-MG storage capacity
  - Temporarily storing onsite and hauling to an offsite WWTP for disposal: two wastewater storage tanks 100 feet in diameter and 40 feet tall
- Stormwater pond: approximately 1.5 acres
- Stormwater infiltration basin: approximately 4.7 acres
- Septic tank/leach field: less than 1 acre

2.3.1.4 Water Supply

The Energy Facility would use water from a deep aquifer system intercepted by an existing well known as the Babson well. (No other Langell Valley area wells or water rights in the deep aquifer system are known to exist.) A well system consisting of the Babson well and two additional water supply wells would be used to withdraw water from the deep zone aquifer. The water withdrawal would be subject to a water right permit issued by the State of Oregon.

During operations, the primary uses of water at the proposed Energy Facility would be for steam generation, demineralized water production, potable water and sanitary systems, and service water. Water also would be available for fire suppression. During construction, water would be used for dust suppression, compaction, vehicle and equipment cleanup, and miscellaneous construction-related uses. Drinking water for construction workers would be bottled water or other potable water trucked to the Energy Facility.

When operating, water use in the Energy Facility would vary daily and seasonally in response to fluctuating electricity demand and weather conditions. As a result, actual daily water use at the Energy Facility is estimated to vary from 0 gallons per minute (gpm) when the Energy Facility is offline up to a maximum of 210 gpm (0.30 mgd or 0.92 ac-ft/day or 0.47 cfs). For average annual conditions with duct firing, it is anticipated that the average withdrawal rate from the water supply wells would be approximately 72 gpm (0.10 mgd or 0.31 ac-ft/day or 0.16 cfs). In addition, 90 gpm (0.13 mgd or 0.40 ac-ft/day or 0.16 cfs) would be required to irrigate up to 16 acres of land between March 1 and October 31 of each year.

Water from the water supply well system would be pumped through a 2.8-mile, 6-inch-diameter water supply pipeline to a 3.0-MG raw water storage tank at the Energy Facility.

2.3.1.5 Fuel and Chemical Storage Facilities

Construction. During construction, fuels and chemicals anticipated to be used include diesel fuel, gasoline, lubricants and oils, solvents, paints, ethylene diamine triacetic acid (EDTA), and surfactant. The diesel fuel and gasoline would be stored in aboveground storage tanks that would be located within secondary containment. The chemicals would be stored in drums and containers located inside construction storage trailers. Spill kits with absorbent materials would be available in the event of a spill of hazardous chemicals.

Operation. Natural gas would be delivered from the existing PG&E GTN pipeline system through a 4.1-mile natural gas pipeline constructed from the Bonanza Compressor Station along the rights-of-way (ROW) of existing Klamath County roads. Natural gas would not be stored onsite.

There would be diesel fuel storage for the fire water pump at the Energy Facility and for the back-up generators at the water supply well system. The diesel fuel storage capacity would be approximately 100 gallons and 4,300 gallons (two tanks each with a capacity of approximately 2,150 gallons) for the fire water pump and back-up generators, respectively. Diesel would be purchased from fuel distributors. Vehicles used would be fueled and serviced offsite. No storage of fuels or lubricants for vehicles would be necessary onsite.

Lubricants and oils for the generators, turbines, transformers, and miscellaneous electrical equipment would be stored in drums and containers. The lubricants and oil would be stored indoors and within appropriate containment areas.

Water treatment chemicals would be stored in aboveground storage tanks or portable plastic tanks (totes). The water treatment chemicals include sulfuric acid, sodium hydroxide, EDTA, hydrazine, ammonia hydroxide, sodium hypochlorite, sodium bisulfite, sodium metabisulfite, sodium nitrite, organic phosphate, sodium phosphate, lime, soda ash, magnesium chloride, polymers, filter acid, and iron chloride. Cleaning fluids and detergents would be used for periodic cleaning of the combustion turbine blades. The chemicals would be stored in totes or aboveground storage tanks situated in the appropriate containment areas designed to hold the volume of the liquids stored plus freeboard, according to applicable regulations and best management practices (BMPs).

Aqueous ammonia would be stored in a 30,000-gallon aboveground storage tank. The tank would be contained within a bermed area and would be designed in accordance with applicable industry specifications. The tank would be equipped with a level gauge and would be monitored from the control room. The area for delivery of aqueous ammonia to the storage tank also would be bermed.

2.3.1.6 Laydown and Storage Areas

The proposed Energy Facility would have a 71.0-acre construction parking lot and laydown areas for pipe, tool and material storage, and trailers. During the life of the Energy Facility, major maintenance and construction projects would require a storage and work area. In addition, large items would require outdoor storage. An approximately 6-acre laydown and storage area would be part of the 50.6-acre Energy Facility site.

2.3.1.7 Fire Prevention and Control

Systems for fire prevention, detection, and control would be installed at the proposed Energy Facility. The systems would be installed in the buildings and yard areas as required by the National Fire Protection Association (NFPA) and the Facility insurer. The systems would be designed to meet local, state, and NFPA standards.

The main fire protection system would include a dedicated water storage system, hose stations, and fire pumps. Water would be supplied by the deep aquifer well system described in Section 2.3.4. A portion of the 325,000-gallon demineralized water storage tank would be dedicated to the fire protection system.

The fire detection system would continuously monitor the Energy Facility, provide indication of the location of fires, warn the Energy Facility personnel, and activate the fire protection system. The combustion turbine enclosures would include carbon dioxide fire-extinguishing systems.

Smoke detectors, heat detectors, manual alarm stations, and indicating devices would be installed throughout the Energy Facility. Portable fire extinguishers would be placed at key locations.

2.3.1.8 Wastewater Management, Beneficial Use, and Disposal

Construction. Wastewater would be generated during construction and testing/ commissioning of the Energy Facility from washdown of concrete trucks after concrete loads have been emptied; washing of exteriors of construction equipment and vehicles to remove accumulated dirt; rinsing of the water systems; and hydrostatic testing of the natural gas and water supply pipelines. Wastewater from concrete truck washdown and cleaning of construction equipment would be managed so that there would be no discharge offsite or discharge to surface waters. Wastewater from the flushing and hydrostatic testing (testing and commissioning wastewater) is estimated to be 6.5 MG. Hydrostatic testing and flushing would be performed sequentially with water filtered between steps so that water can be reused and recycled to the extent possible. During construction and testing/ commissioning, portable toilets would be provided for onsite sewage handling and would be pumped out and cleaned regularly by a qualified contractor.

Operation. The proposed Energy Facility would use water primarily for steam generation, demineralized water production, potable water and sanitary systems, and service water. Water also would be available for fire suppression. Process wastewater from the Energy Facility would be managed by one of three alternatives:

- Beneficial use of the water for irrigated pasture
- Evaporation in an onsite, lined evaporation pond
- Temporary storage onsite and hauling to an offsite WWTP for disposal

Irrigated Pasture Beneficial Use: If process wastewater is managed by beneficial use of the water for irrigated pasture, water developed during the winter months would be stored and combined with process water produced in the summer months to irrigate onsite acreage. The Energy Facility site and land immediately adjacent to the Energy Facility under option by the project proponent, encompasses sufficient acreage with soil types suitable for this activity. Process water can be managed without exceeding annual salt loading rates typical of nearby irrigated lands, or other facilities with permits to use similar water in a similar fashion. Approximately 31 acres would be required to manage the total volume of process water available without exceeding typical total dissolved solids (TDS) loading rates that currently result from irrigated agriculture in the area.

The process water would be used to improve grazing forage yield in areas currently without irrigation, and possibly to enhance the wildlife forage yield in habitat mitigation areas. This activity represents a beneficial use of the water that would not be made if it were evaporated or hauled offsite for disposal. The irrigated use would occur only in areas with well-drained soil and with suitable slopes to minimize the potential for surface runoff or erosion. The irrigated use would not occur in areas that are drained by subsurface drain tiles to minimize any potential discharges to surface water. Annual application rates would occur at levels substantially lower than gross irrigation requirements for full irrigation and the irrigated use would not result in recharge to groundwater during periods of irrigation.

Onsite Evaporation Pond: If process wastewater is managed by evaporation, an optional backup of a 20-acre evaporation pond sized to store approximately 7 MG and lined to protect groundwater would be used to manage process wastewater. The evaporation pond alternative is a contingency only and it would not be built until such time as it is determined that process wastewater management by irrigated pasture beneficial use does not function as designed. If the need for the evaporation pond occurs, the water treatment system at the Energy Facility would be changed to increase the cycling of the water and to reduce the quantity of wastewater to be discharged to the evaporation pond.

The evaporation pond would most likely be designed to operate passively. However, to reduce the size of the footprint, a spray enhancement system would be installed if it were economically viable. A wastewater stream pipeline would take wastewater from the Energy Facility to the evaporation pond. The evaporation pond would be designed and sized to contain sediment from the wastewater for the life of the plant with minimal need to clean out the sediment. There would need to be sufficient freeboard in the evaporation pond to account for sediment accumulation. The evaporation pond would be cleaned periodically and sludge and other solids that would accumulate from evaporation of the wastewater would be removed and disposed of at an approved landfill.

The pond would be designed to include a composite liner system for containment of waste-water and sediment. Bentonite would be added to the soil at the base of the evaporation pond, mixed to a depth of approximately 12 inches, and then compacted to achieve a permeability of greater than $1x10^{-6}$ centimeters per second (cm/sec). An alternative to the bentonite-treated soil would be to use a bentomat geotextile system. The bentomat geotextile system is available with a permeability as low as $5x10^{-9}$ cm/sec. A 60-mil HDPE liner would be placed over the bentonite-treated soil or the bentomat geotextile system, to form the top layer of the composite liner system.

Storage and Hauling to Wastewater Treatment Plant: If this alternative were to be selected, process wastewater would be managed by temporarily storing onsite and hauling to a WWTP for offsite disposal. The project proponent has contacted the two municipal WWTPs in Klamath Falls—the South Suburban Sanitary District and the City of Klamath Falls Sanitary District. The ability of these two WWTPs to accept wastewater from testing and commissioning of the Energy Facility and the wastewater from operation of the Energy

Facility is presently being evaluated. According to managers at both facilities, each would be required to evaluate whether they can meet the EPA categorical standard to accept industrial waste or whether local ordinance provides for acceptance of truck-hauled wastewater. During the life of the Energy Facility, other WWTPs may be constructed or considered for management of wastewater generated at the Energy Facility. The project proponent would arrange with a trucking company to routinely haul the wastewater stored in the wastewater storage tanks at the Energy Facility to the WWTP.

Sanitary wastewater from restroom and shower facilities would be routed to an onsite septic tank, which would discharge to a leach field. Approximate flows of up to 1,500 gallons per day or about 1 gpm are expected.

2.3.1.9 Stormwater Management

Construction. During construction, stormwater would be managed according to NPDES General Construction Permit 1200-C, issued by the Oregon Department of Environmental Quality (ODEQ), and an erosion and sediment control plan. In general, construction erosion control would consist of BMPs, including techniques such as hay bales, silt fences, and revegetation, to minimize or prevent soil exposed during construction from being carried off the site.

Operation. Stormwater would be managed by implementing BMPs such as containment, covering, good housekeeping, preventive maintenance, and spill prevention. The drainage from disturbed areas at the Energy Facility site would be designed to drain to a stormwater pond. The stormwater pond would be sized to detain approximately 750,000 gallons (2.3 acre-feet) of water based on a 25-year storm event.

Stormwater would be managed through three systems—the plant drains system, stormwater sewer system, and offsite stormwater diversion system.

Plant Drains System. The plant drains system would be routed through an oil/water (o/w) separator and then back into the raw water process for plant use.

Stormwater Sewer System. The stormwater sewer system is designed to accommodate a 100-year, 24-hour storm event and would collect stormwater from rooftops, parking lots, and landscaped areas. This storm sewer system would consist of ditches, culverts, and piping as required that are routed to the 1.5-acre stormwater pond. Two alternatives are available for managing the stormwater discharge from the stormwater pond. The preferred alternative would discharge the stormwater into a 4.7-acre infiltration basin. The infiltration basin is designed to allow the stormwater to infiltrate into the ground. The second alternative would discharge the stormwater into the West Langell Valley Road drainage ditch. From the point where the stormwater is discharged into the drainage ditch, the stormwater would travel approximately 8,000 feet before it discharges into the High Line Levee Ditch. The High Line Levee Ditch discharges into the Lost River.

Offsite Stormwater Diversion System. Stormwater run-on to the Energy Facility site would be prevented by diverting the water around the Energy Facility into natural drainages and the West Langell Valley Road drainage ditch. For the transmission line access roads, culverts would be properly sized and designed where the access road crosses intermittent creeks to facilitate flow of stormwater or snowmelt runoff and to minimize erosion. Access roads would be surfaced with gravel to minimize erosion. Drainage would be maintained along the route of the access roads to prevent ponding of stormwater or snowmelt runoff.

2.3.1.10 Solid Waste Management

Construction. A variety of nonhazardous, inert construction wastes would be generated during construction. The major solid waste types would be concrete waste from foundation construction, wood waste from wood forms used for concrete construction, and scrap steel. Additional wastes include erosion-control materials such as straw bales and silt fencing, and packaging materials for parts and equipment.

Generation of wastes from construction would be minimized through detailed estimates of materials needs and through efficient construction practices. Approximately 350 tons per month of solid waste would be generated. Wastes generated during construction would be recycled as much as feasible. Recyclable materials would be separated from the solid waste stream. Solid waste would be stored in onsite roll-off bins. Solid waste would be collected periodically by a private contractor and hauled to a licensed disposal facility. The nearest licensed facility is the Klamath County Landfill, located about 35 miles from the Energy Facility site.

During construction, fuels, lubricant chemicals, and welding gases would be handled by trained personnel. The material would be in controlled storage until used, and any empty containers or waste material would be segregated in storage and properly recycled or disposed of by licensed handlers.

Operation. The proposed Energy Facility would generate approximately 50 tons per year of conventional solid waste consisting of office trash, packing materials, and nonrecyclables. Solid wastes generated during operation would be recycled as much as feasible. Recyclable materials would be separated from the solid waste stream. Solid waste would be stored in onsite roll-off bins. Solid waste would be collected periodically by a private contractor and hauled to a licensed disposal facility. The nearest licensed facility is the Klamath County Landfill, located about 35 miles from the Energy Facility site. This landfill and the regional landfill, Roosevelt Regional Landfill in southern Washington, would accommodate solid waste generated by operation of the Energy Facility.

If onsite evaporation of the wastewater is selected as the preferred alternative, evaporation would leave a solid waste that would be occasionally removed for disposal in a licensed landfill. This solid waste is a nonhazardous solid waste composed of water-treatment chemicals and constituents concentrated from the raw water supply. Rabanco Companies confirmed that the Roosevelt Regional Landfill would accept and manage the sludge as "special waste," meaning that a unique identification number would be created by the landfill operator to track the sludge from the Energy Facility.

2.3.2 Electric Transmission Line

The proposed COB Energy Facility would include construction of an approximate 7.2-mile, 500-kilovolt (kV), alternating current (AC) electric transmission line running south from the Energy Facility to an interconnection at BPA's Captain Jack Substation. Approximately 38 transmission towers would be required. The transmission towers would consist of steel lattice structures assembled in sections near the transmission tower site. Each transmission tower contains three components: the legs, body, and bridge. Typical transmission towers would range in height from 100 to 165 feet, with most towers in the 105- to 110-foot range. On average, the towers would be spaced approximately 990 feet apart, with a range from 380 to 1,500 feet.

Transmission towers would rest on four concrete footings, each about 4 feet in diameter. Allowing room for access and workspace around the footings would result in a permanent footprint disturbance of approximately 60 feet by 60 feet at each transmission tower, and at nine transmission tower locations, approximately 100 feet by 150 feet of additional, permanent space would be required to ensure safety for vehicles and equipment. Footings would be placed in holes that are excavated, augured, or blasted. The design of the footings would vary based on soil properties, bedrock depth, and the soundness of the bedrock at each transmission tower site. The final configuration of the new transmission line (for example, exact number of transmission towers, transmission tower heights, and location of transmission towers) would depend on final design and engineering and geotechnical considerations. Figure 2-3 shows a typical transmission tower structure.

Typically, 500-kV AC transmission lines require three sets of wires (or "conductors"). Each set is referred to as a phase, and typically consists of a pair of bundled aluminum cables. One or two "shield wires" are placed near the top of the transmission structure, above the conductors, to shield the towers from lightning strikes.

An access road for travel by wheeled vehicles would be required for construction and to access the new electric transmission line for maintenance during operation. The access road would be designed for use by cranes, excavators, supply trucks, boom trucks, and line trucks. The access road would be surfaced with gravel. Approximately 6.6 miles of new access road would be required. The access road would be approximately 15 feet wide, and grades would be less than 15 percent. No permanent access roads would be constructed in cultivated or fallow fields. Where temporary roads are used, any disturbed ground would be repaired.

Based on review of a U.S. Geological Survey (USGS) quadrangle map and field work, only three intermittent creeks are present within the proposed electric transmission line corridor, and there are no visible perennial streams. Culverts that are properly sized and designed would be installed where the access road crosses intermittent creeks to facilitate flow of stormwater or snowmelt runoff and to minimize erosion.

Based on a planned 154-foot-wide electric transmission line easement, easement options have been obtained. Grading would occur within the easement at each transmission tower site and along the access road. The transmission tower sites may be graded to provide a relatively level work surface. During construction, staging areas would be needed where steel, spools of conductor, and other construction materials would be stored.

For safe and uninterrupted operation of the electric transmission line, vegetation would be cleared or trimmed. Clearing may be by removal of vegetation or by controlling vegetation so that it does not grow above a certain height. Considerations that influence the amount and type of clearing include vegetation species, height and growth rates, ground slope, wind and snow patterns, conductor elevation above ground, and clearance distance required between the conductors and other objects. Some form of clearing may be required to the edge of the 154-foot-wide easement. Any leaning or diseased trees that could fall into the transmission line or pose a threat to reliable operation would be removed. At transmission tower sites, all trees, brush, stumps, and snags would be removed, including root systems. The amount of clearing required is unknown at this time.

After construction, vegetation control would be necessary, and would include controlling noxious weeds and managing growing vegetation in and adjacent to the easement. Vegetation control would consist of manual, mechanical, biological, and/or chemical methods.

The project proponent would construct the electric transmission line to a final dead-end structure adjacent to the BPA Captain Jack Substation. BPA would be responsible for final interconnection with the substation. Interconnection work would include installation of bus work and bus ties, 500-kV breaker(s), isolation switches, and foundations; and extending the grounding system for the substation.

2.3.3 Natural Gas Pipeline

A new gas pipeline would be required to supply natural gas to the Energy Facility. It would connect to an existing PG&E GTN gas transmission system line through a 4.1-mile-long, 20-inch-diameter natural gas pipeline constructed from the Bonanza Compressor Station along the ROW of existing Klamath County roads.

Metering facilities would be located at either the Energy Facility or the compressor station and not in the natural gas pipeline easement. The peak operating pressure of the PG&E GTN system at the Bonanza Compressor Station is 911 pounds per square inch, gauge (psig). No compression of natural gas would be required.

The natural gas pipeline would be installed in a 36-inch-wide trench at a depth of about 4 feet. The trench would be backfilled with pipe zone material and then with native soil up to the original grade.

Easement options have been obtained for a planned 80-foot-wide easement needed for equipment staging and material laydown. The easement would be immediately adjacent to and along the Klamath County ROW for Harpold County Road No. 1097 and West Langell Valley Road No. 520. The route of the natural gas pipeline would cross the public roads in three places and an irrigation canal in one location. The crossings would be conventional bores underneath the public roads and an irrigation canal. The rest of the natural gas pipeline would be constructed by open trench methods.

In the areas where conventional bores would occur, additional temporary work space would be required on both sides of the road or irrigation canal. Excavations would be larger than in the open trench sections to accommodate (1) greater pipe depth, (2) sharp angles at the crossings, and (3) safe working conditions within the excavations. These excavations could be approximately 15 feet deep. The additional work space would be necessary to excavate the deeper ditch in a safe manner and to store the additional excavated soil.

Additional temporary work space of 40 feet (for a total of 120 feet) would be required along the north side of West Langell Valley Road near the Energy Facility site, where the natural gas pipeline route goes through an approximate 2,200-foot section of steep topography. The extra width would be needed for soil storage when leveling the easement to create a safe working platform for workers and equipment.

2.3.4 Water Supply Well System

Water would be needed by the Energy Facility for steam generation, demineralized water production, potable water and sanitary systems, and service water. Water also would be available for fire suppression. The source of water for construction and operation of the Energy Facility would be groundwater from a deep aquifer system intercepted by a well, known as the Babson well. No other deep aquifer system wells or water rights are known to exist in the Langell Valley area. A water supply system consisting of the Babson well and two additional water supply wells would be used to withdraw water from this deep zone aquifer.

Previous borehole geophysics and aquifer testing at the Babson well (CH2M HILL , 1994) indicated the presence of six groundwater-bearing zones within the upper 2,050 feet of the borehole. The project proponent proposes to use the three deep water-bearing zones that are present below a depth of 1,580 feet to supply water for the Energy Facility. These zones appear to be hydraulically separated from the shallow system by approximately 1,000 feet of non-water-bearing rock. The Babson well would be reconfigured, and the two additional water supply wells would be designed, to isolate the deep zone from the shallow zone system, and withdraw water only from the deep system. .

Development of the Babson well would consist of installing a seal in the well from the surface to approximately 1,500 feet bgs. This seal would consist of a 10-inch or 12-inch welded steel casing grouted in place to seal off the shallow aquifer system. As a result, the well would no longer draw water from the shallow water-bearing zones. The additional water supply wells would be a maximum diameter of 12 inches and the depth of the additional water supply wells is expected to be approximately 2,000 feet. Like the Babson well, the additional water supply wells would be cased and grouted to seal off the shallow aquifer system from the deep system in the wellbore.

An electrical pump with approximately 50 to 100 horsepower (hp) would be installed in each well. Because the deep aquifer system is under considerable confining pressure, the static water level in the wells would be approximately 20 feet bgs. Submersible pumps would be used. Surface features would include a pumphouse (approximately 20 feet by 30 feet with standard height walls) that would contain a heating, ventilation, and air conditioning (HVAC) system and lighting. On the discharge of the pump, a pump control valve would be needed for pump startup and shutdown procedures.

There is existing electrical service to the Babson well. However, this electrical service does not have sufficient capacity to accommodate the increased electrical load from the three 50 to 100-hp pumps. The local power company, PacifiCorp, would be responsible for upgrading the electrical service to accommodate the increased electrical load. Emergency back-up power to the pump would be provided by an onsite diesel generator. The generator would be located near the pumphouses but in a separate walk-in, weatherproof enclosure. The diesel fuel would be stored in an aboveground storage tank located within a secondary containment structure.

Water from the water supply well system would be pumped through a 2.8-mile, 6-inch-diameter water supply pipeline to a 3.0-MG water storage tank located at the Energy Facility.

The water supply pipeline would be constructed within a 60-foot-wide easement on land under ownership options by the project proponent, except for portions of the route that cross Klamath County roads. The route of the water supply pipeline would cross two Klamath County roads: East Langell Valley Road and Teare County Road 1161. In addition, the water supply pipeline would cross an irrigation ditch operated by the Langell Valley Irrigation District in three locations. The crossings would be directionally bored underneath the public roads and irrigation ditch. The rest of the water supply pipelines would be constructed by open trench methods.

In the areas where conventional bores would occur, additional temporary work space would be required on both sides of the road or irrigation canal. Excavations would be larger than in the open trench sections to provide room for workers to safely work down in the excavations. The excavations would be approximately 15 feet deep. The additional work space would be necessary to excavate a safe ditch and store the excavated soil.

A temporary access road for travel by wheeled vehicles would be required for construction. The access road would be designed for use by cranes, excavators, supply trucks, boom trucks, and line trucks. The access road would be removed and revegetated after construction of the water supply pipeline.

The water supply pipeline would be installed in a 36-inch-wide trench at a depth of about 4 feet. The trench would be backfilled with pipe zone material and then with native soil up to the original grade. Figure 2-4 shows a typical section of the water supply pipelines.

2.3.5 Construction Schedule and Activities

Based on conditions of the electric power market after approval of the SCA, the project proponent may decide to construct the Facility in one phase or two phases. If the Facility is constructed in two phases, construction of the second phase may start up to 2 years after the first phase starts commercial operation.

If the Facility is constructed in one phase, construction is expected to take 23 months. If the Facility is constructed in two phases, the first phase of construction is expected to take approximately 18 months.

Because the conditions of the power market are volatile, the project proponent may choose not to start construction of the Facility until 3 years after the SCA is approved.

For the single phase construction, the construction workforce is expected to average 352 employees, with a low of 147 during the first 2 months and final 4 months of construction, and a peak of 543 during the fifteenth and sixteenth months of construction.

Equipment used at the site would include light and heavy trucks, backhoes, bulldozers, graders, cranes, air compressors, welding machines, and power hand tools. Foundation piling equipment may also be used. Some specialized boring equipment would be used to install the pipeline under existing roads and irrigation canals.

2.4 Other Projects Potentially Contributing to Cumulative Impacts

The level of analysis of cumulative impacts is commensurate with the potential for impacts, resources affected, scale of the impact, and other factors. This treatment of cumulative impacts is consistent with the EPA guidance for determining cumulative impacts (*Consideration of Cumulative Impacts in EPA Review of NEPA Documents*, 1999)

2.4.1 Other Energy Projects

There are two other potential energy generation projects near the Energy Facility site: the Klamath County water power project and the Klamath Generating Facility. The Klamath County water power project is proposed to be sited to the southeast of the COB Energy Facility. The Klamath Generating Facility is proposed to be sited about 3 miles south of Klamath Falls, Oregon, adjacent to the existing Klamath Cogeneration Project.

The Klamath County water power project would be a "closed system" pumped storage project with manmade upper and lower reservoirs. The eventual construction of the water power project is uncertain at this time given its preliminary nature. Energy Recycling Company has submitted an application to the Federal Energy Regulatory Commission for a preliminary permit to secure a license for the Klamath County water power project under Part I of the Federal Power Act. Energy Recycling Company has previously held a permit for the project, and the project proponent worked on a similar project at the site from 1991 to 1998 (the Lorella Pumped Storage Project). Despite presentations to potential development groups, the Lorella Pumped Storage Project never progressed to the development stage, and it is not certain that its predecessor, the Klamath County water power project, will do so, either.

Furthermore, according to the application, water for the Klamath County water power project may be obtained from nearby groundwater sources or the proposed Energy Facility. It is unlikely that the water power project will obtain water from local groundwater sources for the following reasons:

- The shallow aquifer system (above approximately 500 feet) is a heavily appropriated basalt aquifer that is in varying degrees of hydraulic connection with the Lost River.
- The state of Oregon is currently adjudicating Klamath River Basin water rights for those with claims dating prior to 1909.

Because the project has been through various stages of conceptual development and permitting for 12 years and obstacles remain, the Klamath County water power project has not been considered in the discussion of cumulative impacts as a reasonably foreseeable future action.

The COB Energy Facility would use water from the deep aquifer system pumped through the Babson well, rather than from shallow groundwater sources. (On April 24, 2002, the project proponent submitted a water right application to the Oregon Water Resources Department [OWRD] and on April 22, 2003, OWRD issued a proposed final order [PFO] that included a draft water right permit.) No other Langell Valley area wells or water rights in the deep aquifer system are known to exist.

Klamath Generation, LLC, a wholly owned subsidiary of PacifiCorp Power Marketing, Inc., submitted an application for a site certificate on December 26, 2001. The project is called the Klamath Generating Facility and if constructed would be a 542.2-MW natural gas combined-cycle system (two gas combustion turbine generators and one or two steam turbine generators) with power augmentation. The proposed facility would be located about 3 miles south of Klamath Falls, Oregon. The proposed site is adjacent to the existing Klamath Cogeneration Project. On April 23, 2002, the applicant withdrew its request for expedited review. ODOE is continuing to review the application under the standard review process.

The Klamath Generating Facility has been considered in the discussion of cumulative impacts on air quality.

2.4.2 Other Recent or Proposed Projects

Other recent projects or proposed projects that have been identified in the vicinity of the Energy Facility include the following:

Lane/Klamath Fiber Consortium: This project involves the acquisition of the fiber optics system between Springfield, Oregon, and Merrill, Oregon. Only a small portion of the project lies in the vicinity of the proposed project. Because this project is currently constructed in existing rights-of-way and construction impacts have been mitigated, there are no past, present, or future environmental impacts contributing to cumulative impacts.

Sykes Telecommunication: This project involved the construction of a new 400-employee call center in Klamath Falls, Oregon. The project has been completed. Agricultural land and natural habitat have not been affected. No water discharges to surface or groundwater have occurred, and there are no air emissions related to the project. The project does create additional cumulative traffic on regional roads. Based on the nature of the project and its relative distance from the proposed Energy Facility, there are no significant cumulative impacts related to the proposed Energy Facility.

Escend Technologies: Escend Technologies designs business-to-business software. Escend opened an office in Klamath Falls in 2000, employing approximately 60 people. The firm estimates that it will grow to 200 employees by 2005. Existing facilities are located in the urban area and do not affect similar types of land and habitats impacted by the proposed Energy Facility. Escend uses city services for water, wastewater, and solid waste. The facility does not have air emissions. Future impacts on regional traffic may occur with increased employment, but these impacts are expected to be spread around the region. Such impacts are not expected to contribute substantially to cumulative traffic impacts in the vicinity of the proposed Energy Facility.

Thermo Pressed Laminates: This manufacturing facility produces laminate materials for furniture, cabinets, and other uses. The facility was constructed in Klamath Falls in 2002 at an existing industrial site. Water supply, wastewater, and solid waste services are provided through the city of Klamath Falls. The facility has minor air emissions and does not have an air permit. Emissions from this facility would be represented by background.

Electro Scientific Industries: Electro Scientific Industries makes capital equipment for the semiconductor and electronics components industries. In 2001, the firm opened a manufacturing facility in Klamath Falls. An additional 200 jobs are anticipated by 2006. Except for air emissions, this facility is beyond the resource impact area identified for cumulative impacts. The facility has minor emissions and does not have an air permit. Emissions from this facility would be represented by background.

Other types of development that potentially could contribute to cumulative impacts include agricultural development, road construction, and land development. Agricultural development historically has impacted the area more than other land uses. The Energy Facility, through land application of the wastewater, would contribute minor cumulative impacts to the present and potential future agricultural development in the area. There are no planned or known road construction projects or land development projects proposed for the project area.

2.5 Other Alternatives

2.5.1 Alternative Strategies for Electrical Supply and Demand Management

In the early 1990s, BPA prepared a number of NEPA documents that analyzed the environmental effects of various alternative policies and business strategies. In 1993, BPA published a document titled *Resource Program Final Environmental Impact Statement* (DOE/EIS-0162). This EIS included a detailed analysis of the environmental consequences of alternative strategies for managing demand and increasing the supply of electrical energy in the Pacific Northwest. Alternatives analyzed consisted of various combinations of conservation, development of renewable resources (including hydropower, geothermal, wind and solar power), efficiency improvements, cogeneration, combustion turbines, nuclear power, and coal.

In the mid-1990s, responding to changes in the electric utility market, BPA modified its business plan and prepared a document titled *Business Plan Final Environmental Impact Statement* (DOE/EIS-0183). It was published in June 1995 and incorporated a number of earlier NEPA documents by reference, including the *Resource Program Final Environmental Impact Statement*.

The *Business Plan Final Environmental Impact Statement* included a description of how it would be used in BPA's decisionmaking process, as follows:

> "This BPA EIS is a programmatic EIS: that is, it addresses 'umbrella' policies and concepts. Approaches, strategies, and general agency direction—not site-specific actions—are recommended here. As the Administrator implements his broader policies and business strategies, other more specific business decisions such as the development of individual energy generation resources and transmission facilities will have their own environmental review and decision processes. These additional environmental reviews will look at site-specific actions, using the information and decisions in this EIS as a base to understand how they fit into more global policies and business strategies. This process is called 'tiering,' where more specific additional information on potential environmental consequences adds to the understanding for subsequent decisions."

The purpose of tiering is to promote orderly and properly sequenced decisionmaking for complex, multistage projects that may have adverse effects on the environment. It also avoids unnecessary and duplicative technical analysis. Broad policies and strategies are first examined in a programmatic EIS. The site-specific impacts of an individual project that is needed to implement the larger policy or strategy are then examined in a site-specific EIS. The analysis of the broad political and strategic alternatives is included in the site-specific EIS by reference and does not need to be repeated.

Consistent with this approach, this EIS for the COB Energy Facility confines itself to analysis of the site-specific environmental impacts of the proposed action. The analyses of larger policy and strategy alternatives are contained in the programmatic Business Plan EIS and Resource Program EIS and are included here by reference.

2.5.2 Alternatives Considered but Eliminated from Detailed Analysis

The project proponent considered various alternatives before developing the proposed Energy Facility. Minimization of impacts to the environment and residents were the most important criteria used in the company's evaluation of alternative sites and the development of proposed Energy Facility features. The proposed Energy Facility site was chosen because it is close to an existing natural gas pipeline and an existing electric transmission line, and thus would minimize the need for construction of new gas and electrical transmission facilities. This offers both economic and environmental advantages.

Alternative transmission corridors were evaluated for the natural gas pipeline, the water supply pipeline, and the electric transmission line. Alternative wastewater discharge scenarios and cooling also were considered. The following sections describe the alternatives considered for these facilities and the reasons the alternatives were eliminated from detailed analysis.

2.5.2.1 Alternative Natural Gas Pipeline

The alternative natural gas pipeline route would have been a more direct, 3.8-mile route from the Bonanza Compressor Station to the Energy Facility. This alternative route would have been located away from the public road ROW and run over two mountains between the compressor station and the Energy Facility site.

The majority of the land along the alternative natural gas pipeline would have been zoned Forestry Range (lands of mixed farm and forestry uses), with some Exclusive Farm Use–Cropland (EFU-C) and EFU–Cropland/Grazing (EFU-CG), and a very small area of Industrial Land at the compressor station. Land uses observed along the alternative natural gas pipeline route included irrigated pasture, a dairy, industrial land (the compressor station), open rangeland/woodlands managed by BLM and private landowners, and dryland farming and cattle grazing on a fallow field.

Even though the alternative natural gas pipeline route would have been slightly shorter than the proposed route (3.8 miles versus 4.1 miles), the alternative was eliminated from further consideration because construction would have taken place on steep slopes, increasing the likelihood of erosion, disturbance, and the potential risk of damage from landslides or sloughing. The route would also have crossed an ancient landslide, which would pose risk to the safe operation of the high-pressure natural gas pipeline.

The proposed route would not face the same disadvantages as the alternative route. Furthermore, the proposed alternative would not impact the operation of the irrigation canals during its construction or operation. No cultural resource sites, wetlands, or sensitive plants were identified during field studies.

2.5.2.2 Alternative Water Supply Pipeline

The project proponent chose to obtain water supply for the Energy Facility from the deep aquifer accessible from the Babson well. Because virtually all existing water supply in the Klamath Basin is from the shallow aquifer or surface sources, this approach minimized environmental impacts on water resources in the region by making use of this little-utilized source.

The 8.0-mile alternative water supply pipeline route from the Babson well to the Energy Facility site would have been substantially longer than the proposed route. The alternative route would have been located along the public road ROW. This route would have originated at the water supply well system, traveled southeast along East Langell Valley Road, and then along several other public road ROWs to West Langell Valley Road, continuing northwest to the raw water supply storage tank at the Energy Facility site.

Zoning along the route of the alternative water supply pipeline is EFU-CG, EFU-C, and FR. The majority of the land use along the alternative water supply pipeline route is irrigated pasture, with a small amount of juniper woodland, sagebrush scrub, and Ponderosa pine habitats. Numerous wetland resources occur along this route, including two high-quality cattail marshes. Many of the remaining wetlands are excavated channels located within a relict lake bed. These wetland areas are mapped on the National Wetland Inventory (NWI) as palustrine emergent wetlands.

The alternative water supply pipeline was eliminated from further consideration because (1) the alternative route is not direct and is 5.2 miles longer than the preferred route, (2) the alternative route would have greater wetland impacts and mitigation requirements, (3) impacts to local traffic would be significantly greater because the alternative route uses the public road ROW for almost the entire route, and (4) the presence of irrigation canals that parallel the roads for hundreds of feet would be expected to prevent the use of the public ROW for staging and construction activities.

2.5.2.3 Alternative Electric Transmission Line

Alternatives for interconnecting the proposed project to the regional transmission system are limited because of the proposed project's location in a remote area with few existing high-voltage lines. However, three alternatives were considered for connecting the Energy Facility with the regional power grid: (1) the preferred 7.2-mile electric transmission line from the Energy Facility to the BPA Captain Jack Substation, (2) an alternative, 7.9-mile electric transmission line that also connects the Energy Facility with the BPA Captain Jack Substation, but runs parallel to the existing Pacific Northwest/Pacific Southwest (PNW/PSW) intertie transmission lines, and (3) connecting to the regional power grid by tying directly into the existing PNW/PSW intertie transmission lines that transect the Energy Facility site.

The third alternative would not require an electric transmission line. This alternative was eliminated because BPA, PGE, and PacifiCorp prohibit direct connection of new generation to the PNW/PSW intertie for protection of system reliability. As result, this alternative was ruled out immediately and no further analysis conducted.

The second alternative for the electric transmission line presented technical, economic, and resource concerns greater than those presented by the preferred alternative. The rejected electric transmission line alternative is known as the "ROW alternative" in reference to facility locations proposed along existing transmission line rights-of-way. The ROW alternative would have required building a new electric transmission line from the Energy Facility to the Captain Jack Substation within a separate 200-foot-wide easement, necessitating property acquisition. The easement would have been 7.9 miles long and run parallel and adjacent to the existing electric transmission ROW corridor and 250 feet from the existing BPA/PGE/PacifiCorp electric transmission lines (three transmission lines collectively known as the PNW/PSW Intertie).

A comparison of the ROW alternative and the preferred electric transmission line route is presented in Table 2-2 of this chapter.

The ROW alternative would cover a larger area than the preferred alternative. The rejected alternative would be 7.9 miles long and would require 44 towers as compared to 7.2 miles and 38 towers for the preferred route. The rejected alternative would have a 200-foot easement that would cover almost 190.8 acres, while the preferred route would have a 154-foot-wide easement that would cover approximately 134.0 acres. The ROW alternative would require 52 acres of BLM-owned land, while the preferred route would require 44 acres of BLM-owned land.

Zoning along the route of the alternative electric transmission line is EFU, FR, and F. Land uses observed along the alternative electric transmission line route include existing electric transmission lines, fallow agricultural fields used for cattle grazing, residents, a lake, selective historical timber harvesting of ponderosa pine woodland, open rangeland/ woodlands managed by Federal and private landowners, and the PG&E GTN interstate gas pipeline system.

A cluster of residences are located in the upper half of the route. These residences are approximately 400 feet from the westernmost existing transmission line. Electric and magnetic fields (EMFs) would increase for the residences along the alternative transmission line. If the alternative transmission line were to be constructed, these residences would only be approximately 200 feet from the centerline of the transmission line, or approximately 100 feet from the edge of the 200-foot easement. In addition, visibility impacts would occur at residential locations as a result of clearing trees and vegetation to within 100 feet (the edge of the 200-foot easement described above) of the residences.

During field surveys of the ROW alternative, three cultural resource sites were identified. The amended National Historic Preservation Act (NHPA) of 1966 established a Federal policy of avoiding or minimizing adverse effects to cultural resources when planning and constructing federally-involved projects. As such, the proposed electric transmission line has been moved to avoid these resources.

During field surveys in June and July 2002, several bald eagles were observed foraging along the alternative electric transmission line easement. There is a resident population of bald eagles at McFall Reservoir approximately 1,750 feet west of the alternative electric transmission line route.

BPA wants to maintain the flexibility to construct a fourth transmission line adjacent to the three existing lines, and the project proponent's ROW electric transmission line alternative would not be consistent with that objective. In addition, BPA has raised technical concerns about the feasibility of another electric transmission line adjacent to the existing electric transmission lines.

2.5.2.4 Alternative Cooling Scenario

The project proponent considered water cooling for the Energy Facility. Peak water demand for water cooling would be approximately 7,590 gallons per minute (gpm) (10.9 million gallons per day [gpd]). Average annual water demand would be approximately 5,390 gpm (7.6 million gpd). These values include 90 gpm for seasonal irrigation. A draft water right permit was issued by OWRD in a PFO dated April 22, 2003. This draft water right allowed water withdrawal from the deep zone aquifer at a rate up to 7,500 gpm for industrial uses and 90 gpm for seasonal irrigation use.

Subsequently, the project proponent decided to switch to air cooling from wet cooling in response to feedback from the community. Amendment No. 1 to the SCA was filed with EFSC on July 25, 2003, to switch to air cooling.

On August 19, 2003, OWRD provided ODOE with a revised recommendation and draft water right permit reflecting a reduction in the industrial water requirement to a maximum instantaneous rate of 210 gpm. The 90 gpm for seasonal irrigation use remained unchanged.

TABLE 2-1
Summary of Affected Environment and Environmental Consequences

Environmental Resource	Existing Conditions	Impact of Proposed Action/Mitigation	Impact of No Action Alternative
Geology, Soil, and Seismicity	The Energy Facility site is located in a subbasin of the larger Klamath Basin in south-central Oregon. The Klamath Basin is a composite graben that forms the westernmost structural trough of the Basin and Range physiographic province. The Klamath graben is bounded by predominantly north- to northwest-striking normal faults.	**3.2.1** Landslides present a low risk to the proposed Energy Facility. If, upon further evaluation, the risk of landslide increases, additional mitigation measures would be implemented, including further adjustment of the transmission tower locations and installation of instrumentation on the towers to monitor for movement. **3.2.2** The Energy Facility would have a moderate impact on land identified as high-value soil in Klamath County. The proposed project would restore 91 acres of fallow land to high-quality deer habitat. Another 145 acres of habitat would be improved in the wildlife mitigation area. In addition, a facility retirement and site restoration approach would support restoration of the Energy Facility site to its current agricultural use. The approach uses topsoil salvaging and replacement, and standard farming practices. **3.2.3** Limited erosion would occur during construction with the implementation of best management practices (BMPs). **3.2.4** Soil erosion during operation of the Facility would be limited by stormwater control features and implementation of BMPs from a National Pollutant Discharge Elimination System (NPDES) permit and an erosion and sediment control plan. **3.2.5** The risk to human safety and harm to physical property as a result of seismic hazard would be minimal at the Energy Facility. Facilities would be constructed to Uniform Building Code standards for seismic design. **3.2.6** For the process wastewater management alternative involving beneficial use of the water for irrigated pasture, projected loading rates of total dissolved solids (TDS) would be limited to prevent buildup of salts in soil. The projected loading rates of the individual constituents of the process water do not indicate any other significant soil or crop hazard resulting from irrigation by process wastewater or salt-tolerant species. Agricultural soil would not be adversely impacted by the land application of process wastewater. The process wastewater would be applied to the pasture at agronomic rates during the irrigation season and at an	No changes to existing conditions would occur.

TABLE 2-1
Summary of Affected Environment and Environmental Consequences

Environmental Resource	Existing Conditions	Impact of Proposed Action/Mitigation	Impact of No Action Alternative
		instantaneous application rate less than the infiltration rate of the soil. Irrigation would not be conducted during periods of frozen or saturated soil to prevent erosion and generation of surface runoff. The process wastewater quality would generally be of equal or better quality than the shallow groundwater and Lost River water used for irrigation to lands around the beneficial use area.	
Hydrology and Water Quality	The only perennial surface water body in the Facility vicinity is the Lost River. Intermittent seasonal drainages also exist within the area. In addition, shallow and deep aquifers underlie the area.	**3.3.1** Water for the Energy Facility would be diverted from a deep system aquifer, which does not appear to be hydraulically connected to surface water bodies. No mitigation is proposed for the water withdrawal from the deep zone aquifer, but as an additional layer of protection, the water right would require operational monitoring and appropriate mitigation if any impacts are discovered to the shallow zone aquifer or surface water. The existing and two new water supply wells would be cased and sealed through the shallow zone aquifer and 1,100 feet of non-water bearing volcanic rock to a depth of approximately 1,500 feet below the ground surface (bgs) No water would be diverted from the Lost River. To reduce water requirements the Energy Facility would be designed to be air cooled. To further reduce water requirements, water would be recycled and reused from the plant drains, evaporative cooler blowdown, and heat recovery steam generator (HRSG) blowdown. **3.3.2** Wastewater and stormwater discharge during Facility construction and operation could affect surface and groundwater quality. BMPs for management of stormwater would be used to safeguard water quality during construction and operation. Onsite stormwater would be recycled (plant drains system) or discharged to an infiltration basin (storm sewer system). Wastewater management would be by one of three options: beneficial use of the water for irrigated pasture, an evaporation pond, or storage and hauling to an offsite wastewater treatment plant (WWTP). **3.3.3** Chemical spills at the proposed Energy Facility could affect surface and groundwater quality.	No changes to existing conditions would occur.

TABLE 2-1
Summary of Affected Environment and Environmental Consequences

Environmental Resource	Existing Conditions	Impact of Proposed Action/Mitigation	Impact of No Action Alternative
		BMPs and compliance with applicable regulations would avoid or minimize such impacts.	
Vegetation and Wildlife	The project area is located within the Klamath Ecological Province (East Cascades Ecoregion), on the eastern side of the Cascade Mountains. This region is characterized by large basins surrounded by ancient lake terraces and basaltic fault block mountains. Elevations range from around 4,000 to 8,400 feet. The soil in the area is derived from basaltic parent material and generally have loamy surface horizons overlaying loamy to clayey subsurface horizons. The climate is characterized by warm, dry summers and cool, moist winters. The average annual precipitation in Klamath County is 14 inches, of which only 27 percent occurs during the growing season.	**3.4.1** Construction and operation of the proposed Energy Facility could cause a temporary or permanent loss of vegetation and wildlife habitat. The proposed project would restore 91 acres of fallow land to high-quality deer habitat and another 145 acres of habitat would be improved in the wildlife mitigation area. Mitigation measures would be implemented during construction to limit disturbed areas to those needed to ensure practical and safe working conditions, to identify off-limits area, and to revegetate disturbed areas. **3.4.2** Construction and operation of the proposed Energy Facility would create noise and lighting that could disturb wildlife. BMPs would be implemented to reduce disturbances. Workers would receive training regarding wildlife and habitat and safe vehicle speeds. **3.4.3** Bald eagles and other birds could be injured or killed by collisions with power lines. Bird flight diverters would be installed. **3.4.4** Construction and operation of the proposed Energy Facility would disturb less than 0.5 acre of wetlands. Directional boring techniques and a minimum amount of fill would be used to avoid impacts to wetlands. **3.4.5** For the process wastewater management alternative involving beneficial use of the water for irrigated pasture, constituents in the process wastewater would not be expected to be toxic to wildlife. A Screening-Level Ecological Risk Assessment (ERA) following U.S. Environmental Protection Agency (EPA) and Oregon Department of Environmental Quality (ODEQ) guidance was conducted. The results of the ERA indicate that none of the constituents evaluated would be considered to present significant risk to ecological receptors.	No changes to existing conditions would occur.

TABLE 2-1
Summary of Affected Environment and Environmental Consequences

Environmental Resource	Existing Conditions	Impact of Proposed Action/Mitigation	Impact of No Action Alternative
Fish	Surface waters within the project area support various species of fish, including one federally and state-listed endangered species. Construction and operation of the Facility would not affect fisheries resources in the area.	**3.5.1** Construction of new access roads along the electric transmission line corridor would result in less than 0.5 acre of impact to wetlands related to intermittent creeks. Construction during the dry season (if possible) is recommended as a mitigation measure to avoid the presence of fish and minimize erosion and sedimentation. Culverts would be installed.	No changes to existing conditions would occur.
Traffic and Circulation	The existing network of roads surrounding the proposed facility includes West Langell Valley Road, East Langell Valley Road, Harpold Road, Oregon Route (OR) 70 (ODOT #23), OR 50, and OR 140. These local roads currently have low average daily traffic volumes and low average yearly accident rates. Levels of service are generally A or B, which are considered a high level of operations. These five roads have a high-quality asphalt surface.	**3.6.1** During construction, roadways in the vicinity of the Energy Facility would experience a decrease in level of service. Construction activities would be scheduled during off-peak hours and a carpooling program would be offered. **3.6.2** Vehicles weighing more than 80,000 pounds (maximum legal load limit) could cause some visible damage to county roads. Before and after conditions would be documented. If damage occurs, the proposed project would restore pavement to previous condition. **3.6.3** Operation of the Energy Facility would generate additional traffic. No mitigation measures are recommended.	No changes to existing conditions would occur.
Air Quality	The proposed Facility is located in an area currently classified as attainment for all criteria air pollutants. The closest air quality data are collected at Klamath Falls, 34 miles to the northwest. Air quality in the project area is expected to be significantly better than Klamath Falls. Oregon Department of Environmental Quality (ODEQ) air quality data summaries available on the Web site indicate that the 24-hour National Ambient Air Quality Standard (NAAQS) for particulate matter less than 10 microns in diameter (PM_{10}) has not been exceeded at Klamath Falls since 1992. No exceedance of the annual PM_{10} standard has occurred in the last 10 years. Monitoring for $PM_{2.5}$ began in July 1998, and has not measured an exceedance of either the proposed annual or	**3.7.1** Construction would cause short-term emissions of fugitive dust and construction equipment exhaust. BMPs would be issued to control fugitive dust and other incidental emissions. **3.7.2** Operations would not cause impacts. **3.7.3.** Operation of the Energy Facility would result in emissions of greenhouse gases. The proposed project would pay approximately $13.6 million to The Oregon Climate Trust, which would use these funds to finance CO_2 mitigation projects. **3.7.4.** Operation of the proposed Energy Facility would result in emissions of hazardous air pollutants.	No changes to existing conditions would occur.

TABLE 2-1
Summary of Affected Environment and Environmental Consequences

Environmental Resource	Existing Conditions	Impact of Proposed Action/Mitigation	Impact of No Action Alternative
	24-hour NAAQS. There has been no exceedance of the 1-hour carbon monoxide (CO) NAAQS in the last 11 years, and the 8-hour NAAQS has not been exceeded since 1991.	Emission-reducing equipment would be continuously monitored to minimize emissions. **3.7.5.** Operation of the Energy Facility could impact Air Quality-Related Values in federally managed Class I areas in the region; however, modeling results show pollutants and haze would have a significant impact. No mitigation measures are recommended. **3.7.6.** Operation of the Energy Facility would not result in significant odor emissions. No mitigation measures are recommended.	
Scenic and Aesthetic Values	This is a predominantly undeveloped area devoted to forests and farming. A number of aesthetic and scenic resources, such as national forests, existing and proposed wilderness trails, and scenic highways surround the proposed Energy Facility.	**3.8.1** Visual impacts to scenic and aesthetic resources could potentially result from the stacks and transmission towers for the electric transmission line; however, these Facility features would be in the background of any views. The proposed Energy Facility would not impact designated scenic areas. No mitigation measures other than those included in the proposed project, such as painting facilities to blend with the landscape and using nonglare, low-impact lighting, are recommended. **3.8.2** Impacts from Facility lighting would be minimal. See mitigation measures for Impact 3.8.1.	No changes to existing conditions would occur.
Cultural Resources	Three archaeological sites were identified during field surveys of the project area. All three sites are likely to be eligible for listing on the National Register of Historic Places (NRHP) and would qualify as an archaeological site under the Oregon statutes. Two of these sites (35-KL-2175 and PAS-3) are characterized by dispersed lithic scatter containing waste flakes (the by-product of stone tool manufacture), and tools. The remaining site (PAS-4) is a series of four, partially buried stone features that are of cultural and religious value to The Klamath Tribes.	**3.9.1** None of three known cultural sites would be affected by construction and operation of the Facility. The electric transmission line and the water supply pipeline have been moved from their original locations to avoid any impacts. **3.9.2** Unknown cultural resources could be adversely affected by the proposed project. A Cultural Resources Management Plan (CRMP) would be developed in coordination with The Klamath Tribes. The Plan would identify specific protocols and procedures for protecting known and unknown cultural resources. Archaeological monitoring would occur during construction to prevent accidental impacts to the known cultural sites and any resources discovered during construction.	No changes to existing conditions would occur.

TABLE 2-1
Summary of Affected Environment and Environmental Consequences

Environmental Resource	Existing Conditions	Impact of Proposed Action/Mitigation	Impact of No Action Alternative
Land Use Plans and Policies	The Facility is located in a rural area where elevations range from approximately 4,000 to 8,400 feet. The majority of the lowland areas have been converted to agricultural use. The agricultural lands include cultivated crops, irrigated pasture, unimproved pasture, and fallow fields. There are a few developed areas with residential, agricultural, and industrial uses such as farm homes, dairies, the Pacific Gas & Electric Gas Transmission Northwest (PG&E GTN) compressor station, and Captain Jack Substation.	**3.10.1** The proposed Facility would permanently disturb a total of 108.7 acres of land during the 30-year operating life of the Energy Facility, including an approximate 50.7 acres of land within the Klamath County Big Game Winter Range SRO. The proposed project would restore 91 acres of fallow field to habitat and improve another 145 acres of habitat in the wildlife mitigation area. **3.10.2**. Operations at the Energy Facility site would have limited, if any, impact on agricultural activities. No mitigation measures are recommended. **3.10.3** Construction of the Energy Facility would temporarily impact agricultural activities. BMPs would be employed during construction to minimize and avoid impacts to agricultural activities. **3.10.4** Construction of the Energy Facility could have temporary impacts to dairy operation. In addition to the BMPs that would be employed during construction to minimize and avoid impacts to agricultural activities, herbicides would not be used and activities would be coordinated with dairy owner. **3.10.5** The Energy Facility would have permanent and temporary impacts to pasture land. BMPs would be employed during construction to minimize and avoid impacts to pasture land. In addition, temporary fences and gates would be constructed so that at convenient intervals livestock could cross construction areas, and permanent fences if damaged would be repaired or replaced. **3.10.6** Construction impacts would occur to rangeland/woodlands along the natural gas pipeline, water supply pipeline, and the electric transmission line, and permanent impacts to rangeland/woodlands along the electric transmission line. BMPs would be employed during construction to minimize and avoid impacts to rangeland/woodlands. Additional mitigation measures would be implemented to avoid and repair impacts.	No changes to existing conditions would occur.

TABLE 2-1
Summary of Affected Environment and Environmental Consequences

Environmental Resource	Existing Conditions	Impact of Proposed Action/Mitigation	Impact of No Action Alternative
		3.10.7 Permanent impacts would occur to forest ranges along the electric transmission line. BMPs would be employed during construction to minimize and avoid impacts to forest ranges. Additional mitigation measures would be implemented to avoid and repair impacts.	
Socioeconomics	Population has been growing in the vicinity of the Facility at less than 1 percent per year during the last decade, which was approximately one-half of the state's growth rate. In early 2002, the unemployment rate in Klamath County was approximately 13 percent, primarily owing to declines in the construction and mining sectors. In 2000, housing vacancy rates were around 3 percent for owner-occupied housing and 9 percent for rental housing.	**3.11.1** The proposed Energy Facility would result in a limited short-term and long-term population increase. No mitigation measures are recommended. **3.11.2** The proposed project would result in an increase in short-term and long-term employment opportunities in the area. No mitigation measures are recommended. **3.11.3** The proposed Energy Facility would have a short-term impact on housing. New residents would likely settle in the communities within a 30-minute driving distance. No mitigation measures are recommended.	No changes to existing conditions would occur.
Public Services and Utilities	Water and sewer service is provided inside urban growth boundaries (UGBs) of the project area. Outside of UGBs, water is supplied by private wells and sewage goes to individual septic tanks. Solid waste is disposed of at two landfills. Police protection outside UGBs is provided by the Klamath County Sheriff and the Oregon State Patrol. Rural fire protection around Bonanza and Klamath Falls is provided by Klamath County Fire Districts #1, #4, and #5, and the Bonanza Rural Fire Protection District. Health care is available at the Merle West Medical Center in Klamath Falls; however, the closest trauma center is in Bend. The four school districts serving the project area report declining enrollment.	**3.12.1** The proposed Energy Facility would have limited, if any, effects on the capacity of local utilities during construction, and no effects during operations. No mitigation measures are recommended. **3.12.2** The proposed Energy Facility would not affect the level of service provided by local public services. Onsite security would be provided during construction. No other mitigation measures are recommended.	No changes to existing conditions would occur.

TABLE 2-1
Summary of Affected Environment and Environmental Consequences

Environmental Resource	Existing Conditions	Impact of Proposed Action/Mitigation	Impact of No Action Alternative
Health and Safety	The Energy Facility site consists primarily of scrub brush with limited cattle grazing. Limited industrial and commercial utility uses exist in the area. Development in the vicinity of the Energy Facility site consists of widely distributed residences. Intermittent noise includes traffic on local roads, agricultural activities, and distant overhead aircraft. Continuous noise is absent.	**3.13.1** A natural gas leak could occur, posing a risk of fire. **3.13.2** Diesel fuel could leak from the storage container, posing a fire risk and possible contamination of soil. **3.13.3** Aqueous ammonia could spill or ammonia vapor could be released to the atmosphere, posing a health risk. **3.13.4** Hazardous nonfuel substances could spill, with the potential to harm people at the Energy Facility and in the surrounding area. **3.13.5** A fire could occur at the Energy Facility, posing a threat to workers and nearby people and structures. **3.13.6** The high-voltage electric transmission line could cause electrical shocks directly and from induced charges. **3.13.7** Electric and magnetic fields (EMFs) would increase but would be well within allowable limits. **3.13.8** Operation of the proposed Energy Facility could affect noise levels but would be within limits allowed by state statute. **3.13.9** Construction of the proposed Energy Facility could affect noise levels. Mitigation measures for the proposed project include compliance with applicable Federal, state, and local regulations governing health and safety and the handling and storage of hazardous materials and fuels. No mitigation measures are recommended beyond those proposed by the project. A barrier wall would be reserved as a contingency mitigation measure. The wall would be installed if a noise exceedance is detected during Facility performance testing.	No changes to existing conditions would occur.

TABLE 2-2
Comparison of Preferred and Alternative Electric Transmission Lines Routes

Criteria	Preferred Route	Alternative Route[1]
Attributes		
Number of towers	38	44
Electric transmission line route length	7.2 miles	7.9 miles
Permanent easement width	154 feet	200 feet
Total permanent easement	134.0 acres	190.8 acres
Total Easement Area		
Total Exclusive Farm Use-(EFU) zoned land	17.0 acres 0.9 mile	12.1 acres 0.6 mile
Total Forest-zoned land and Forestry-Range-zoned land	117.0 acres 6.3 miles	177.2 acres 7.3 miles
Total BLM-owned land	44 acres	52 acres
Permanent Disturbance (includes tower base, roads, and loss of functional use)		
EFU-zoned land	5.3 acres	1.24 acres
Ponderosa Pine Woodland to be cleared, including some merchantable timber	12.4 acres	60 acres
Juniper Woodland to be cleared, not considered merchantable timber	31.6 acres	118 acres
Wildlife habitat by ODFW Category 2[2]	31.6 acres	4 acres
Wildlife habitat by ODFW Category 3[2]	25.7 acres	13 acres
Other Resource Impacts		
Wetlands	Three intermittent creeks within right-of-way	Three intermittent creeks within right-of-way
Cultural resources	No cultural resource impacts. Route modified to avoid cultural sites identified during survey Closest known cultural resource site is 1,800 feet	Known culturally sensitive area. Previous ethnographic studies conducted with Modoc elders in 1994 produced oral testimony suggesting the presence of traditional cultural properties in the Bryant Mountain area. Closest known cultural resource site is 4,500 feet for west side and 3,500 feet for east side
Endangered species	Approximately 4,000 feet from bald eagles observed at McFall Reservoir	Approximately 1,750 feet from bald eagles observed at McFall Reservoir
Raptor mortality	Single line using bird flight diverters	Cluster of four electric transmission lines cause “net effect,” therefore increased risk of raptor mortality.[3] No flight diverts on existing lines.
Visual	New electric transmission line in area where not previously located	New electric transmission line clustered with existing lines

TABLE 2-2
Comparison of Preferred and Alternative Electric Transmission Lines Routes

Criteria	Preferred Route	Alternative Route[1]
Engineering and Safety Issues		
Proximity to occupied dwelling (feet)	3,000 feet	400 feet for west side; 1,000 feet for east side
Geotechnical considerations	Routed around a historical landslide	None known
Other constraints	Worked with landowners to develop route that is acceptable	Two sharp-angle structures: one where BPA line turns and heads west to Captain Jack and the second to enter Bay 2 at Captain Jack

ODFW = Oregon Department of Fish and Wildlife

[1] Information for the parallel route was based on analysis of the preferred route and environmental work for a pump storage project conducted in the mid-1990s. Route-specific surveys for cultural resources, rare plants, and wildlife have not been conducted.

[2] Permanent disturbance calculated for loss of forage habitat only owing to construction of roads and tower bases; does not include clearing of timber that may be required but is not considered forage habitat.

[3] Avian Power Line Interaction Committee, "Mitigating Bird Collisions With Power Lines: The State of the Art in 1994," page 21, 1994 (authors: Wendy M. Brown, Sidney Gauthreaux, A. D. Miller).

Figure 2-1
11 x 17
Color
Front

Figure 2-1
11 x 17
Color
Back

Figure 2-2
11 x 17
Color
Front

Figure 2-2
11 x 17
Color
Back

Figure 2-3
8.5 x 11
front

Figure 2-3
8.5 x 11
back

Figure 2-4
8.5 x 11
front

Figure 2-4
8.5 x 11
back

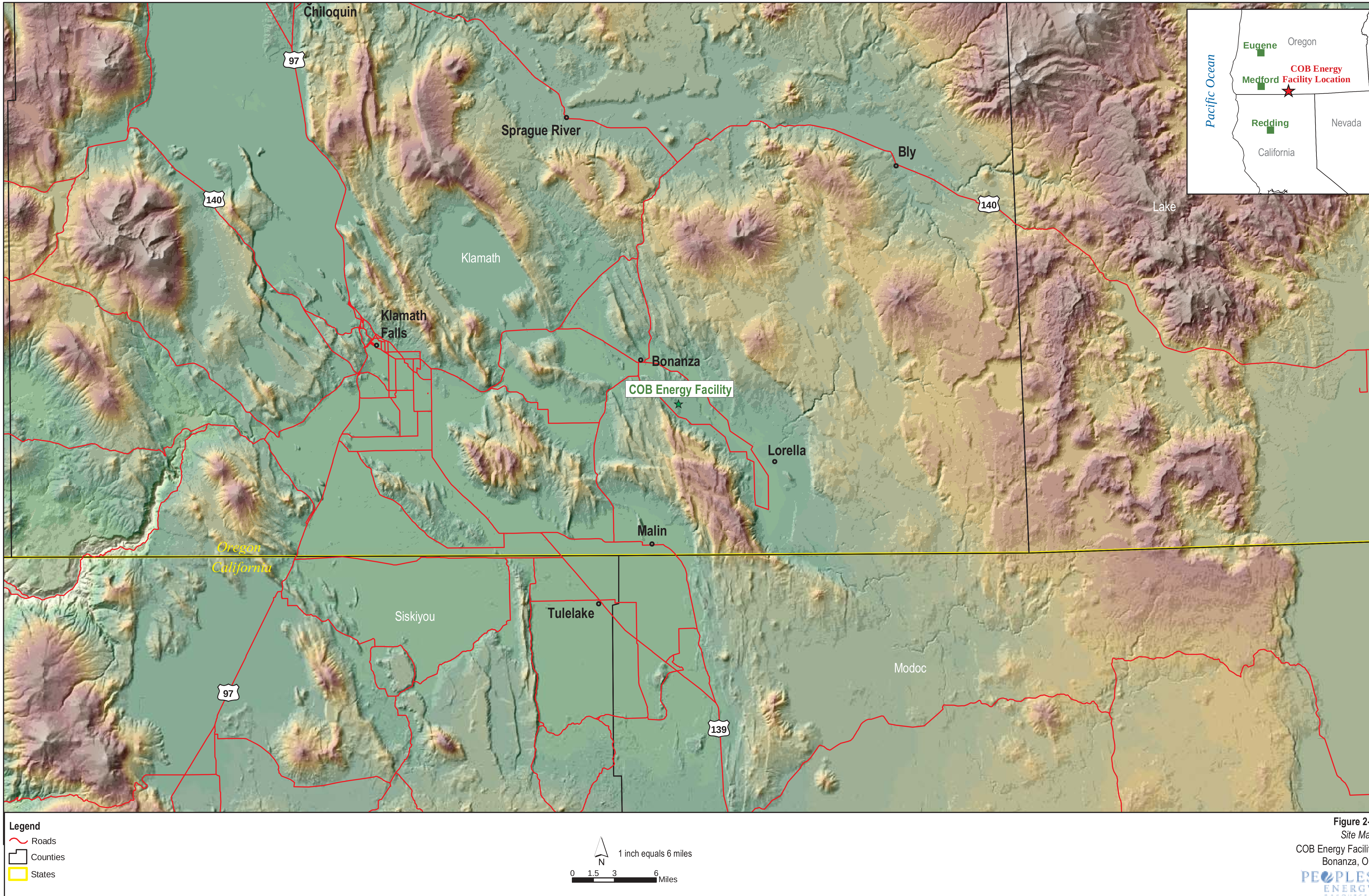
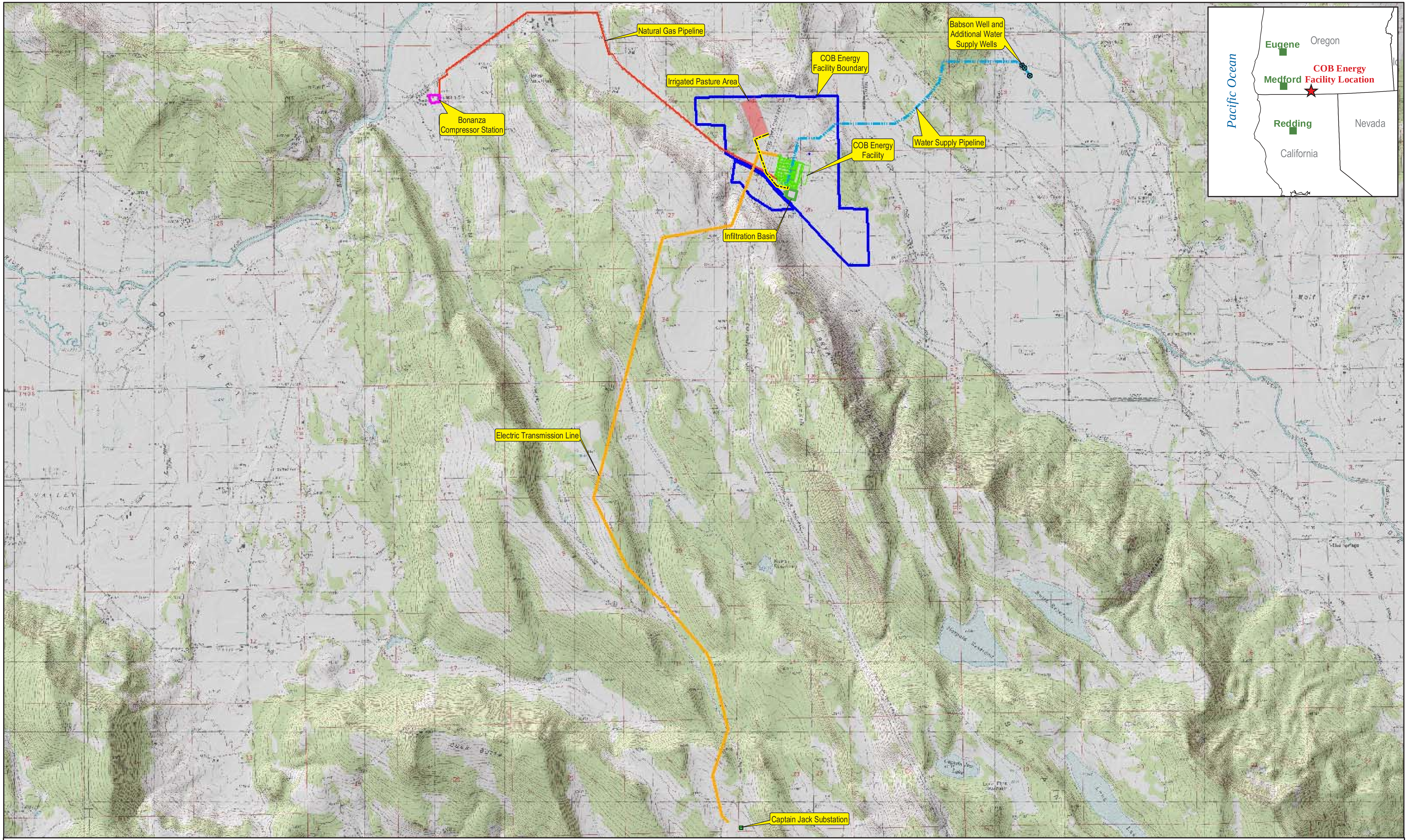


Figure 2-1
Site Map
COB Energy Facility
Bonanza, OR

PEOPLES ENERGY RESOURCES

File Path: P:\PERC\167426\Gis\EIS\mxds\EIS_8-7-03\2-1_site-map.mxd, Date: 08 07, 2003 7:37:25 AM



Legend

- Captain Jack Substation
- Babson Well and Additional Water Supply Wells
- COB Energy Facility Boundary
- Bonanza Compressor Station
- COB Energy Facility
- Electric Transmission Line
- Natural Gas Pipeline
- Water Supply Pipeline
- Irrigation Pipeline
- Infiltration Basin
- Irrigated Pasture Area

N

1 inch equals 4,000 feet

0 2,000 4,000 8,000 Feet

Figure 2-2

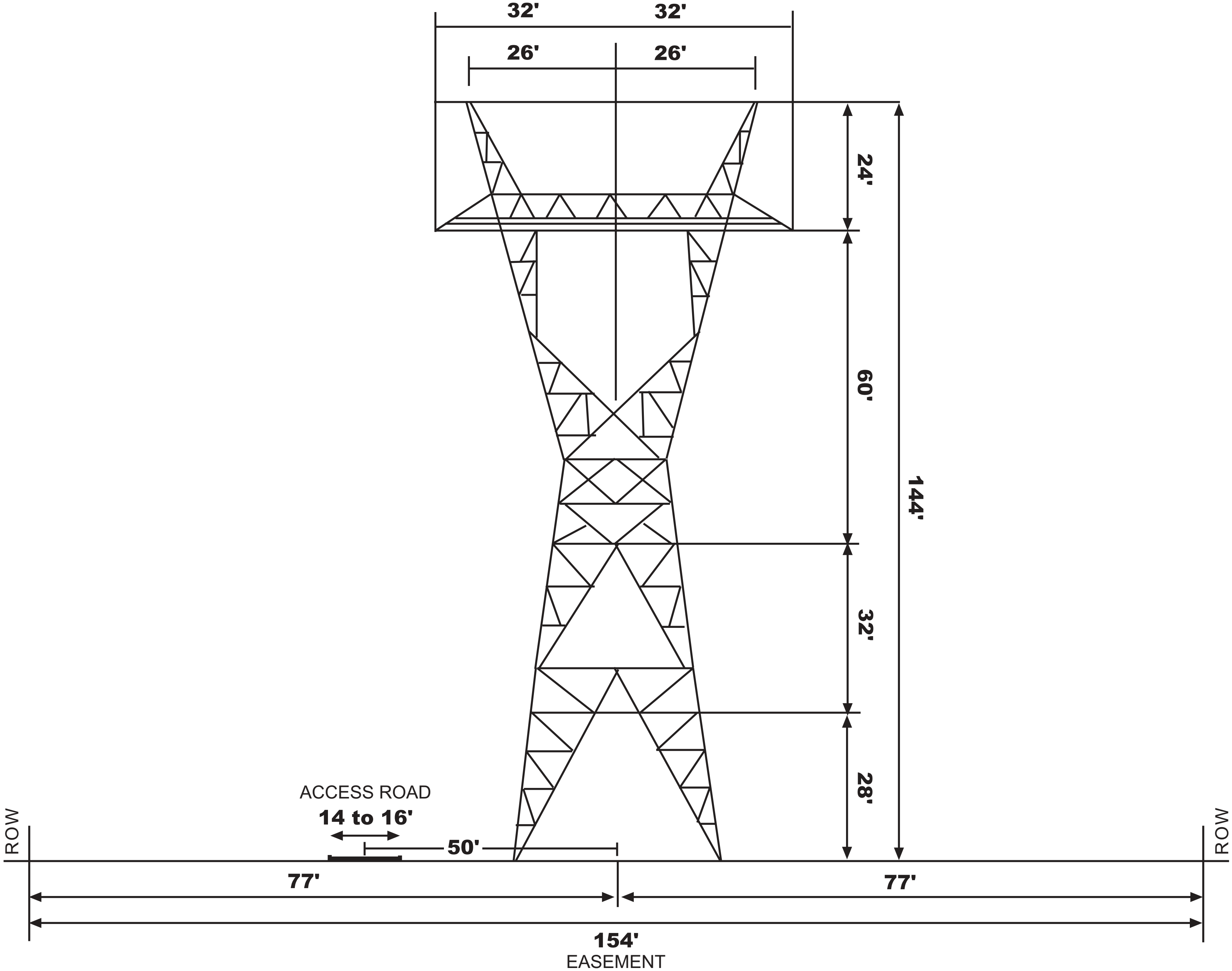
Facility Map

COB Energy Facility

Bonanza, OR

PEOPLES ENERGY RESOURCES

File Path: \\Rosa\Proj\PERC\167426\Gis\EIS\mxds\EIS_October_03\2-2_facility-map.mxd, Date: October 27, 2003 4:24:30 PM



NOTES:

1. TRANSMISSION TOWER IS LATTICE.
2. CONDUCTORS COULD BE HORIZONTAL OR VERTICAL.
3. ACCESS ROAD MAXIMUM GRADE IS LESS THAN 15 PERCENT.

Figure 2-3
Typical Transmission Tower Structure
COB Energy Facility
Bonanza, OR

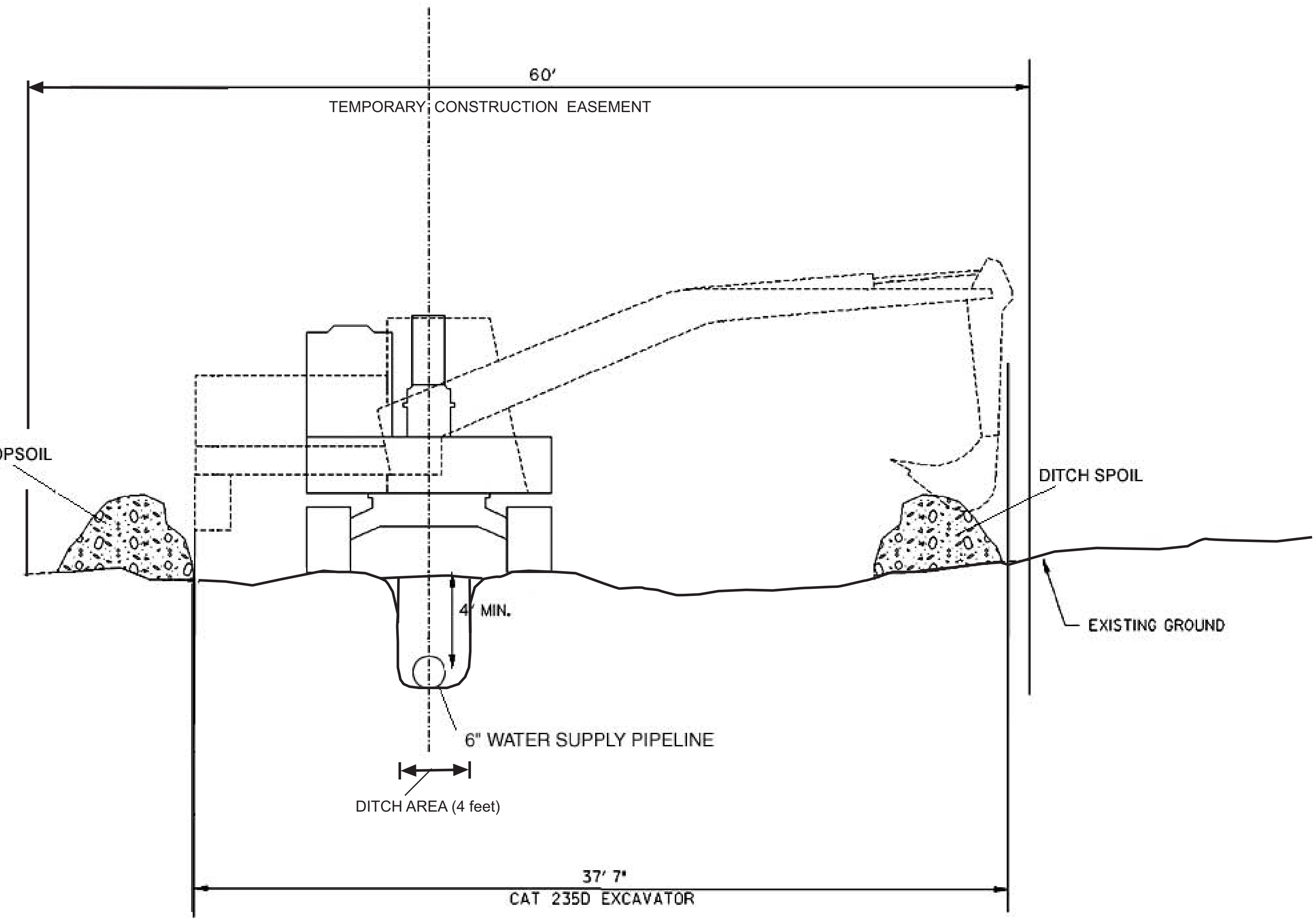


Figure 2-4
Typical Water Supply Pipeline Configuration
COB Energy Facility
Bonanza, OR

CH2MHILL

PEOPLES ENERGY Resources

CHAPTER 3

Affected Environment and Environmental Consequences

3.1 Introduction

This chapter provides an assessment of the effects of the proposed Energy Facility on various environmental elements, including geology, soil, and seismicity, hydrology and water quality, vegetation and wildlife, fish, traffic and circulation, air quality, visual quality and aesthetics, cultural resources, land use plans and policies, socioeconomics, public services and utilities, and health and safety (including noise). The information presented in this chapter is based on the detailed analyses of the SCA submitted to EFSC on September 5, 2002, and Amendments No. 1 and No. 2 to the SCA submitted to EFSC on July 25, 2003, and October 15, 2003, respectively, by the project proponent. Table 3.1-1 provides a summary of the affected environment and anticipated impacts of the Energy Facility and the No Action Alternative.

3.1.1 Mitigation Measures

The sections of this chapter that address each element of the environment include a discussion of mitigation measures. In this EIS, mitigation measures are broadly defined to include measures taken to avoid, minimize, or offset environmental impacts. Two classes of mitigation measures are described in this chapter: measures already incorporated in the proposed project, and additional measures recommended in this EIS. The mitigation measures included in the proposed project are those mitigation measures that the project proponent has proposed in its application to EFSC for a site certificate. The environmental analyses contained in this chapter were made assuming that these mitigation measures would be implemented as part of the proposed project.

Recommended mitigation measures are measures that would further reduce the environmental impacts of the Energy Facility. If the Energy Facility is approved, these mitigation measures would be considered in the Record of Decision.

3.1.2 Environmental Impacts of the No Action Alternative

If the No Action Alternative were selected, the COB Energy Facility would not be built. Accordingly, none of the potential impacts to water, land, and air discussed in this chapter would be realized. However, the No Action Alternative would have three adverse impacts of its own. First, the proposed project's contribution to the regional need for more electrical power would be foregone, potentially resulting in power shortages, limits on economic development, and increased power costs. Second, to the extent the regional need for power could be met through existing generation resources, a negative environmental impact would result because those older sources are, on average, less efficient and more polluting than the proposed COB Energy Facility. Third, the proposed project would not contribute to the regional economy.

3.1.3 Unavoidable Adverse Impacts

This EIS identifies measures to mitigate the potential adverse impacts of the proposed project through avoiding, minimizing, rectifying, reducing, or compensating for the adverse impact. However, even with mitigation, some adverse impacts would still occur if the proposed project is implemented, and these impacts thus would be considered unavoidable. The following unavoidable adverse impacts would occur during the 30-year lifetime of the Energy Facility:

3.1.3.1 Geology, Soil, and Seismicity

- 56.7 acres of Exclusive Farm Use (EFU) land would be converted to energy production
- Soil erosion would occur at the project site and along the pipeline and electric transmission line easement as a result of the land disturbance.
- The project would impact 13.9 acres of designated high-value agricultural soil

3.1.3.2 Hydrology and Water

- 162 gallons per day (gpd) of water, under average conditions would be used for power generation and irrigation requirements.

3.1.3.3 Vegetation and Wildlife

- Less than 0.5 acre of wetland would be filled.
- 108.7 acres of designated Oregon Department of Fish and Wildlife habitat would be removed from potential use by wildlife, including 50.7 acres of designated Significant Resource Overlay by Klamath County for high- and medium-density deer winter range.[9]

3.1.3.4 Traffic and Circulation

- Energy Facility construction traffic (835 daily trips) would decrease the Level of Service (LOS) of roads in the vicinity of the project.

3.1.3.5 Air Quality

- During construction, fugitive dust and combustion exhaust would be emitted from equipment and vehicles.
- During operation, the Energy Facility would emit up to 354 tons of NO_2 annually, 246 tons of PM_{10} annually, and 465 tons of CO annually.

3.1.3.6 Scenic and Aesthetic Values

- The Energy Facility would be visible in an area where industrial facilities previously did not exist.

[9] This acreage also includes lands designated as high-value soil and exclusive farm use.

3.1.3.7 Socioeconomic

- During construction, there would be a short-term impact on housing in the vicinity of the project.

3.1.3.8 Health and Safety

- Electric and magnetic fields would increase as a result of the construction of the switchyard and the electric transmission line.
- There would be an increase in noise levels in the vicinity of Energy Facility

3.1.4 Short-Term Uses and Long-Term Productivity

NEPA requires an analysis of the relationship between short-term uses of the environment and the maintenance and enhancement of long-term productivity for all alternatives. The following describes the local short-term use of the land as a power facility weighed against the long-term productivity of the rangeland, dryland agricultural fields, fallow fields, and woodlands. This analysis primarily focuses on permanent impacts during the 30-year life of the proposed project.

3.1.4.1 Proposed Action

The short-term uses of the land would result in increased short-term construction jobs and long-term operational jobs in Klamath County. In addition, there would be increased tax revenues for both the state of Oregon and Klamath County. The revenues would be used to enhance local and state public services and infrastructure and contribute to social programs. Mitigation proposed by the project proponent would also increase the productivity of 31 acres of agricultural land by beneficial use of process wastewater for pasture irrigation. The proposed project would restore 91 acres of fallow land to high-quality deer habitat and another 145 acres of habitat would be improved in the wildlife mitigation area. The proposed project would generate electricity that would meet present and future demand for power for homes and business throughout the western states.

Although water would be withdrawn from a deep aquifer, there are no other known users of this water in the vicinity of the proposed project. By using an air-cooled system, the Energy Facility would minimize the use of the water resource and wastewater would be used beneficially for irrigating 31 acres of pasture land. No wastewater or stormwater would be discharged to surface or ground waters.

Short-term construction impacts would result in the loss of existing vegetation and increased traffic, noise, and soil erosion. The implementation of best management practices (BMP's) through the proposed project's erosion and sediment control plan, regulated under NPDES General Construction Permit 1200-C, would be employed to minimize soil loss. Construction activities would disturb vegetation in some areas. However, following construction , revegetation of disturbed areas would be in conformance with a revegetation plan.

Long-term productivity impacts would result from the permanent loss for 30 years of approximately 108.7[10] acres of undeveloped land used for cattle grazing and fallow dryland

[10] Does not Include the corridor for the buried natural gas pipeline.

farming fields. The electric transmission line would impact fallow agricultural fields used for cattle grazing, woodlands, and open rangeland. The natural gas pipeline would follow an existing road right-of-way (Harpold County Road and West Langell Valley Road) and have minor long-term productivity impacts. The water well system and pipeline would be constructed through or adjacent to irrigated pasture and other agricultural operations, including open range land and woodlands on land under option by the project proponent. Approximately 56.7 acres of EFU land would be permanently impacted, including approximately 13.9 acres of high-value soil land[11]. Operation of the project would result in a long-term loss of the existing productivity of approximately 108.7 acres of agricultural, woodland, and rangeland. However, after the Facility is retired the land would be restored, as described in the site restoration plan required by EFSC, to the former uses.

Other impacts on long-term productivity of natural resources include the use of natural gas, impacts on air quality, and use of water resources. The proposed Energy Facility would consume natural gas resulting in a loss of this natural resource. As a result of using natural gas in a combustion turbine, the proposed Energy Facility could also have a potential long-term impact on global warming through the release of greenhouse gases. However, this would be offset by the proposed CO_2 mitigation as required by EFSC.

The short-term use (30 years) of natural resources would have a minor adverse impact on the long-term viability of the environmental resources in the vicinity of the project.

3.1.4.2 No Action Alternative

Under the No Action Alternative, the land would essentially remain in the same use over the long-term, but there would be no short-term positive or negative impacts.

3.1.5 Irreversible and Irretrievable Commitments of Resources

Irreversible and irretrievable resource commitments are related to the use of nonrenewable resources and the effects that the uses of these resources have on future generations. Irreversible effects primarily result from the use or destruction of a specific resource (for example, energy and minerals) that cannot be replaced within a reasonable time frame. Irretrievable resource commitments involve the loss in value of an affected resource that cannot be restored as a result of the action.

3.1.5.1 Proposed Action

The proposed action would result in both irreversible and irretrievable commitments of resources for the construction and operation of the Energy Facility. Construction of the Energy Facility would result in the consumption of hydrocarbons (such as gas, oil, and propane), gravel, sand, and wood and other materials that go into the production of steel, glass, aluminum, other metal alloys, asphalt, concrete, and bricks. The depletion of these natural resources is not expected to have a significant adverse effect on their availability over the lifetime of the project. At the retirement of the project, all salvageable material would be removed prior to demolition of the Facility. During and after demolition, scrap material such as metal would be sorted from nonuseable material and recycled. These actions would reduce the overall irreversible impacts of constructing the Energy Facility.

---

[11] Does not include the corridor for the buried natural gas pipeline.

During construction there would be temporary impacts on approximately 256.7 acres of land, but these impacts would be reversible following construction and restoration of the land, including buried pipelines, construction laydown areas, and other temporary construction features.

During its operational lifetime, the Energy Facility would consume approximately 9,000 MMBtu of per hour of natural gas annually. This is an irretrievable commitment of a nonrenewable resource.

Although the project has a projected life of 30 years, it is anticipated that the land would be restored back to the former uses at the end of the project as required by EFSC. Productivity of the land would be lost during the life of the project, but it would not be irretrievably lost.

3.1.5.2 No Action Alternative

If the proposed action is not constructed, the land and natural resources estimated to construct and operate the Energy Facility would not be irreversibly nor irretrievably committed.

3.2 Geology, Soil, and Seismicity

The proposed Energy Facility would be located in a subbasin of the Klamath Basin. The Energy Facility site, the natural gas pipeline, and the water supply pipeline would not have substantial changes in elevations where they are sited but the electric transmission line would. Two landslide areas have been observed in the vicinity of the electric transmission lines, and the transmission towers have been sited away from them.

Earthquakes are likely within the basin. However, the risk to human safety and the destruction of improvements would be minimized through the design and construction of the Facility, so impacts would be low.

The Energy Facility would cause the permanent disturbance during the 30-year operating life of the Energy Facility to approximately 13.1 acres of nonirrigated, high-value farmland soil. However, this soil is not considered prime farmland by the Natural Resources Conservation Service (NRCS) because it is not irrigated. Construction and operation of the Energy Facility could cause wind and water erosion. However, the implementation of BMPs and the National Pollutant Discharge Elimination System (NPDES) permits during construction and operation would minimize those impacts.

The information presented in this section is based on the studies and analysis conducted for the SCA as amended by Amendments No. 1 and No. 2, filed with EFSC on July 25, 2003, and October 15, 2003, respectively.

3.2.1 Affected Environment

The Energy Facility site is located in a subbasin of the larger Klamath Basin in south-central Oregon. The Klamath Basin is a composite graben that forms the westernmost structural trough of the Basin and Range physiographic province. The Klamath graben is bounded by predominantly north- to northwest-striking normal faults. The geology and topography of the Facility site are summarized below and shown in Figure 3.2-1.

3.2.1.1 Topography

Energy Facility Site. Most of the Energy Facility site is proposed in relatively flat agricultural fields. The site slopes gently upward towards the northeast to a low ridge. The total elevation difference is about 135 feet from the low point at elevation 4,205 feet in a field on the southeast end of the site to the top of the low ridge at elevation 4,340 feet at the northern end of the site.

Electric Transmission Line Easement. The electric transmission line easement would have substantial topographic relief. From the Energy Facility site, the alignment would extend southwestward up the steep slope of the Bryant Mountain ridge. From the top of the ridge, the alignment would trend generally south-southwestward, crossing a number of gently sloping upland ridges. The alignment would then turn south-southeastward and run subparallel to an upland ridge. Near its southern terminus, the alignment would cross a 30-foot-high rock cliff. The total elevation change along the alignment would be about 590 feet, with the low point of 4,290 feet elevation at the Energy Facility site and a high point of 4,880 feet elevation near the southern end of the alignment.

Natural Gas Pipeline Easement. The natural gas pipeline easement would follow along West Langell Valley and Harpold Roads. The easement would cross county roads in three places, and an irrigation canal in one place. The slopes would be very gentle, with a total elevation difference along the alignment of about 185 feet. The low point of 4,120 feet elevation would occur within the floodplain of the Lost River along Harpold Road. The high point of 4,305 feet elevation would occur along West Langell Valley Road just southwest of the Energy Facility site.

Water Supply Pipeline Easement. The water supply pipeline easement would cross several low ridges and basins from the raw water supply storage tank to the existing water supply well. In addition, the alignment would cross two paved Klamath County roads and three irrigation ditches. The alignment would also cross under the existing electric transmission lines that extend through the proposed Energy Facility site. The total elevation change would be about 235 feet, with the low point of 4,130 feet elevation at the water supply well and the high point of 4,365 feet elevation along the low ridge just north of the proposed Energy Facility site.

3.2.1.2 Geological Features

The following summarizes the geological features of the Energy Facility.

Energy Facility Site. Information provided on the Energy Facility site is based on the *Preliminary Geotechnical Engineering Report, COB Energy Facility, Bonanza, Oregon* (GeoEngineers, 2002).

The Energy Facility site would be partially underlain by Tertiary-age basalts that erupted from 15 million to 4 million years ago from multiple volcanic vents. The intact basalt is generally highly to closely fractured, hard, moderately weathered, blocky to massive, and moderately strong. Individual flows are typically 10 feet thick. The tops of flows are fractured and weathered. In addition, the top 5 to 10 feet of basalt are highly fractured and locally weathered to a gravelly soil.

Overlying and interbedded with the basalt units is a volcaniclastic rock that is massive, soft to moderately hard, severely to moderately weathered, blocky, and weak to moderately strong. The uppermost portion of this unit is highly weathered and has the properties of a very dense soil.

A very generalized distribution of these units is that basalt directly underlies steep slopes and upland areas and the volcaniclastic rock is the uppermost unit underlying the flatter basins and areas with agricultural fields.

Overlying the volcaniclastic rock in the flat-lying basins is a volcanic ash that is attributed to the eruption of Mount Mazama (Crater Lake). The ash has an age of about 6,000 years. The ash is a fine elastic silt that is slightly cemented giving it a stiff and to hard consistency. It ranges in thickness from 0 feet thick at the fringes of the basins to more than 39 feet thick in the middle of the basins.

Recent surficial soil mantles the other geologic units. In the steeply sloping and upland areas where basalt bedrock is exposed or close to the surface, the soil consists of a mixture of silt, sand, gravel, cobbles and boulders. The thickness ranges from 0 feet to about 5 feet. Within the flatter lying basins, the surficial soil ranges from a silty sand to a silt with sand.

This soil also contains occasional to some gravel. The thickness of the basin surficial soil is 5 to 13 feet in the vicinity of the proposed Energy Facility site. In the agricultural fields, the upper 18 inches of soil has been loosened by tilling activities.

An unmapped normal fault occurs along the base of Bryant Mountain, immediately to the southwest of the Energy Facility site. The inferred trace of the fault is shown in Figure 3.2-1. The fault trends northwest-southeast and is at least 10 miles in length. The bedrock has been uplifted on the southwest side of the fault, giving rise to Bryant Mountain, and down-dropped on the northeast side, resulting in the basin where the Energy Facility site would be located. The fault likely dips to the northeast, extending beneath the proposed Energy Facility site.

Natural Gas Pipeline Easement. Rock and soil units along the natural gas pipeline easement appear to be similar to those at the proposed Energy Facility site. However, no subsurface information currently exists for the easement. Shallow basalt bedrock occurs along only 20 percent of the alignment, mostly near the Energy Facility site. The subsurface soil is presumably similar to the agricultural fields at the proposed Energy Facility site. There may be recent alluvial sands and silts located along Harpold Road, which roughly parallels the Lost River.

The extension of the fault along the base of Bryant Mountain ridge crosses the proposed natural gas pipeline along Harpold Road. The trace of the fault is not apparent as it crosses under the Lost River floodplain north of Harpold Road.

Electric Transmission Line Easement. The rock and soil units along the proposed electric transmission line easement appear to be similar to the proposed Energy Facility site. However, no subsurface information currently exists for the easement. More than 90 percent of the easement has shallow bedrock. The rock is mostly basalt, although some volcaniclastic rock could also be present. Soil is shallow and consists of mixtures of silt, sand, gravel, cobbles, and boulders.

An ancient landslide has been identified where the northern section of the proposed electric transmission line easement would extend up the steep slope that forms the Bryant Mountain Ridge, southwest of the Energy Facility. No signs of recent movement were observed in the field or on air photos. The electric transmission line route was relocated around the ancient landslide.

The alignment would cross a cliff created by resistant basalt. The cliff is about 30 feet high and consists of columnar jointed basalt. The columns are wide and are up to about 8 feet in diameter. In addition, it is common for the columnar joints to be open by as much as several feet. This indicates that the columns are slowly toppling. Transmission towers would be located to span over this cliff area. The landslide and rock cliff are shown in Figure 3.2-1.

The electric transmission line easement would traverse several faults. The fault along the base of Bryant Mountain ridge would cross the easement on the far north end near the Energy Facility. At its southern end the transmission line would cross a mapped fault (Walker and MacLeod, 1991). This is a normal fault that is down-dropped to the northeast, similar to the Bryant Mountain ridge fault. It runs subparallel to the easement for a short distance. These faults are shown in Figure 3.2-1. There are undoubtedly other unmapped normal faults crossing the easement that have less obvious topographic expression.

Water Supply Pipeline Easement. The rock and soil units that would be along the water supply pipeline easement appear to be similar to the Energy Facility site composition. However, no subsurface information currently exists for the easement. Sloping and upland areas are underlain by basalt. Flat-lying basins with agricultural fields are likely underlain by volcaniclastic rock and volcanic ash. Shallow basalt bedrock occurs along about 50 percent of the easement. Shallow and deep soil both occur and are assumed to be similar to soil at the Energy Facility site.

The water supply pipeline easement would cross several unmapped normal faults. These faults trend northwest-southeast and are down-dropped on the northeast side similar to the Bryant Mountain ridge fault. The inferred fault traces are shown in Figure 3.2-1.

3.2.1.3 Soil

The near-surface soil at the Energy Facility site and vicinity was identified using the Natural Resources Conservation Service (NRCS, formerly Soil Conservation Service) Soil Survey of Klamath County, Oregon, Southern Part (NRCS, 1985). The soil survey describes soil conditions in the upper 5 feet and classifies land capability. Figure 3.2-2 shows the NRCS soil map units for the vicinity.

A preliminary soil investigation and shallow groundwater assessment was conducted in December 2002. Soil borings were made at 15 locations to a depth of 48 inches, where borings were not otherwise restricted by shallow bedrock or hardpan. Figure 3.2-3 shows the field sampling locations. Soil properties recorded for each boring included texture, moisture, effervescence (using 10 percent hydrochloric acid), and presence of cementation, hardpan, bedrock, and redoximorphic features. At selected boring locations, composite soil samples were collected to establish background soil chemical characteristics. A summary table of soil properties is presented in Table 3.2-1.

Soil Units. Sixteen soil map units were identified within the Energy Facility site footprint and the natural gas pipeline, water supply pipeline, and electric transmission line easements. A breakdown of soil areas by Facility feature for permanent and temporary disturbance is presented in Tables 3.2-2 and 3.2-3, respectively. General soil descriptions are provided below.

6B Calimus fine sandy loam, 2 to 5 percent slopes. This well-drained soil can be found on terraces and alluvial fans near the edge of warmer basins. It formed in alluvial and lacustrine sediment weathered mainly from diatomite, tuff, and basalt. Permeability is moderate, runoff is slow and erosion hazard is slight. The soil is used for irrigated crops such as Irish potatoes, alfalfa hay, barley, wheat, oats, and pasture crops.

7 Calimus loam, 0 to 2 percent slopes. This well-drained soil can be found on terraces near the edge of warmer basins. It formed in loamy sediment weathered mainly from diatomite, tuff, and basalt. Permeability is moderate, runoff is very slow, and erosion hazard is slight. The soil is used for irrigated crops such as Irish potatoes, alfalfa hay, barley, wheat, oats, and pasture crops.

7B Calimus loam, 2 to 5 percent slopes. This well-drained soil can be found on terraces and alluvial fans near the edge of warmer basins. It formed in alluvial and lacustrine sediment weathered mainly from diatomite, tuff, and basalt. Permeability is moderate, runoff is slow, and erosion hazard is slight. The soil is used for irrigated crops such as Irish potatoes, alfalfa hay, barley, wheat, oats, and pasture crops.

7C Calimus loam, 5 to 15 percent slopes. This well-drained soil can be found on terraces and alluvial fans near the edge of warmer basins. It formed in alluvial and lacustrine sediment weathered mainly from diatomite, tuff, and basalt. Permeability is moderate, runoff is medium, and erosion hazard is moderate. The soil is used for irrigated crops such as alfalfa hay, barley, wheat, oats, and pasture crops.

9B Capona loam, 2 to 5 percent slopes. This well-drained soil can be found on terraces and rock benches near the edge of warmer basins. It formed in material weathered mainly from tuff, diatomite, and basalt. Permeability is moderate, runoff is medium, and erosion hazard is moderate. The soil is used for irrigated and dryland crops such as Irish potatoes, alfalfa hay, barley, wheat, oats, pasture crops, and dryland wheat. Bedrock is at a depth of 20 to 40 inches.

23B Harriman loam, 2 to 5 percent slopes. This well-drained soil can be found on terraces near the edge of warmer basins. It formed in lacustrine sediment weathered mainly from tuff, diatomite, and basalt. Permeability is moderately slow, runoff is slow, and erosion hazard is slight. The soil is mainly used for irrigated crops such as Irish potatoes, alfalfa hay, barley, wheat, oats, pasture, and cereal hay. Lacustrine bedrock is at a depth of 40 to 60 inches.

23C Harriman loam, 5 to 15 percent slopes. This well-drained soil can be found on terraces near the edge of warmer basins and below escarpments. It formed in lacustrine sediment weathered mainly from tuff, diatomite, and basalt. Permeability is moderately slow, runoff is medium, and erosion hazard is moderate. The soil is mainly used for irrigated and dryland crops such as alfalfa hay, barley, wheat, oats, pasture, and cereal hay. Lacustrine bedrock is at a depth of 40 to 60 inches.

26 Henley loam. This somewhat poorly drained soil can be found on low terraces. It formed in alluvial and lacustrine sediment. Zero to 2 percent slopes are most common. Permeability is moderate, runoff is very slow, and erosion hazard is slight. The soil is most commonly used for irrigated pasture. Where the soil has been drained and alkali has been removed, alfalfa hay, barley, wheat, oats, and cereal hay are grown. Hardpan is at a depth of 20 to 40 inches.

28 Henley-Laki loam. This somewhat poorly drained (Henley) to moderately well-drained (Laki) soil can be found on low terraces. It formed in mixed alluvial and lacustrine sediment. Zero to 2 percent slopes are common. Permeability is moderate, runoff is very slow, and erosion hazard is slight. The soil is used for irrigated crops such as pasture, alfalfa hay, barley, wheat, oats, and cereal hay. Hardpan is at a depth of 20 to 40 inches underneath the Henley soil.

38 Laki loam. This moderately well-drained soil can be found on low terraces. It formed in very deep alluvial and lacustrine sediment weathered from basalt, diatomite, tuff, and ash. Zero to 2 percent slopes are common. Permeability is moderate, runoff is very slow, and erosion hazard is slight. The soil is used for irrigated crops such as Irish potatoes, barley, wheat, oats, cereal hay, and pasture.

40 Laki-Henley loam. This moderately well-drained (Laki) to somewhat poorly drained (Henley) soil can be found on low terraces. It formed in alluvial and lacustrine sediment weathered from diatomite, tuff, basalt, and ash. Zero to 2 percent slopes are common. Permeability is moderate, runoff is very slow, and erosion hazard is slight. The soil is used for irrigated crops such as pasture, alfalfa hay, barley, wheat, oats, cereal hay, and Irish potatoes. Hardpan is at a depth of 20 to 40 inches.

50E Lorella very stony loam, 2 to 35 percent south slopes. This well-drained soil can be found on escarpments at the edge of warmer basins that mostly face south. It formed in very cobbly and gravelly material weathered from tuff and basalt. Permeability is slow, runoff is rapid, and erosion hazard is high. The soil is used for range and wildlife habitat. Tuffaceous bedrock is at a depth of 19 inches.

51E Lorella-Calimus association, steep north slopes. This well-drained soil can be found on escarpments at the edge of warmer basins that dominantly face north. It formed in very cobbly and gravelly material weathered from tuff and basalt. Permeability is slow (Lorella) to moderate (Calimus), runoff is rapid (Lorella) to medium (Calimus), and erosion hazard is high (Lorella) to moderate (Calimus). The soil is used for range and wildlife habitat. Tuffaceous bedrock is at a depth of 19 inches.

58B Modoc fine sandy loam, 2 to 5 percent slopes. This well-drained soil can be found on terraces near the edge of basins. It formed in lacustrine sediment weathered mainly from tuff, diatomite, basalt, and a small amount of ash. Permeability is moderately slow, runoff is slow, and erosion hazard is slight. The soil is mainly used for irrigated crops such as alfalfa hay, barley, wheat, oats, pasture, cereal hay, and Irish potatoes. An indurated hardpan is at a depth of 20 to 40 inches.

74B Stukel-Capona loam, 2 to 15 percent slopes. This well-drained soil can be found on rock benches around the edges of warmer basins. It formed in material weathered mainly from tuff and diatomite. Permeability is moderate, runoff is rapid (Stukel) to medium (Capona), and erosion hazard is high. The soil is mainly used for range and irrigated crops such as pasture, barley, wheat, oats, and cereal hay. Tuffaceous bedrock is at a depth of 17 inches (Stukel) and 25 inches (Capona).

74D Stukel-Capona loam, 15 to 25 percent slopes. This well-drained soil can be found on rock benches around the edges of warmer basins. It formed in material weathered mainly from tuff and diatomite. Permeability is moderate, runoff is rapid (Stukel) to medium (Capona), and erosion hazard is high. The soil is mainly used for range and wildlife habitat. Tuffaceous bedrock is at a depth of 17 inches (Stukel) and 25 inches (Capona).

Identification of Farmland Soil. Prime and unique farmlands are protected under the Federal Farmland Protection Act (FFPA) of 1984 (7 CFR Part 658.2). The FFPA recognizes that lands within the urban growth boundary (UGB) are committed to urban development, regardless of soil type. However, proposed projects outside the UGB are subject to evaluation by the Natural Resource Conservation Service (NRCS), formerly the Soil Conservation Service (SCS).

The following soil types encountered at the Energy Facility site are classified as prime farmland by the NRCS under certain conditions:

Class 1 Soil. No soil listed by the state of Oregon as Class 1, nonirrigated, high-value farmland soil for southern Klamath County (OAR 660-033-0020) would be permanently disturbed by construction of the Energy Facility site.

A total of 9.6 acres along the electric transmission line route is listed as prime or Class 1, nonirrigated, high-value soil for southern Klamath County (OAR 660-33-020). The soil type is 23B Harriman loam, 2 to 5 percent slopes.

Class 2 Soil. The following soil types listed by the state of Oregon as Class 2, nonirrigated, high-value farmland soil for southern Klamath County (OAR 660-33-020) can be found at the Energy Facility site and the electric transmission line:

- 6B Calimus fine sandy loam, 2 to 5 percent slopes
- 7A Calimus loam, 0 to 2 percent slopes
- 7B Calimus loam, 2 to 5 percent slopes

The NRCS identifies these soil types as prime farmland only if they are irrigated. A total of approximately 17.7 acres of these soil types fall within the Facility permanent disturbance areas. This number represents about 17 percent of the 108.7 acres of permanent disturbance during the 30-year operating life of the Energy Facility.

3.2.1.4 Seismicity

The following describes the faults present within 50- and 100-mile radii of the Energy Facility. Also described are the seismic forces at work within the project area.

Faults. Figure 3.2-1 shows inferred faults and landslides in the immediate vicinity of the proposed Energy Facility site, including one fault mapped by a CH2M HILL engineering geologist; the fault runs within a few hundred feet of the proposed Energy Facility. These faults have not previously been identified as having seismic activity and are not known to be active. One ancient landslide was observed in the vicinity of the proposed Energy Facility. The landslide shows no apparent signs of recent instability. Areas of shallow bedrock are not shown in Figure 3.2-1 because of the prevalence of shallow bedrock along the alignments. Although the faults could pose hazards, the risk to human safety and the destruction of property would be minimized through the design and construction of the Facility.

In addition to the inferred faults shown in Figure 3.2-1, faults within a 50-mile radius of the Energy Facility are summarized below. Only mapped faults are discussed. The assessment of activity is based on historical seismicity. If there is evidence for possible late Quaternary (less than 780,000 years) fault movement, the fault is considered potentially active and a probability of activity is assigned to it. Quaternary faults for which there is no evidence of displacement are not considered potentially active sources and the probability of activity is considered zero. Therefore, the lowest probability of activity is 0 and the highest probability of activity is 1.

The **West Klamath Lake Fault**, the **South Klamath Graben Zone** and the **East Klamath Graben Fault** are subdivisions of the **Klamath Graben**. The Klamath Graben is at the northwestern end of a set of complex northwest-trending horsts and grabens at the west edge of the Basin and Range structural province.

The **West Klamath Lake Fault** is located approximately 35 miles northwest of the site. It has a probability of activity of 1.0 and a total length of 40 miles.

The **South Klamath Graben Zone** has a probability of activity of 1.0 and a total length of 31 miles. It is approximately 17 miles west of the site.

The **East Klamath Graben Fault** has a probability of activity of 0.5. The total length of the fault is 12 miles. It is located approximately 42 miles north to northwest of the site.

The **Sky Lakes Fault** is a series of several 3- to 8-mile-long north-trending normal faults lying approximately 40 miles from the site. The probability of activity is 0.6. The total length of the feature is about 37 miles.

The **Mahogany Mountain Fault Zone** is a zone of northwest-trending normal faults along the northeast side of Butte Valley in north-central California near the Oregon border. The probability of activity of the Mahogany Mountain Fault Zone is 1.0 and the total length is about 17 miles. This fault zone lies approximately 30 miles southwest of the site.

The **Cedar Mountain Fault Zone** is a complex, 27-mile-long zone of north-trending normal faults in northern California near the Oregon border, approximately 23 miles southwest of the site. The probability of activity is 1.0.

The **Winter Ridge-Ana River-Slide Mountain Fault Zone** is a northwest-trending normal fault zone located about 50 miles northeast of the site. The probability of activity is 1.0. The total length of the fault zone is about 43 miles. Maximum rupture lengths considered are between 10 and 43 miles.

The **Goose Lake Graben** is a north-trending graben located along the Oregon-California border west of Warner Mountain, about 50 miles east of the site. The probability of activity is 0.8. Maximum rupture lengths of the normal fault considered are between 12 and 37 miles.

Faults within a 100-mile radius of the Energy Facility site are summarized below:

The **Southeast Newberry Zone/Crack-in-the-Ground Fault/Viewpoint Fault Zone** is a discontinuous northwest-trending fault zone located about 58 miles northwest of the site and mapped at about 40 miles in total length. Maximum rupture lengths are mapped between 16 and 25 miles. The probability of activity is 1.0.

The **Southwest Newberry Fault Zone** is an east- and west-facing group of normal faults located about 62 miles south of the Energy Facility site. The probability of activity is 0.8. A range of maximum surface rupture lengths of 6 to 16 miles is expected.

The **Chemult Graben (Western Margin)** is a discontinuous north- to northeast-trending normal fault zone located about 93 miles southwest of the site and mapped at about 34 miles in total length. Maximum rupture lengths are mapped between 19 and 34 miles. The probability of activity is 0.8.

The **Walker Rim Fault (Eastern Margin)** is located about 93 miles southwest of the site. Maximum rupture lengths are mapped between 14 and 37 miles. The probability of activity is 0.3.

The **Paulina Marsh Fault** is a northwest-trending strike slip fault located about 70 miles north of the site and mapped at about 7 miles in length. Maximum rupture lengths are expected to be between 6 and 19 miles. The probability of activity is 1.0.

The **Abert Rim Fault** is a north 15° east-trending normal fault located about 65 miles to the northeast of the site and mapped at about 30 miles in length. Maximum rupture lengths are expected to be 19 and 28 miles. The probability of activity is 1.0.

The **Surprise Valley Fault** is a normal fault located in the north-south bounded basin in northeastern California, approximately 67 miles to the southeast of the site. The fault has a mapped length of about 52 miles. Maximum rupture lengths are expected to be 19 and 52 miles. The probability of activity is 1.0.

The **Warner Valley Graben** is a predominantly normal-faulting graben that extends for a distance of more than 62 miles from northern California into southern Oregon. The fault along the eastern margin of the valley is divided into two faults sources, the East Warner Valley north and south. These faults are assigned a probability of activity of 0.5 and maximum rupture lengths between 12 and 37 miles. The fault along the western margin of the valley is characterized separately. It was assigned a probability of activity of 0.2 and maximum rupture lengths between 12 and 28 miles.

Seismic Hazard. The seismic hazard in the project area results from three seismic sources: interplate events, intraslab events, and crustal events (Geomatrix Consultants, 1995). Each of these sources has a different cause and therefore produces earthquakes with different characteristics (that is, peak ground accelerations, response spectra, and duration of strong shaking). Each source is capable of generating a peak ground acceleration (PGA) on rock at the site larger than 0.05g.

Two of the potential seismic sources, interplate and intraslab events, are related to the subduction of the Juan De Fuca plate beneath the North American plate. Interplate events occur as a result of movement at the interface of these two tectonic plates. Intraslab events originate within the subducting tectonic plate, away from its edges, when built-up stresses within the subducting plate are released. These source mechanisms are referred to as the Cascadia Subduction Zone (CSZ) source mechanism. The CSZ originates off the northern coast of California, extends along the coast of Oregon and Washington, and subducts beneath both states. The two source mechanisms associated with the CSZ are currently thought to be capable of producing moment magnitudes of about 9.0 and 7.5, respectively (Geomatrix Consultants, 1995). These moment magnitudes are the largest postulated magnitudes for the two source mechanisms. They are used as limiting values in the probabilistic model for estimating ground motions or as the source magnitude for deterministic estimates of ground motion. Interplate earthquakes are usually thrust events occurring on relatively shallow dipping faults at depths of less than about 30 miles (Geomatrix Consultants, 1995). Intraslab events are typically deeper, 25 to 45 miles, and have normal faulting mechanisms.

Earthquakes caused by movements along crustal faults, generally in the upper 10 to 15 miles, are the third source mechanism. In the vicinity of the Facility, these movements occur on the crust of the North America tectonic plate when built-up stresses near the surface are released. Several crustal faults are in the vicinity of the Energy Facility site. Faults within a 50-mile and 100-mile radius around the Facility are listed under Faults above

(Geomatrix Consultants, 1995). A magnitude 6.5 earthquake at the Klamath Graben fault zone near Klamath Falls and a magnitude 6.0 earthquake, randomly picked, 6 miles away from the Facility are considered appropriate to represent the maximum credible earthquake in the vicinity of the Facility. The selected magnitude of these events is equal to or greater than the magnitude of recorded events in southern Oregon.

Two earthquakes struck the Klamath Falls area in September 1993. Recorded magnitudes were 5.9 and 6.0. The 6.0 quake, located more than 67 miles away, was the most distant event to affect the proposed Energy Facility site.

3.2.2 Environmental Consequences and Mitigation Measures

As described below, the Energy Facility would have no significant unavoidable adverse impacts on geology, soil, or seismicity.

Impact 3.2.1. Landslides present a low risk to the proposed Energy Facility.

Assessment of Impact. One existing ancient mass landslide and one small toppling-type landslide were identified along the route of the electric transmission line during the site reconnaissance. The route has been modified to miss the ancient landslide based on visual observation and review of aerial photographs; the overall stability of the ancient landslide mass would be evaluated during the geotechnical investigation. Stability of the toppling landslide has already been evaluated and the transmission towers would be set back far enough from the top of the slope and the toe of the slope to avoid the unstable area.

Recommended Mitigation Measures. If upon further evaluation, the stability of the ancient landslide mass was found to be lacking, additional mitigation measures would be implemented, including further adjustment of the transmission tower locations and installation of instrumentation on the towers to monitor for movement.

Impact 3.2.2. The Energy Facility would have a low impact on land identified as high-value soil in Klamath County.

Assessment of Impact. The Energy Facility site would be located on a fallow field that was used for dryland grain farming until 1999, but the crop was not economical due to low productivity. The Energy Facility site has been heavily grazed and soil and vegetation productivity are low. Approximately 13.1 acres of high-value farmland soil would be permanently disturbed on the Energy Facility site.

Approximately 10.9 acres of the land within the natural gas pipeline construction easement is classified as high-value soil if irrigated. This soil would be temporarily disturbed during construction, and fully restored after pipeline installation. Because this soil is not irrigated in this location, it is not considered prime, high-value farmland soil.

Along the electric transmission line easement, 0.4 acre of land classified as high-value farmland if irrigated would be permanently disturbed. The soil along the electric transmission line easement would not be irrigated and thus is not considered prime, high-value farmland soil.

Class 1 Soil. No soil listed by the state of Oregon as Class 1, nonirrigated, high-value farmland soil for southern Klamath County (OAR 660-033-0020) would be permanently disturbed by construction of the Energy Facility site.

A total of 9.6 acres along the electric transmission line route is listed as prime or Class 1, nonirrigated, high-value soil for southern Klamath County (OAR 660-33-020). The soil type is 23B Harriman loam, 2 to 5 percent slopes.

Class 2 Soil. The following soil can be found at the Energy Facility site and the electric transmission line and is listed as Class 2, nonirrigated, high-value farmland soil for southern Klamath County (OAR 660-33-020):

- 6B Calimus fine sandy loam, 2 to 5 percent slopes
- 7A Calimus loam, 0 to 2 percent slopes
- 7B Calimus loam, 2 to 5 percent slopes

A total of approximately 23.7 acres of this soil falls within the Facility impact areas. This number represents about 23 percent of the 108.7 acres of permanent disturbance during the 30-year operating life of the Energy Facility.

A facility retirement and site restoration approach would support restoration of the Energy Facility site, to its current agricultural use. This is consistent with the current zoning of Exclusive Farm Use-Cropland (EFU-C). The approach uses topsoil salvaging and replacement, and standard farming practices.

Recommended Mitigation Measures. The following measures would be employed to minimize construction impacts on highly-valued soil and agricultural practices:

- Consult with landowners and farmers to address field access, revegetation, timing, and other sensitive cropping issues.
- Consult with landowners to identify the locations of drainage and irrigation systems.
- Flag tile and irrigation lines prior to construction.
- Maintain the flow of irrigation water during construction or coordinate a temporary shutoff with affected parties.
- Coordinate with farm operators to provide access for farm equipment to fields isolated by construction activities.
- The natural gas pipeline and water supply pipeline would be buried with 4 feet of topcover; the pipelines would be installed under drain tiles unless the drain tiles are located deep enough to allow the pipelines to be installed above the drain tile with at least 4 feet of topcover over the pipelines and, where feasible, a 12-inch clearance between the tile and the pipelines; where feasible and practicable, install the pipelines with greater than 4 feet of topcover where specifically requested by the landowner to allow for certain site-specific conditions or practices; and install plastic warning ribbon approximately 12 inches above the buried pipelines to provide a greater level of safety for potential future excavation activities.

- Follow an erosion and sediment control plan as part of NPDES General Construction Permit 1200-C; control the discharge from trench dewatering to avoid damaging adjacent agricultural land, crops, or drainage systems.
- Control dust emissions generated during construction, as necessary, by the control of vehicle speed, by wetting the construction area or by other means; and coordinate with farm operators to provide adequate dust control in areas where specialty crops are susceptible to damage from dust contamination.
- Identify potential noxious weed and soil-borne pathogen threats before construction and develop appropriate plans.
- Require contractors to thoroughly clean construction equipment prior to the moving into a new construction area or relocating from one construction area to another.
- Consult with the appropriate agencies to determine the location of noxious weeds.
- Make reasonable efforts to obtain straw bales for erosion control and straw for mulch that are free of noxious and nuisance weed contamination.
- Use Oregon-certified seed or equivalent for revegetation.
- Construct linear facilities adjacent to public rights-of-way and along property lines, and avoid bisecting fields.
- Where possible, strip and segregate topsoil from subsoil over the trench, from the trench spoil storage area and from areas subject to grading in agricultural lands; store topsoil immediately adjacent to the stripped area to the extent practical; replace the segregated topsoil after the trench is backfilled and the subsoil is restored to grade.
- Take suitable precautions to minimize the potential for oversize rock to be introduced into the topsoil and to become interspersed with soil that is placed back in the trench and remove excess surface rock from agricultural soil following construction activities.
- Locate temporary access roads used for construction purposes in coordination with the landowner and any tenants; attempting to identify existing farm lanes as preferred temporary access roads for construction; and designing and constructing temporary roads with proper drainage and to minimize soil erosion.
- Restrict the operation of vehicles and heavy equipment, or take other appropriate action, on excessively wet soil on the portion of the construction work area in agricultural land where the topsoil is not stripped and segregated so that deep rutting does not result in the mixing of topsoil and subsoil.

The following measures would be employed to mitigate temporary construction impacts on agricultural practices:

- Restore and return to agricultural use the areas temporarily impacted by construction.
- Deep root, invasive crops that can cause damage to the buried pipelines would be restricted within a 10-foot-wide area (centered over the centerline) directly over the pipelines.

- Restore drainage patterns to prevent ponding of water.
- Implement additional restoration efforts if visual crop deficiencies occur on the construction area.
- Inspect the construction areas for noxious weed infestations following construction and treat new infestations resulting from construction activities.
- Use appropriate tillage on compacted agricultural land to relieve soil compaction and follow tillage with revegetation of affected areas.
- Repair or replace damaged irrigation lines or drainage tiles.

Impact 3.2.3. Limited erosion would occur during construction with the implementation of BMPs.

Assessment of Impact. Generally, construction activities introduce the potential for increased erosion; however, the implementation of BMPs through the proposed project's erosion and sediment control plan, regulated under NPDES General Construction Permit 1200-C, would be employed to minimize soil loss. Construction activities would disturb vegetation in some areas; however, following construction, revegetation of disturbed areas would be completed in conformance with a revegetation plan.

The natural gas pipeline would parallel county roads to minimize traffic disturbance during construction. Lands temporarily affected by the natural gas pipeline construction would include irrigated and nonirrigated cropland and rangeland. Some soil and vegetation disturbance within the 80-foot construction easement would be required for equipment access, excavation, soil stockpiling, and laydown areas. Additional temporary work space of 40 feet (for a total of 120 feet) would be required along the north side of West Langell Valley Road near the Energy Facility site, where the natural gas pipeline route goes through an approximate 2,200-foot section of steep topography. The extra width is needed for soil storage when leveling the easement to create a safe working platform for workers and equipment.

Soil removed from the excavations would be temporarily stockpiled within the construction easement and would be exposed to wind and water erosion during construction. Dust and erosion control mitigation measures would be used. Following pipeline installation, trenches would be backfilled with native soil to the surface and revegetated according to the project's revegetation plan.

The proposed electric transmission line would require the construction of approximately 38 transmission towers and a gravel surfaced access road for travel by wheeled vehicles during construction and to access the new transmission line for maintenance during operation. Grading would occur as needed within the easement to construct the footings and foundations of the transmission towers and to construct the 14- to 16-foot-wide access road. Prior to grading for these features, trees, brush, stumps, and snags would be removed, including root systems. During construction, staging areas would be needed for storage. During construction, dust and erosion control mitigation measures would be employed. Culverts would be installed where the access road crosses an intermittent creek to facilitate flow of stormwater or snow melt runoff and to minimize erosion.

The water supply pipeline would cross irrigated and nonirrigated land used for crop production and rangelands. The total width of temporary construction easement would be 60 feet. Surface vegetation within the temporary construction easement would be temporarily impacted. A portion of the water supply pipeline would follow an existing unimproved road in order to minimize disturbances to agricultural soil. During construction, dust and erosion control mitigation measures would be employed. The water supply pipeline would be placed under the three identified agricultural canals using conventional bore construction techniques. After construction, the temporary disturbed areas would be revegetated in accordance with the Facility revegetation plan.

<u>Recommended Mitigation Measures</u>. No measures beyond those included in the proposed project are recommended.

<u>Impact 3.2.4. Soil erosion during operation of the Facility would be limited by stormwater control features, implementation of BMPs, and an erosion and sediment control plan.</u>

<u>Assessment of Impact</u>. Operations activities would be limited to those areas directly related to the Facility (i.e., access roads, the Energy Facility site). Some stormwater would be shed from paved and gravel surfaces and structures during periods of precipitation. Drainage collection procedures would be used to capture and route this runoff to a stormwater pond and an infiltration basin. Quarry stone or other similar materials would be used in onsite drainage ditches leading to the stormwater pond to reduce the potential for soil erosion.

During operations, gravel access roads along electric transmission line would be used for maintenance and repairs. Gravel roads and associated stormwater control features would be maintained so road surfaces do not create soil erosion and sediment transport. Heavy equipment used for vegetation control under the electric transmission line would be restricted to the access roads and transmission tower sites where possible.

If the alternative of stormwater disposal into the West Langell Valley Road side ditch is selected, NPDES General Stormwater Permit 1200-Z and an erosion and sediment control plan would specify BMPs to use.

<u>Recommended Mitigation Measures</u>. No measures beyond those included in the proposed project are recommended.

<u>Impact 3.2.5. The risk to human safety and harm to physical property as a result of seismic hazard would be minimal at the Energy Facility.</u>

<u>Assessment of Impact</u>. The Energy Facility would be located in an area subject to earthquakes. The Energy Facility would be designed to sustain no permanent structural damage under ground-shaking conditions. By limiting structural damage through design and engineering, the risk to human safety would be minimal. Based on the analysis contained in the SCA, and subject to verification of assumptions through further geotechnical work, the Energy Facility and related pipelines and electric transmission line could be designed, engineered, and constructed without danger to human safety arising from seismic events. The *Preliminary Geotechnical Engineering Report* indicates that Uniform Building Code design parameters for seismic design address peak ground acceleration greater than that likely at the Energy Facility (GeoEngineers, 2002). (USGS earthquake hazards data indicate that there is a 10 percent chance of exceeding a PGA of 0.17g in

50 years in the site area.) Furthermore, based on the relative density of the onsite soil and current accepted analyses, there is low potential for liquefaction at the site. Consequently, lateral spread is not considered to be a hazard.

Buried pipelines with welded joints have low vulnerability to ground shaking that does not cause permanent deformations. Such permanent deformations would occur only from actual fault displacement along the pipelines or substantial soil movement resulting from seismically induced liquefaction, lateral spreading, subsidence, or landslides. Based on expected soil and rock responses at the Facility, no movements sufficient to damage the buried pipelines would be likely.

Liquefaction refers to the loss of shear strength that saturated soil deposits can experience during undrained cyclic loading, such as earthquake loading. The susceptibility of a soil deposit to liquefaction is a function of the degree of saturation, soil grain size, relative density, percent fines, age of deposit, plasticity of fines, earthquake ground motion characteristics, and several other factors. Based on the relative density of the onsite soil at the Energy Facility site, the potential for liquefaction at the site would be low.

The probability of fault displacement within the Facility would be low for faults that are mapped and identified as active. The closest known active faults are 15 miles to the southwest, 5 miles to the north, and 10 miles to the east of the Energy Facility site (Geomatrix Consultants, 1995). Fault displacement from the fault adjacent to the Facility may be as great as 4 inches. Pipelines and electric transmission lines that cross the fault could be designed for this level of displacement, if this fault is determined to be active.

The Oregon Structural Specialty Code (OSSC) uses the UBC, 1997 edition, with current amendments by the state of Oregon and local agencies. The Energy Facility would be designed to meet or exceed the minimum standards in UBC chapter 16, divisions IV and V, Earthquake Design and Soil Profile Types, respectively, with slight modifications by the current amendments of the state of Oregon and local agencies. The Facility could be designed to the OSSC so that no damage would occur during the design earthquake.

Recommended Mitigation Measures. No measures beyond those included in the proposed project are recommended.

Impact 3.2.6. Process wastewater management alternative by beneficial use of the water for irrigated pasture.

Assessment of Impact. Agricultural soil would not be adversely impacted by the land application of process wastewater. The process wastewater would be applied to the pasture at agronomic rates during the irrigation season and at an instantaneous application rate less than the infiltration rate of the soil. Irrigation would not be conducted during periods of frozen or saturated soil to prevent erosion and generation of surface runoff. The process wastewater quality would generally be of equal or better quality than the shallow groundwater and Lost River water used for irrigation to lands around the beneficial use area. Fertilization would be conducted according to Oregon State University fertilization guidelines and typical pasture management activities would be conducted as described in Amendment No. 2 to the SCA, Attachment I-2 (*COB Energy Facility Land Application Plan*).

The high-quality process wastewater would be applied at rates preventing buildup of applied water constituents to harmful levels. With irrigation to full crop water requirements and the natural winter precipitation-driven leaching, a suitable leaching fraction would be provided. At 28.6 inches of irrigation and 6.7 inches of deep percolation, the annual leaching fraction is 23 percent. With this leaching fraction and the estimated process wastewater electrical conductivity (EC) of 0.32 deciSiemens per meter (dS/m), the maximum increase in EC of the soil saturation paste extract (EC_e) at the bottom of the root zone is estimated at 0.7 dS/m. The average root zone EC_e increase would be about 0.33 dS/m. The background EC_e of Calimus soil types from samples collected at the Energy Facility site by CH2M HILL in November 2002 was 0.25 dS/m (0 to 20 inches depth). Even the most salt sensitive of pasture grasses are not negatively affected by soil salinity until the average root zone EC_e is increased to above 1.5 dS/m (Ayars and Westcot, 1989). Under the condition of partial irrigation, where the leaching fraction has been reduced by curtailing late season irrigation, the soil salinity would increase slightly. At 14.3 inches of irrigation and 1.9 inches of deep percolation, the annual leaching fraction would be reduced to about 13 percent and the maximum increase in EC_e at the bottom of the root zone would be 1.2 dS/m. The average root zone EC^e increase would be about 0.59 dS/m. Using a threshold EC_e of 1.5 dS/m and a background EC_e of 0.25 dS/m, the minimum leaching requirement necessary to keep the average root zone EC_e below the threshold EC_e is about 5 percent. All water balance scenarios meet this minimum condition.

The sodium hazard of the irrigation water, which influences soil infiltration, and as indicated by the sodium adsorption ratio (SAR) and EC, is considered slight to moderate. The EC and SAR of the process wastewater are virtually identical to the EC_e and SAR of the Calimus soil types onsite as determined on samples collected at the Energy Facility site by CH2M HILL in November 2002. The Calimus soil EC_e and SAR were 0.25 dS/m and 0.8 respectively, compared to the process wastewater EC and SAR of 0.32 dS/m and 0.8. Given these results, the sodium hazard of the process wastewater is lower than that of the pore water in the Calimus soil and no changes to sodium hazard of the site soil are anticipated.

Restrictions on use of the process wastewater were evaluated against standard irrigation water quality criteria (Table 3.2-4). Process wastewater sodium, chloride, boron, EC, and TDS were all within the range of concentrations under which no restriction is placed on irrigation uses (Ayars and Westcot, 1989). In addition, sulfate concentrations of 6.29 mg/L or 0.13 milliequivalents per liter (m_{eq}/L) are low enough that excess gypsum formation would not be a concern. At the projected irrigation rates, 41 lbs/ac of sulfate would be applied annually. The OSU pasture fertilizer guide recommends application of 20 to 30 lbs/ac of sulfur per year, which equates to 60 to 90 lb/ac of sulfate per year. No additional sulfur fertilizer would be applied to the site and low sulfur analysis fertilizer for addition of nitrogen, phosphorous, and potassium would be used. A specific fertility management program would be outlined in the irrigation management plan submitted to ODEQ prior to irrigation of process wastewater.

<u>Recommended Mitigation Measures</u>. No mitigation measures are recommended.

3.2.3 Cumulative Impacts

The proposed Energy Facility would result in the permanent disturbance of 108.7 acres of land during its 30-year operating life. Of this total, approximately 13.1 acres of high-value soil would be permanently disturbed. Table 3.2-2 shows the permanent impact in acres by soil type.

Cumulative impacts to soil can result from past, present, and reasonably foreseeable actions such as cultivation, livestock grazing, and urban and industrial development. Operation of the proposed Energy Facility would not contribute to cumulative impacts to seismicity or other geologic conditions or hazards. Because of increased impervious surfaces resulting from conversion of the land to industrial use, operation of the proposed Energy Facility would result in a minor loss of soil productivity. There are no other known or proposed industrial facilities in the vicinity of the project so no cumulative impacts are anticipated.

Another potential impact to the soil resource is erosion by wind or water. Stormwater and wastewater would be managed for beneficial use, either as irrigated pasture or groundwater recharge (infiltration basin). Therefore, erosion caused by wind and water from the Energy Facility would have minor or no cumulative impacts. The following mitigation actions would be implemented to minimize potential cumulative impacts:

- Prior to construction, an erosion control plan and measures would be implemented to minimize water and wind erosion.
- During Energy Facility operation, stormwater would be strictly controlled and managed onsite.
- Permeable surfaces or exposed soil at the operational Facility would be landscaped and planted to minimize wind erosion.
- Land application would minimize soil erosion by applying the wastewater through a sprinkler system in agronomic-controlled rates.

TABLE 3.2-1
Summary of Soil Properties by Sampling Location

Sample Location	Soil Map Unit	Depth to Bedrock (inches)	Depth to Hardpan (inches)	Zone of Induration (inches)[a]	ECe (dS/m)[b]	SAR [b]	ESP[b]	Fluoride (mg/kg)[b]
20	50E	9	-	-	0.3	0.5	<0.1	< 0.1
21	50E	13	-	-	-	-	-	-
22	50E	11	-	-	0.2	0.3	<0.1	-
23	50E	11	-	-	0.4	1.2	0.4	-
24	7C	35	-	-	0.3	0.7	<0.1	-
25	40	22	-	-	-	-	-	-
26	40	>48	-	-	0.3	0.6	<0.1	< 0.1
27	40	-	32	29-32	0.8	7.5	8.9	-
28	40	>48	-	37-48	-	-	-	-
29	40	>48	-	38-48	0.4	1.1	0.3	-
30	40	>48	-	-	-	-	-	-
31	40	46	-	-	-	-	-	-
32[c]	7A	-	-	-	0.3	0.8	<0.1	< 0.1
33[c]	7A	-	-	-	0.2	0.8	<0.1	-
34	40	-	16	-	-	-	-	-
35	40	>48	-	33-48	-	-	-	-
36	40	-	25	9-25	-	-	-	-

[a] Induration is the cementation of soil particles by humus, carbonates, or oxides of silica, iron, or aluminum resulting in a hard and brittle soil consistence. Due to the effervescence of indurated materials at this site when applying 10% hydrochloric acid, it was determined that the cementing agent was in fact a carbonate material.

[b] Composite samples were collected from a 0-20” depth except at locations 20, 22, and 23 where sample depth was limited by the depth of bedrock.

[c] Samples were collected for soil analysis but no profile descriptions were made.

Soil map units referred to include:

7A Calimus loam, 0 to 2 percent slopes
7C Calimus loam, 2 to 5 percent slopes
40 Laki-Henley loams
50E Lorella very stony loam, 2 to 35 percent south slopes

TABLE 3.2-2
Soil Area by Facility Feature—Permanent Disturbance During the 30-Year Operating Life of the Energy Facility (in Acres)

Symbol	Map Unit Name	Energy Facility Site	Water Supply Well System	Water Supply Pipeline	Natural Gas Pipeline	Electric Transmission Line	Irrigated Pasture Access Road	Total Facility
6B	CALIMUS FINE SANDY LOAM, 2 TO 5 PERCENT SLOPES					4.1		4.1
7A	CALIMUS LOAM, 0 TO 2 PERCENT SLOPES	17.7					0.4	18.1
7B	CALIMUS LOAM, 2 TO 5 PERCENT SLOPES	4.7				1.9		5.4
7C	CALIMUS LOAM, 5 TO 15 PERCENT SLOPES	2.9				5.3		8.2
9B	CAPONA LOAM, 2 TO 5 PERCENT SLOPES							0.0
23B	HARRIMAN LOAM, 2 TO 5 PERCENT SLOPES					8.3		8.3
23C	HARRIMAN LOAM, 5 TO 15 PERCENT SLOPES					5.3		5.3
26	HENLEY LOAM							0.0
28	HENLEY-LAKI LOAMS							0.0
38	LAKI LOAM							0.0
40	LAKI-HENLEY LOAMS	18.9				1.3		20.2
50E	LORELLA VERY STONY LOAM, 2 TO 35 PERCENT SOUTH SLOPES	6.4	0.3			26.4		33.1
51E	LORELLA-CALIMUS ASSOCIATION, STEEP NORTH SLOPES					4.5	0.1	4.6
58B	MODOC FINE SANDY LOAM, 2 TO 5 PERCENT SLOPES					0.2		0.2
74B	STUKEL-CAPONA LOAMS, 2 TO 15 PERCENT SLOPES							0.0
74D	STUKEL-CAPONA LOAMS, 15 TO 25 PERCENT SLOPES							0.0
	TOTALS	**50.6**	**0.3**	**0.0**	**0.0**	**57.3**	**0.5**	**108.7**

TABLE 3.2-3
Soil Area by Facility Feature—Incremental Temporary Disturbance (in Acres)

Symbol	Map Unit Name	Energy Facility	Construction Parking and Laydown	Subtotal: Energy Facility Site	Water Supply Well System	Water Supply Pipeline	Natural Gas Pipeline	Electric Transmission Line	Irrigated Pasture Access Road and Pipeline	Total Facility
6B	CALIMUS FINE SANDY LOAM, 2 TO 5 PERCENT SLOPES			0.0		0.3		4.8		5.1
7A	CALIMUS LOAM, 0 TO 2 PERCENT SLOPES	17.7	9.7	27.4		0.4	2.9		0.7	31.4
7B	CALIMUS LOAM, 2 TO 5 PERCENT SLOPES	4.7	15.6	20.3		1.1	6.1	1.9	4.3	33.7
7C	CALIMUS LOAM, 5 TO 15 PERCENT SLOPES	2.9		2.9		0.8		5.5		9.2
9B	CAPONA LOAM, 2 TO 5 PERCENT SLOPES			0.0			3.4			3.4
23B	HARRIMAN LOAM, 2 TO 5 PERCENT SLOPES			0.0				9.6		9.6
23C	HARRIMAN LOAM, 5 TO 15 PERCENT SLOPES			0.0				5.6		5.6
26	HENLEY LOAM			0.0			5.9			5.9
28	HENLEY-LAKI LOAMS			0.0					0.6	0.6
38	LAKI LOAM			0.0		0.6				0.6
40	LAKI-HENLEY LOAMS	18.9	17.1	36.0		2.2	0.5	1.6		40.3
50E	LORELLA VERY STONY LOAM, 2 TO 35 PERCENT SOUTH SLOPES	6.4	26.6	35.0	1.3	5.4	15.6	30.9		88.2
51E	LORELLA-CALIMUS ASSOCIATION, STEEP NORTH SLOPES			0.0		5.7		4.7	0.1	10.5
58B	MODOC FINE SANDY LOAM, 2 TO 5 PERCENT SLOPES			0.0				0.3		0.3
74B	STUKEL-CAPONA LOAMS, 2 TO 15 PERCENT SLOPES			0.0		2.9	8.1			11.0
74D	STUKEL-CAPONA LOAMS, 15 TO 25 PERCENT SLOPES			0.0			1.3			1.3
	TOTALS	**50.6**	**71.0**	**121.6**	**1.3**	**19.4**	**43.8**	**64.9**	**5.7**	**256.7**

TABLE 3.2-4
Irrigation Water Quality Criteria

Parameter	Units	Process Water Concentration	Ceiling Concentration for No Restriction on Irrigation Use
Sodium (sprinkler irrigation)	m_{eq}/L	0.88	3
Chloride (sprinkler irrigation)	m_{eq}/L	0.12	3
Boron	mg/L	0.54	0.7
EC	dS/m	0.32	0.7
TDS	mg/L	203	450

ds/m = deciSiemens per meter
EC = electrical conductivity
m_{eq}/L = milliequivalents per liter
mg/L = milligrams per liter
TDS = total dissolved solids

Figure 3.2-1
11 x 17
Color
Front

Figure 3.2-1
11 x 17
Color
Back

Figure 3.2-2
11 x 17
Color
Front

Figure 3.2-2
11 x 17
Color
Back

Figure 3.2-3
11 x 17
Front

Figure 3.2-3
11 x 17
Back

Figure 3.2-4
11 x 17
Front

Figure 3.2-4
11 x 17
Back

3.3 Hydrology and Water Quality

The only perennial surface water body in the Facility vicinity is the Lost River. Intermittent seasonal drainages also exist within the area. Several irrigation canals facilitate seasonal surface drainage and water transport for agricultural crops and pasture lands in the basin areas. In addition, shallow and deep aquifers underlie the area. Construction and operation of the proposed Facility would utilize water from the deep basalt aquifer, which test data suggests is not hydraulically connected to the shallow aquifer or surface water features in the project vicinity. The Facility would reconfigure the Babson well so that it draws water only from the deep system. The Babson well is the only known well to intersect the deep aquifer system in the project area. There would be no discharge of wastewater to surface or groundwater.

Process wastewater from the Energy Facility would be managed by one of three alternatives:

- Beneficial use of the water for irrigated pasture
- Evaporation in an onsite, lined evaporation pond
- Temporary storage onsite and hauling to a WWTP for offsite disposal

Sanitary wastewater during operations would be treated and managed using an onsite septic drainfield. During construction, Portable toilets would be provided for onsite sewage handling during construction and would be pumped and cleaned regularly by a licensed contractor.

The information presented in this section is based on the studies and analysis conducted for the SCA as amended by Amendments No. 1 and No. 2, filed with the EFSC on July 25, 2003, and October 15, 2003, respectively.

3.3.1 Affected Environment

The analysis area[12] is located within the Klamath Ecological Province (East Cascades Ecoregion), on the eastern side of the Cascade Mountains. This region is characterized by large basins surrounded by ancient lake terraces and basaltic fault block mountains. Elevations range from around 4,000 to 8,400 feet. The soil in the area is derived from basaltic parent material and generally have loamy surface horizons overlaying loamy to clayey subsurface horizons. A silica cemented hardpan occurs at depths of around 3 feet in many of the ancient dry lakebeds in the area (Anderson et al., 1998; Franklin and Dyrness, 1988).

The climate is characterized by warm, dry summers and cool, moist winters. The average annual precipitation in Klamath County is 14 inches, of which only 27 percent occurs during the growing season. The average winter temperatures range between 16.4°F and 37.8°F, and the average summer temperatures range between 39°F and 71°F (Anderson et al., 1998).

[12] Analysis area as described in this section consists of the survey area of the Energy Facility site and a quarter mile on either side of the centerline of the linear features.

3.3.1.1 Surface Water

No surface water bodies are located on the Energy Facility site. The access road for electric transmission would cross three seasonal creeks. Regional and local hydrologic features are described below. As described in Section 3.3.1.2, the area's deep aquifer system is isolated from surface water in the vicinity of the proposed project.

Hydrology. The Facility site lies within the Klamath River Basin. By geographic definition, the Klamath Basin is the area drained by the Klamath River and its tributaries. As the Klamath is one of only three rivers that pierce both the Cascades and the Coastal mountain ranges before emptying into the Pacific Ocean, the entire Basin is an area encompassing portions of south-central Oregon and northern California—an area roughly twice the size of Massachusetts. In Oregon, the Klamath Basin occupies more than 5,600 square miles and covers almost all of Klamath County and smaller portions of Jackson and Lake Counties to the west and east. At the California-Oregon border, the Klamath River Canyon marks the Basin's low point and at an elevation of 2,755 feet, is its drain point. Water bodies within the Klamath Basin are overappropriated, and the state of Oregon is currently adjudicating Klamath River Basin water rights for those with claims dating prior to 1909.

Lost River. The Lost River watershed is a closed, interior basin covering approximately 3,000 square miles of the Klamath River watershed in southern Oregon and Northern California. The headwaters originate east of the Clear Lake Reservoir in Modoc County, California, and flow approximately 75 miles to the Tulelake Sump. Seasonal flows in the Lost River are controlled by releases from the Clear Lake Dam. Historical channel modification, water diversion, and wetland drainage associated with the U.S. Bureau of Reclamation's Klamath Project have resulted in a highly altered system. Water from the Lost River is currently used for domestic and industrial water supply, irrigation, and livestock. The Lost River is the only fish-bearing perennial habitat in proximity to the analysis area. The closest section of the Lost River is approximately 2 miles north of to the Energy Facility site. The Lost River is approximately 0.4 miles north and east of the Babson well.

Intermittent Creeks. Several intermittent creeks were observed in the analysis area during field surveys. These creeks were dry at the time of the surveys, but had defined bed and bank features. Most of the drainages either lacked vegetation or contained only sparse upland vegetation within the channel. The habitat values of these creeks are discussed in more detail in Section 3.5, Fish.

Irrigation Canals. Several irrigation canals have been excavated to facilitate surface drainage and water transport for agricultural crops and pasture lands in the basin areas. These channels appear to be routinely maintained and were largely devoid of vegetation.

Surface Water Quality. ODEQ is required by Section 303(d) of the Clean Water Act to identify water bodies that do not meet standards for conditions such as temperature, pH, or toxics. The standards set by ODEQ are designed to protect beneficial water uses like drinking, agricultural use, recreation, industrial water supply, and cold water fisheries. The Klamath Basin has portions of 46 different rivers and lakes which, for one reason or another, have failed to meet these standards. While the area's high summer temperatures account for many of the listings, water bodies such as the Klamath and Lost Rivers fail several different standards, some of which persist throughout the year.

3.3.1.2 Groundwater

Hydrology. Subsurface hydrology in the analysis area is characterized by a shallow aquifer system and a deep aquifer system. The deep aquifer system is overlain by approximately 1,100 feet of volcanic rock that confines the deeper aquifer system (below 1,500 feet). Above the 1,100 feet of volcanic rock that separates the deep aquifer system, lies approximately 500 feet of permeable rock that constitutes the upper (shallow) aquifer, a heavily appropriated basalt aquifer that is in varying degrees of hydraulic connection with the Lost River. The shallow aquifer system is used for irrigation, stock watering, and domestic water supply. The project proponent would not use water from the shallow aquifer system.

The sole source of water for construction and operation of the Energy Facility would be groundwater from the deep aquifer system intercepted by an existing well known as the Babson well. No other Langell Valley area wells or water rights in the deep aquifer system are known to exist. The Babson well is located approximately 2 to 3 miles east of the Energy Facility, and is reported to have been originally drilled to depths exceeding 5,000 feet for oil and gas exploration in the 1920s, and currently has partial obstructions at depths of 1,870 and 2,050 feet. Previous borehole geophysics and aquifer testing at the Babson well (CH2M HILL , 1994) indicated the presence of two separate aquifer systems within the upper 2,050 feet of the borehole. The deep water-bearing zones that are present below a depth of 1,500 feet would be the sole supply water for the Energy Facility.

Because of this lack of other deep wells to provide information, the areal extent, recharge area, and recharge rate of the deep aquifer system are not well known. Accordingly, an assessment of the likely recharge area was performed (CH2M HILL, 2002a). The assessment concluded that the recharge area probably is higher in altitude and located about 20 to 50 miles to the east and north of the Babson well. It also concluded that the recharge area likely is regional in scope, with a minimum size of approximately 1,100 square miles. Based on these conclusions, and using local precipitation figures and the most likely range of known aquifer recharge rates in central Oregon, it is conservatively estimated (i.e. a minimum estimate) that the deep aquifer's annual recharge volume is between 134 billion and 241 billion gallons. Table 3.3-1 provides a summary of the annual recharge volume calculations.

An intensive 30-day aquifer test in 1993 at the Babson well (CH2M HILL , 1994) suggested that the deep groundwater-bearing zones below 1,580 feet are hydraulically isolated from the shallow aquifer system and surface water in the vicinity of the Energy Facility. For the test, the deep aquifer at the Babson well was pumped at a rate of 3,260 gpm for 30 days while water levels were monitored at 23 different locations within approximately 4 miles of the Babson well. Because no other wells are known to be completed in the deep aquifer within the project area, the monitoring locations consisted of numerous wells completed in the shallow aquifer system, two staff gauges along the Lost River, the Bonanza Springs, a well hydraulically connected with the Bonanza Springs, and a well in connection with a nearby marsh. No effects due to pumping the deep aquifer were observed at any of the monitored wells, the Lost River, Bonanza Springs, or the nearby marsh. Consequently, the results of the aquifer test indicate there is no observable hydraulic connection between the deep aquifer system at the Babson well and the shallow aquifer or surface water features.

A second aquifer test was performed in the summer of 2002 (CH2M HILL , 2002b). The Babson well was pumped at an average rate of 6,800 gpm for approximately 30 days. An expanded observation well network was used (31 different locations) that included both shallow wells and deeper irrigation wells in Langell Valley, Yonna Valley, Swan Lake Valley, Malin, and Klamath Falls. There was a hydraulic response in the observation well network attributable to a leaking well packer. This aside, the data do not indicate that the deep system is in hydraulic connection to a shallow aquifer system. A reconstructed well should eliminate the minor response observed.

Deep aquifer response suggests extremely high aquifer transmissivity and supply: at the end of the 30-day pumping period, water levels had recovered to the pretest static level within 5 minutes. These observations show that the roughly 294 million gallons withdrawn for this test were insignificant relative to the rate and volume of water available to the Babson well. Appendix B presents the Executive Summary from the *Water Supply Supplemental Data Report: Deep Aquifer Testing at the COB Energy Facility Water Supply* (CH2M HILL, 2002a).

Groundwater Quality. Groundwater quality within the shallow aquifer varies to some degree depending on local soil conditions and degree of connectivity between ground and surface waters. Since July 1991, fecal coliform has been found in several of the town of Bonanza's domestic wells. According to OWRD, studies compiled by Klamath County hypothesize that consecutive drought years forced farmers and ranchers to irrigate more heavily with groundwater. The drawn down aquifer permitted infusions of Lost River water, which carried in the contaminants.

The proposed project, however, would utilize deep zone groundwater. The deep zone groundwater is of high quality, with very low dissolved solids and no parameters suggesting interaction with shallow groundwater and surface water. The deep zone groundwater from the Babson well meets Federal drinking water standards without treatment. Because testing has demonstrated that deep system withdrawals would not impact shallow system water levels and the Facility would not discharge wastewater to the shallow groundwater system or surface water, Facility operations would not have an impact on existing groundwater quality.

3.3.2 Environmental Consequences and Mitigation Measures

As described below, the Energy Facility would have no significant unavoidable adverse impacts on hydrology and water quality.

Impact 3.3.1. Water for the Energy Facility would be diverted from the deep aquifer, which is not hydraulically connected to surface water bodies.

Assessment of Impact. Under annual average conditions, the Energy Facility would need 162 gpm of water (72 gpm for year-round industrial use and 90 gpm for seasonal irrigation use) to supply its water requirements. Under maximum consumption conditions, that rate would increase to 300 gpm (210 gpm for year-round industrial use and 90 gpm for seasonal irrigation use) for brief periods of time. In addition, construction of the Facility would result in the use of approximately 6.5 million gallons of water. Tables 3.3-2 and 3.3-3 show estimated water use during Facility construction and operation, respectively.

Water to supply this demand would be withdrawn from the deep aquifer using a reconstructed Babson Well and two additional water supply wells. Figure 3.3-1 shows a schematic of how the Babson well would be reconstructed. The water would be conveyed to the Energy Facility site via a 2.8-mile pipeline. On April 24, 2002, the project proponent submitted to OWRD a water right application for this use. A draft water right permit was issued by OWRD in a PFO dated April 22, 2003.

Test data do not indicate that pumping at the proposed rates would lower the water level in the deep aquifer. A 2002 aquifer test conducted at near-maximum rates (approximately 6,800 gpm) withdrew more than 290 million gallons from the deep aquifer over a 30-day pumping period. Within 5 minutes of the test's conclusion, water levels in the deep zone had recovered to the pre-test static water level. The much faster than anticipated recovery suggests that the volume removed (290 million gallons) is not significant relative to the rate of recharge to the deep system and that pumping would not significantly impact deep zone water levels.

The annual groundwater usage proposed for the Energy Facility is a small fraction of the estimated annual recharge to the deep aquifer from precipitation. (Table 3.3-1). The recharge estimates presented in Table 3.3-1 are considered conservative (i.e., minimums, or under-estimates) because they account for only a portion of the total possible recharge area, and do not consider deep interbasin groundwater flow that likely contributes additional recharge to the Klamath Basin. On an annual basis, the Energy Facility would use approximately 110.4 million gallons of groundwater from the deep aquifer system, assuming the Energy Facility is operating under maximum water consumption conditions (maximum ambient conditions and using supplement duct firing) for 365 days per year. This is a conservative estimate; actual water usage would likely be much less. For example, if the Energy Facility operated at an annual 72 percent capacity factor, water use would be approximately 7.0 million gallons (assumes average annual ambient conditions and a typical summer daytime average for process water rates and a monthly profile of operating conditions with and without supplemental duct firing).

It has been estimated that the deep aquifer system receives, at a minimum, anywhere from 134 billion to 241 billion gallons (from 411,000 to 739,000 ac-ft) of recharge from precipitation. When compared to the range of recharge estimates, the Energy Facility's groundwater usage would amount to less than 0.05 percent of the water that recharges the deep aquifer from precipitation on an annual basis. With the likelihood that the deep aquifer is recharged over a broader area and receives additional recharge from other hydrologic basins, the Energy Facility's groundwater usage would probably be less than 0.05 percent of the aquifer's recharge volume. Therefore, the impact on the deep aquifer is expected to be insignificant, consistent with the observed hydraulic response to pumping.

Aquifer and borehole tests have indicated that the shallow and deep systems are not hydraulically connected. No other wells or water rights are known to exist in the deep aquifer system within the project area. Therefore, no adverse effects on those waters potentially affected would occur as a result of the proposed Energy Facility. Because the Energy Facility would be developing a new water source, not appropriating from existing sources, the proposed use would not impair the availability of water for beneficial purposes such as drainage, sanitation and flood control.

Recommended Mitigation Measures. The proposed Energy Facility would include a number of features to reduce water use. During construction, rinse and wash waters would be cascaded from system to system to minimize water use. In addition, steps would be instituted to ensure that dust suppression water use is not excessive or insufficient.

The Energy Facility was originally designed for wet cooling by control of the cycles of concentration (ratio of the concentration of contaminants in the circulating water divided by the incoming makeup water contaminant level) to approximate the quality of the water in the Lost River and water used by the local irrigation districts. This would have resulted in a peak water demand of approximately 9,900 gpm (14.26 mgd or 43.76 ac-ft/day or 22.06 cfs). The wet-cooled design was further refined to incorporate water treatment and recycling to increase the cycles of concentration and reduce the peak water use to 7,500 gpm (10.80 mgd or 33.14 ac-ft/day or 16.71 cfs)or by 24 percent.

In response to public comments regarding the amount of water use, the design was changed to switch from wet cooling to air cooling. Air cooling reduces the Energy Facility water requirements by 97 percent (210 gpm vs. 7,500 gpm). As with the original SCA, an additional 90 gpm would be used for irrigation around the Energy Facility site.

Water use in the Energy Facility would vary daily and seasonally in response to fluctuating electricity demand and weather conditions. As a result, actual daily water use at the Energy Facility is estimated to vary from 0 gpm when the Energy Facility is offline up to a maximum of 210 gpm (0.30 mgd or 0.92 ac-ft/day or 0.47 cfs). For average annual conditions with duct firing, it is anticipated that the average withdrawal rate from the water supply wells would be approximately 72 gpm (0.10 mgd or 0.31 ac-ft/day or 0.16 cfs).

Impact 3.3.2. Wastewater and stormwater discharge during Energy Facility construction and operation could affect surface and groundwater quality.

Assessment of Impact. Sanitary sewage, process blowdown, cooling system blowdown, and stormwater runoff would be generated by the Energy Facility. Treatment and management would occur on-site, with no discharge of wastewater to surface or groundwater under the preferred alternatives.

3.3.2.1 Process wastewater

Process wastewater from the Energy Facility would be managed by one of three alternatives:

- Beneficial use of the water for irrigated pasture
- Evaporation in an onsite, lined evaporation pond
- Temporary storage onsite and hauling to a WWTP for offsite disposal

Irrigated Pasture Beneficial Use. If process wastewater is managed by beneficial use of the water for irrigated pasture, water developed during the winter months would be stored and combined with process water produced in the summer months to irrigate approximately 31 onsite acres. The Energy Facility site and land immediately adjacent to the Energy Facility under option by the project proponent, encompasses sufficient acreage with soil types suitable for this activity that the process water can be managed without exceeding annual salt loading rates typical of nearby irrigated lands, or other facilities with permits to use similar water in a similar fashion (see Section 3.2.2 for more detail).

The process water would be used to improve grazing forage yield in areas currently without irrigation, and possibly to enhance the wildlife forage yield in habitat mitigation areas. This activity represents a beneficial use of the water that would not be made if it were evaporated or hauled offsite for disposal. The irrigated pasture use would occur only in areas with well-drained soil and with suitable slopes to minimize the potential for surface runoff or erosion. The irrigated use would not occur in areas that are drained by subsurface drain tiles to minimize any potential discharges to surface water. Annual application rates would occur at levels substantially lower than gross irrigation requirements for full irrigation and the irrigated use would not result in recharge to groundwater during periods of irrigation.

Onsite Evaporation Pond. If process wastewater is managed by evaporation in an onsite, lined evaporation pond, process wastewater from the Energy Facility would go to an approximate 20-acre, lined evaporation pond. The evaporation pond would most likely be designed to store approximately 7 MG and operate passively. A spray enhancement system would be installed if it proved economically viable. A wastewater stream pipeline would take wastewater from the Energy Facility to the evaporation pond. The evaporation pond would be designed and sized to contain sediment from the wastewater for the life of the plant with minimal need to cleanout the sediment. This would require that there be sufficient freeboard in the evaporation pond while taking into account sediment accumulation. See Table 3.3-4 for a comparison of wastewater quality in a land application scenario and an evaporation pond scenario.

The pond would be designed to include a composite liner system for containment of wastewater and sediment. Bentonite would be added to the soil at the base of the evaporation pond, mixed to a depth of approximately 12 inches, and then compacted to achieve a permeability of greater than $1x10^{-6}$ centimeters per second (cm/sec). Alternatives to the bentonite-treated soil would be to use a bentomat geotextile system. The bentomat geotextile system is available with a permeability as low as $5x10^{-9}$ cm/sec. A 60-mil HDPE liner would be placed over the bentonite-treated soil or the bentomat geotextile system, to form the top layer of the composite liner system. The evaporation pond would be netted to prevent access by birds and surrounded by a chain-link fence to prevent access by wildlife.

Storage and Hauling to Wastewater Treatment Plant. If this alternative is selected, process wastewater would be managed by temporarily storing wastewater onsite in two 5.0-MG tanks and hauling to a WWTP for offsite disposal. The project proponent has contacted the two municipal WWTPs in Klamath Falls—the South Suburban Sanitary District and the City of Klamath Falls Sanitary District. The ability of these two WWTPs to accept wastewater from testing and commissioning of the Energy Facility and the wastewater from operation of the Energy Facility is presently being evaluated. According to managers at both facilities, each would be required to evaluate whether they can meet the EPA categorical standard to accept industrial waste or whether local ordinance provide for acceptance of truck-hauled wastewater. Over the life of the Energy Facility, other WWTPs may be constructed or considered for management of wastewater generated at the Energy Facility. The project proponent would arrange with a trucking company to routinely haul the wastewater stored in the wastewater storage tanks at the Energy Facility to the WWTP.

3.3.2.2 Sanitary sewage

Sanitary wastewater from restroom and shower facilities would be routed to an onsite septic tank, which would discharge to a leach field. Approximate flows of up to 1,500 gallons per day or about 1 gpm are expected. The onsite system would be designed in accordance with Klamath County's standards for onsite disposal systems. Percolation into the ground of treated sanitary sewage from the septic system would not have a substantial adverse effect on groundwater quality. During construction, portable toilets would be provided for construction worker use.

3.3.2.3 Stormwater

Construction. During construction, stormwater would be managed according to NPDES General Construction Permit 1200-C, issued by ODEQ, and an erosion and sediment control plan. In general, construction erosion control would consist of BMPs, including techniques such as hay bales, silt fences, and revegetation, to minimize or prevent soil exposed during construction from becoming sediment to be carried offsite.

Operation. While stormwater is not considered wastewater, stormwater would be managed at the Energy Facility by a 4.7-acre infiltration basin and therefore would be covered under a Water Pollution Control Facility (WPCF) permit. Under the preferred alternative, there would be no discharge of stormwater from the Energy Facility into surface waters, stormwater drainage ditches, or irrigation canals.

Stormwater is managed through three separate systems, including the plant drains system, the storm sewer system, and the stormwater run-on diversion system. Figure 3.3-2 shows a schematic of the three separate and segregated systems designed to handle stormwater during Facility operations. The figure shows individual drainage systems as well as a breakdown of the drains connected to each system. The individual drainage systems are described in more detail below.

Plant Drains System. A dedicated plant drains system would be designed and constructed at the Facility to segregate stormwater that comes in direct contact with plant components from the storm sewer system, thus preventing runoff in the plant drains system from reaching the stormwater pond or the infiltration basin. This design would be accomplished by separating the runoff from drains with the potential to come in contact with pollutants from the remainder of the storm drainage system. Drains in areas with the potential for contact with pollutants from materials used or stored at the Energy Facility would be routed to the segregated plant drains system, which would discharge to an o/w separator. This system includes drains inside buildings and enclosures and drains from the interior of spill containment berms. The resulting o/w separator discharge water would be routed to a wastewater collection basin and then pumped back to the raw water tank for use as process water. No stormwater collected by the segregated plant drains system would be routed to the stormwater pond or infiltration basin.

The wastewater collection basin would be a concrete sump placed in a location accessible to inspection without interfering with Facility operations. It would hold approximately 5,000 to 10,000 gallons.

The oil from the o/w separator would be contained in the o/w separator itself. The o/w separator would include a level indicator with an alarm that would alert the operations staff when it needs to be emptied. At that point, a licensed contractor would pump the oil out and haul it offsite for proper disposal.

The dedicated plant drains system would consist of the following components:

- Combustion turbine enclosure floor drains
- Steam turbine area foundation and floor drains
- Heat recovery steam generator (HRSG) foundation and stack floor drains
- Warehouse/maintenance building floor drains
- Administration building floor drains

Storm Sewer System. Stormwater that falls inside the fenceline of the Energy Facility and is not routed to the plant drains system described above would be collected in the storm sewer system. The collection of rainfall runoff in this system would be limited to parking lots, roof drains, graveled areas, and vegetated areas. This storm sewer system would consist of ditches, culverts, and piping that are routed to the stormwater pond. From the stormwater pond, there would be two alternatives for stormwater discharge. The preferred alternative would be to discharge the stormwater into a 4.7-acre infiltration basin. The second alternative would be to discharge the stormwater through a ditch adjacent to the Energy Facility access road into the West Langell Valley Roadside ditch, where it would eventually enter the High Line Levee Ditch and then the Lost River. These alternatives are described in more detail below.

Stormwater Pond. The captured runoff from the Energy Facility in the storm sewer system would be conveyed to a 2.5-acre-foot (ac-ft), 1.5-acre, 750,000-gallon stormwater pond, located in the southeast corner of the Energy Facility (see Figure 3.2-4). This stormwater pond would serve two purposes: 1) provide pretreatment of the runoff before it enters the infiltration basin, and 2) provide temporary storage should unwanted material make its way into the stormwater.

The stormwater pond would provide a wide spot in the stormwater flow path. This wide spot would reduce the flow velocity of the stormwater, allowing suspended sediment to settle out. The operating life of the infiltration basin would be increased by removing the sediment.

A ditch would be constructed from the toe of the fill for the Energy Facility over to the infiltration basin to convey stormwater in the stormwater pond to the infiltration basin. An 18-inch-diameter discharge pipe would be installed through the southern end of the dyke of the stormwater pond. The outlet would discharge into the ditch. The pipe would include a manually operated valve that would normally be closed. The 18-inch-diameter discharge pipe would drain the 2.3 acre-foot (1.5-acre) stormwater pond if it were full in approximately 5 hours.

The stormwater pond is not designed to detain a 100-year, 24-hour storm. It would detain only approximately 34 percent (2.3 acre-feet divided by 6.7 acre-feet). The spillway would be sized to handle the peak flow from the 100-year, 24-hour storm, which is approximately 112 cubic feet per second (cfs). The dyke of the stormwater pond would include a 2-foot-deep, concrete-lined flume directly above the discharge pipe. This flume would act as an emergency spillway for storms greater than the volume of the stormwater pond. The spillway would route stormwater overflow to the ditch that directs water into the infiltration basin. The 112-cfs peak flow would occur for less than 15 minutes and is not representative of the average flow for a 100-year storm.

Infiltration Basin Alternative. Though not accounted for in the preliminary basin sizing, evaporation of the collected stormwater would occur during the summer months. Vegetation would be planted in the bottom of the infiltration basin to improve the infiltration functions and protect these surfaces from rain and wind erosion. There are three primary reasons to vegetate the basin with native grasses or other suitable vegetation:

- The #1 cause of soil erosion in Klamath County is wind on barren soil.
- The infiltration basin would be a collection basin for windblown soil and noxious weed seeds. Although the soil could become resuspended by the wind, some seeds would germinate and overtime the basin would be vegetated by noxious weeds and require greater maintenance to remove weeds.
- Vegetation would help uptake any nutrients or potential pollutants that could be in the stormwater.

A chain-link fence would be installed around the infiltration basin to prevent debris such as windblown vegetation or litter from entering and settling on the basin bottom. The fence would also serve to prevent unauthorized personnel or wildlife from entering the basin. A gate would be installed in the fence to allow access for maintenance personnel and equipment. An access road would be constructed from the access road to the Energy Facility over to the infiltration basin (see Figure 3.2-4).

Runoff calculations were performed using the TR-20 hydrologic model. This model was developed by the Soil Conservation Service and the U.S. Department of Agriculture. The 100-year, 24-hour storm event was used to size the infiltration basin. This return event is consistent for the design of stormwater retention systems. The probability of a 100-year storm event to occur in any 1 year is one percent.

The infiltration basin would be located adjacent to the Energy Facility on Calimus series loam soil. The NRCS (Natural Resources Conservation Service) Soil Survey for Klamath County lists the saturated infiltration rate for this soil as 0.6 inch per hour (in/hr) to 2.0 in/hr. The infiltration basin was sized using the lower value of 0.6 in/hr. Using this lower infiltration value provides a conservative infiltration basin size.

The primary controlling factor in sizing the infiltration basin is the surface area of the basin bottom, the depth of water storage, and 1 foot of freeboard. One foot of freeboard is a typical design standard for stormwater ponds. Over-designing the infiltration basin would reduce the chances of the water overtopping the infiltration basin should a storm larger than the 100-year event occur or if back-to-back smaller storm events occur. A 48-hour drawdown period of the 100-year stormwater volume was used for sizing the infiltration basin and is consistent with the design requirements of similar functioning ponds, such as extended dry detention ponds. The additional 1 foot of freeboard would provide approximately 40 percent additional storage volume that could be filled by stormwater before overtopping would occur. Drawdown duration would be less than 48 hours for the more frequent return storm events.

West Langell Valley Road Drainage System Alternative: In this alternative, the outflow from the stormwater pond would go to a Klamath County drainage ditch along the east side of West Langell Valley Road. This drainage ditch discharges to an irrigation canal, labeled High Line Levee Ditch on the U.S. Geological Survey quadrangle map. High Line Levee Ditch eventually discharges to the Lost River. The drainage ditch along the east side of West Langell Valley Road is approximately 8,000 feet long and the irrigation canal to the Lost River is approximately 32,000 feet long. Therefore, stormwater from the Energy Facility site would travel approximately 40,000 feet before it reaches the Lost River.

The stormwater runoff calculations were performed using TR-55 software, which employs the Natural Resource Conservation Service (NRCS, formerly the Soil Conservation Service [SCS]) method for computing stormwater runoff. A weighted curve number of 88 was used for the Energy Facility site. For the same area, a weighted curve number of 69 was used to calculate the predevelopment runoff. A 25-year storm event consisting of 2.5 inches of rainfall was used as the design case for the stormwater pond. This storm event resulted in 1.38 inches of runoff from the Energy Facility site, which is approximately 1.5 MG. The peak predevelopment flow was calculated at 12 cfs (5,386 gpm) and was used as the peak outflow from the stormwater pond. The peak runoff from the Energy Facility site was calculated at 85 cfs (38,151 gpm) and was used as the peak inflow to the stormwater pond. Based on the predevelopment flow and the Energy Facility site hydrographs, the 1.5-acre stormwater pond is sized for 2.3 acre-feet or approximately 750,000 gallons.

Offsite Stormwater Diversion System. Stormwater diversion ditches would be installed on the north and west sides of the Energy Facility to divert stormwater form undisturbed areas adjacent to the Energy Facility from flowing onto the Energy Facility. These diversion ditches would direct water into existing natural drainage system or into the drainage ditch along West Langell Valley Road. Runoff to the south and east of the Energy Facility would naturally drain away from the Energy Facility.

Ancillary Facilities. For the water supply pipeline and transmission line access roads, culverts would be properly sized and designed where the access road crosses intermittent creek to facilitate flow of stormwater or snowmelt runoff and to minimize erosion. Access roads would be surfaced with gravel to minimize erosion. Drainage would be maintained along the route of the access roads to prevent ponding of stormwater or snowmelt runoff.

Recommended Mitigation Measures. No measures beyond those included in the proposed project are recommended.

Impact 3.3.3. Chemical spills at the proposed Energy Facility could affect surface and groundwater quality.

Assessment of Impact. Various chemicals, such as sulfuric acid, sodium hypochlorite, and sodium hydroxide, would be stored at the Energy Facility. The chemicals would be stored in totes or aboveground storage tanks situated in the appropriate containment areas designed to hold the volume of the liquids stored plus freeboard, according to applicable regulations and BMPs. Aqueous ammonia would be stored in a 30,000-gallon aboveground storage tank. The tank would be contained within a bermed area and would be designed in accordance with applicable industry specifications. The tank would be equipped with a level gauge and would be monitored from the control room. The area for delivery of aqueous ammonia to the storage tank also would be bermed. Because of these design features, any chemical spill that might occur at the Energy Facility would not adversely affect surface or groundwater quality.

SPCC Plan. A Spill Prevention, Control, and Countermeasure (SPCC) plan would be prepared and implemented at the Energy Facility. The SPCC plan would include an inspection program consisting of regular inspections and recordkeeping. It would be a detailed, Facility-specific, written description of how Facility operations comply with the prevention guidelines in the Federal oil pollution prevention regulation. These guidelines include such measures as secondary containment, facility drainage, dikes or barriers, sump and collection systems, retention ponds, curbing, tank corrosion protection systems, and liquid level devices. This plan is another level of protection to prevent stormwater runoff from coming in contact with pollutants.

The project proponent is required to ensure that wastes are appropriately handled onsite and disposed of at the proper facility and are transported by a licensed and reputable firm. Materials would be stored in sealed containers, and to the extent possible, those sealed containers would be stored in inside buildings.

Tanks storing chemicals, diesel fuel, or lubricants not located in buildings would be inside secondary containment structure or arrangement, such as perimeter berms or dual walls, in the event of a spill. After a rainfall event, the secondary containment located outdoors would be inspected prior to releasing stormwater to the o/w separator in the plant drains system. If any pollutants are present, they would be handled as called for in the SPCC plan.

Additional Precautions. The following is a description of precautions taken to minimize the chance for pollutants to come in contact with stormwater runoff:

- The generator step-up transformer foundations would include concrete containment sized to hold 110 percent of the oil in the transformers, which would account for the contents of the transformer plus a design rainfall event.
- Two storage tanks of approximately 2,200 gallons each would be used to store fuel for the Energy Facility's emergency generators would be located outdoors. These tanks would be surrounded by a concrete curb for secondary containment. The secondary containment would be sized to hold 110 percent of the volume of the tank, which would allow for the contents of the tank plus a design rainfall event.
- A 30,000-gallon aqueous ammonia tank would be located outdoors and would be surrounded by a concrete secondary containment sized to hold 110 percent of the volume of the tank. This containment volume would allow for the contents of the tank, plus rainfall.

These containments would include a drain with a valve that would be normally locked closed. Following a rainfall event, the containments would be inspected for pollutants. If no pollutants are visible, the valve would be opened and the water would be released to the plant drains system and o/w separator. If there is a leak or spill, the stormwater would be pumped out and hauled offsite by a licensed contractor for proper processing and disposal.

EDTA, hydrazine, amine, sodium nitrite, and sodium phosphate would be stored in sealed 400- to 500-gallon totes. Generator lube oil, combustion turbine lube oil, cleaning fluid/detergent, glycol, and caustic would be stored in sealed 55-gallon drums. The totes and 55-gallon drums would be stored inside the warehouse maintenance building and would be surrounded by concrete curbs for secondary containment. These curbs would be sized to hold 110 percent of the volume of the containers. Because these areas would be exposed to rainfall, these containment curb areas would not have drains. If service water enters the secondary containment, it would be allowed to evaporate. If a leak or spill occurs in these areas, it would be handled as described in the SPCC plan.

Recommended Mitigation Measures. No measures beyond those included in the proposed project are recommended.

3.3.3 Cumulative Impacts

The proposed Energy Facility would use an average of approximately 72 gpm for year-round industrial use (power generation) plus 90 gpm for seasonal irrigation use from the deep basalt aquifer. A draft water right permit was issued by OWRD on April 22, 2003. This draft permit was issued as No. 1 by OWRD, indicating the draft permit is the first permit issued for this water source. On August 19, 2003, OWRD provided ODOE with a revised recommendation and draft water right reducing the maximum instantaneous rate to 210 gpm for industrial use. This reduction reflects the change from wet cooling to air cooling. The draft water rate of 90 gpm for seasonal irrigation use remained unchanged.

As described earlier in this section, use of water from the deep aquifer is expected to have no effect on existing uses of the shallow aquifer or surface waters in the area. The proposed withdrawal is likely to be insignificant relative to the recharge capacity of the deep aquifer. Based on existing information, there are no known, past, present, or reasonably foreseeable users of the deep aquifer in the vicinity of the proposed Energy Facility. As a result, no cumulative impacts are expected to result from operation of the proposed Energy Facility unless other users were to apply for and obtain water rights in the deep aquifer.

TABLE 3.3-1
Estimated Annual Groundwater Recharge Volume to the Deep Aquifer System

Estimated Recharge Area:	1,100 sq. miles (approximately 704,000 acres)
Estimated Average Annual Precipitation in Estimated Recharge Area:	28 inches
Estimated Annual Recharge Volumes:	
At 25% of annual precipitation: (recharge rate = 7.0 in/yr):	134 billion gallons (411,000 acre-feet)
At 45% of annual precipitation: (recharge rate = 12.6 in/yr):	241 billion gallons (739,000 acre-feet)

TABLE 3.3-2
Estimated Water Use During Construction and Testing/Commissioning

Activity	Required Quantity (gallons)	Wastewater Quantity (gallons)	Final Disposition
Service/fire protection system filling	1,675,000		EP or OTD or IPBU
Demineralized water system commissioning	325,000		EP or OTD or IPBU
HRSG and auxiliary boiler cleaning and flushing	740,000	1,520,000	EP or OTD or IPBU
BOP/CTG/STG piping tests, flushes, and cleaning		580,000	EP or OTD or IPBU
Air-cooled condenser testing and cleaning		500,000	EP or OTD or IPBU
HRSG commissioning/Steam blows	3,760,000	2,150,000	EP or OTD or IPBU
Subtotal	**6,500,000**	**4,750,000**	
RO Reject	**Included in HRSG/Commissioning/ Steam Blows**	2,200,000	Land Application or Evaporation
Dust Suppression	**200,000**		Evaporation/ Absorption

TABLE 3.3-2
Estimated Water Use During Construction and Testing/Commissioning

Note: Water requirements shown are net water requirements added to the system and do not include reused or recycled water from other commissioning activities.

BOP = balance of plant
CTG = combustion turbine generator
HRSG = heat recovery steam generator
EP = evaporation pond
IPBU = irrigated pasture beneficial use
OTD = offsite treatment and disposal by licensed contractor
STG = steam turbine generator
RO = reverse osmosis

TABLE 3.3-3
Estimated Water Use and Disposition During Operations

Process Where Flow Starts	Process Receiving Flow	Water System Flows (gpm)* Peak	Water System Flows (gpm)* Average	Final Disposition
Water supply wells	Raw water storage tank	210	115	Storage
Raw water storage tank	Demineralization process	317	130	Land application or evaporation
	HRSG blowdown tanks	100	100	Land application or evaporation
	Evaporative coolers	216	0	Land application or evaporation
	Potable water/sanitary systems	1	1	Septic system
	Service water	5	5	Land application or evaporation
	Fire protection	3,000	N/A	Storage
Reverse osmosis Treatment	Demineralization process	159	65	Demineralized water storage
	Wastewater storage tank	159	65	Land Application evaporation, or haul offsite to WWTP
Demineralized Process	Water/steam cycle	66	65	Land application or evaporation
	Wastewater collection basin	93	0	Land application or evaporation
Water/steam cycle	HRSG blowdown tanks	23	23	Land application or evaporation
	Evaporation	43	42	Evaporation
Evaporative coolers	Evaporation	108	0	Evaporation
	Wastewater collection basin	108	0	Land application or evaporation
HRSG blowdown tanks	Evaporation	8	8	Evaporation
	Wastewater collection basin	214	214	Land application or evaporation
Wastewater collection basin	Raw water storage tank	115	115	Storage
Stormwater from disturbed areas on Energy Facility site	Stormwater pond	Variable	Variable	Infiltration
	Stormwater infiltration basin	Variable	Variable	
Stormwater run-on from undisturbed areas	Plant stormwater by-pass drainages	Variable	Variable	Existing drainages and West Langell Valley Road drainage ditch

* Rates are for two blocks (1,160 MW) and are with supplemental duct firing.
HRSG = heat recovery steam generator
WWTP = wastewater treatment plant

TABLE 3.3-4
Process Wastewater Characteristics

Parameter	Land Application Case	Evaporation Pond Case	Units
pH	7.5-9.0	7.5-9.0	Standard units
Iron	0.14	0.68	mg/L
Copper	0.00	0.032	mg/L
Manganese	0.02	0.044	mg/L
Calcium	28.92	65.6	mg/L
Magnesium	11.74	26.6	mg/L
Sodium	20.12	52.0	mg/L
Potassium	4.22	9.57	mg/L
Boron	0.54	1.22	mg/L
Silica	71.12	183.0	mg/L
Chloride	4.14	15.7	mg/L
Nitrate as N	0.84	1.9	mg/L
Nitrite as N	0.02	0.044	mg/L
Ammonia as N	0.00	0.35	mg/L
Sulfate	6.29	269.8	mg/L
Total Alkalinity	164.12	250.0	mg/L as $CaCO_3$
Fluoride	0.20	0.44	mg/L
Phosphorous	0.05	20	mg/L
Orthophosphate as P	0.05	20	mg/L
Sulfite	1.00	25.0	mg/L
Oil and Grease	0.30	10.7	mg/L
TOC	1.50	69.6	mg/L
TDS [1]	203	1,077	mg/L
TSS	1.00	1.0	mg/L
Phosphonates [2]	0.00	30.0	mg/L
Polyacrylate [2]	0.00	20.0	mg/L
Free Chlorine [2]	0.00	0.20	mg/L

[1] Includes treatment chemicals identified in [2].

[2] Added as treatment chemical.

$CaCO_3$ = calcium carbonate
mg/L = milligrams per liter
TDS = total dissolved solid
TOC = total organic content
TSS = total suspended solid

Figure 3.3-1
11 x 17

front

Figure 3.3-1
11 x 17

back

Figure 3.3-2

11x17

front

Figure 3.3-2

11x17

back

3.4 Vegetation and Wildlife

Vegetation and wildlife habitat and species at the proposed Energy Facility site and along the alignments of the natural gas, water pipeline, and electric transmission line could potentially be affected by the proposed Facility. For the purpose of analysis, vegetation and wildlife habitat was identified within the survey area of the Energy Facility site and ¼ mile on either side of the proposed project's linear features. Potential effects from construction or operation of the proposed Energy Facility are expected to stay within or close to the proposed Energy Facility site and within the established construction easements of the proposed related or supporting facilities.

The information presented in this section is based on the studies and analysis conducted for the SCA as amended by Amendments No. 1 and No. 2, filed with EFSC on July 25, 2003, and October 15, 2003, respectively.

3.4.1 Affected Environment

The analysis area is located within the Klamath Ecological Province (East Cascades Ecoregion), on the eastern side of the Cascade Mountains (see Figure 3.4-1). This region is characterized by large basins surrounded by ancient lake terraces and basaltic fault block mountains. Elevations range from around 4,000 to 8,400 feet. The soil in the area is derived from basaltic parent material and generally has loamy surface horizons overlaying loamy to clayey subsurface horizons (Anderson et al., 1998; Franklin and Dyrness, 1988). The climate is characterized by warm, dry summers and cool, moist winters. The average annual precipitation in Klamath County is 14 inches, of which only 27 percent occurs during the growing season.

3.4.1.1 Vegetation Communities and Habitats

Methodology. Reconnaissance-level surveys for the proposed Energy Facility site and associated natural gas and water supply pipelines were conducted on October 10 and 11, 2001. Detailed habitat assessment and field surveys for biological resources were conducted by three biologists at the Energy Facility site, and along the proposed natural gas, water supply, and electric transmission line alignments from May 6 to May 10, 2002. Additional rare plant and breeding bird surveys were conducted from June 17 to 20, 2002, and on July 9 and 10, 2002. Prior to conducting the 2002 biological surveys, the centerlines of the proposed related or supporting facilities were flagged in the field by surveyors. Gross level habitat surveys were conducted for areas within 0.25-mile of the Energy Facility and the natural gas pipeline, water supply pipeline, and electric transmission line. Aerial photography, topographic maps, visual estimation, and field verification at specific locations were used to categorize habitat types.

Habitat Classifications. Habitat classifications within the analysis area were based on plant community types developed by Kagan and Caicco (1992). General habitat descriptions also incorporate ecological data from *Wildlife-Habitat Relationships in Oregon and Washington* (Johnson and O'Neil, 2001) and *Natural Vegetation of Oregon and Washington* (Franklin and Dyrness, 1988). Five major vegetative communities occur at the Facility site and along the electric transmission line corridor (Figure 3.4-1). These vegetation communities provide primary habitat for wildlife in the area. They include agricultural lands, ruderal areas, western juniper woodland, ponderosa pine forest, and sagebrush-steppe habitat. Developed areas and aquatic habitats are also found within the project area. Descriptions of each habitat type are provided below. Each habitat type is further categorized in relation to the Oregon Department of Fish and Wildlife (ODFW) habitat classification system. The total acreage and ODFW category for each habitat type are summarized in Table 3.4-1. ODFW habitat categories are shown in Figure 3.4-2.

Western Juniper Woodland. Western juniper woodland is the driest forest community in the Pacific Northwest and is generally found in the transition zone between ponderosa pine forest and shrub-steppe habitats. This type occurs widely throughout eastern Oregon on shallow, often rocky soil, at elevations ranging between 1,500 and 6,500 feet. This habitat type is widespread throughout the analysis area on low hills and terraces at elevations between 4,000 and 5,000 feet. It is found on well-drained stony to very stony loams derived from weathered tuff and basalt, as well as on loamy soil derived from lacustrine and alluvial deposits (NRCS, 1985).

This habitat type is characterized by the almost sole dominance of western juniper (*Juniperus occidentalis*) in the canopy layer. Throughout much of this habitat type the trees are generally widely spaced, creating a savanna-like setting with shrub cover between 10 to 40 percent in the understory. In some areas, western juniper creates a woodland or forested habitat with only a few scattered shrubs in the understory. Low sagebrush (*Artemisia arbuscula*) is the dominant shrub in most areas with big sagebrush (*Artemisia tridentata*), desert gooseberry (*Ribes velutinum*), and rabbitbrush (*Chrysothamnus nauseosus*, *C. viscidiflorus*) also found within the shrub layer. Native bunchgrasses such as Sandberg's bluegrass (*Poa secunda*), Idaho fescue (*Festuca idahoensis*), bluebunch wheatgrass (*Pseudoroegneria spicata*), Thurber's needlegrass (*Achnatherum thurberianum*) and squirrel tail (*Elymus elymoides*) make up approximately 5 to 25 percent of the ground cover in most areas. Common native forbs include larkspur (*Delphinium nuttallianum*), lupine (*Lupinus lepidus*), phlox (*Phlox diffusa*), lomatium (*Lomatium* spp.), and alpine waterleaf (*Hydrophyllum capitatum*). Where intensive livestock grazing has occurred in this habitat type, the understory vegetation is relatively sparse and made up of non-native species. Shrubs and native perennial bunchgrasses are either absent or very sparse in these areas. See Table 3.4-2 for a list of the types of plant species.

Ponderosa Pine Forest. Ponderosa pine habitats are widely distributed throughout eastern Oregon and are often found adjacent to sagebrush-steppe and western juniper habitat types. Ponderosa pine forests generally occur on dry sites characterized by coarse-textured, well-drained soil at elevations between 1,000 and 6,000 feet. Within the analysis area, ponderosa pine forest was observed on low hills and basins along the southern sections of the proposed electric transmission line alignment at elevations between 4,300 and 4,600 feet. This habitat type generally occurs on well-drained, loamy soil derived from weathered sandstone, basalt, and lacustrine sediments (NRCS, 1985).

Ponderosa pine (*Pinus ponderosa*) is the dominant species in the canopy layer of this forested habitat. Western juniper, curl-leaf mountain mahogany (*Cercocarpus ledifolius*), and Klamath plum (*Prunus subcordata*) are present in the lower canopy layer. The soil is covered by a moderate accumulation of duff, with Sandberg's bluegrass and Idaho fescue the most common species in the herbaceous layer, accounting for 10 to 50 percent of the cover. Table 3.4-2 includes a full list of present species. This habitat is considered to have moderately high commercial value (USDA, 1979) and some of these areas have been selectively logged in the past.

Sagebrush-Steppe. Sagebrush-steppe is extensively distributed throughout southeastern Oregon on stony shallow soil at elevations ranging from 3,500 to 7,000 feet. Within the analysis area this habitat type generally occurs between 4,000 and 5,000 feet, adjacent to western juniper habitats on well-drained loams and stony loams derived from weathered tuff and basalt (NRCS, 1985).

This habitat is characterized by shrubs. Low sagebrush is the most common species, accounting for 15 to 30 percent of the cover. Big sagebrush and rabbitbrush are also common in some areas. Sandberg's bluegrass is the most common species in the herbaceous layer, accounting for 10 to 20 percent of the cover. Other grasses such as Idaho fescue, Thurber's needlegrass, cheatgrass, and intermediate wheatgrass (*Elytrigia intermedia*) were also present but generally made up less than 5 percent of the cover. Common forbs included blue-eyed Mary, stoneseed (*Lithospermum ruderale*), phlox, buckwheat (*Eriogonum umbellatum*), and fleabane (*Erigeron* spp.). Refer to Table 3.4-2 for a full listing of vegetative species.

Ruderal Areas. Ruderal areas were observed along the margins of agricultural and developed areas at elevations between 4,100 and 4,200 feet. This habitat type occurs on loamy soil derived from weathered diatomite, basalt, and tuff as well as sandy loams formed from alluvial and lacustrine sediments. The vegetation in these areas is generally sparse and characterized by dominance of non-native species such as cheatgrass, tansy mustard, and clasping pepperweed (*Lepidium perfoliatum*). Native species are either absent or provide only minimal cover.

Agricultural Lands. The majority of the lowland areas within the analysis area have been converted to agricultural use. These areas occur on the loamy soil, formed in alluvial and lacustrine deposits on low terraces throughout the analysis area. Agricultural lands include cultivated crops, irrigated pasture, unimproved pasture, and fallow fields.

Cultivated crops areas are intensely managed for agricultural production. Common crops within the analysis area include alfalfa, wheat, barley, and oats. Irrigated pastures are areas that have been disked and planted with forage crops such as intermediate wheatgrass, tall fescue (*Festuca arundinacea*), and Kentucky bluegrass (*Poa pratensis*). Pasture land within the analysis area is used for cattle, sheep, and horses. In the higher elevations and more remote basins, pasture areas are not irrigated. The unimproved pasture areas appear to have been disked at some point and planted with forage grasses such as intermediate wheatgrass, tall fescue, and Kentucky bluegrass. Rabbitbrush and low sage are often present along the margins of unimproved pastures. These habitats are currently used for sheep and cattle grazing. Fallow fields are areas that were recently used for dryland farming of wheat and barley, but are no longer in production. These areas are characterized by a sparse cover (10 to 15 percent) of intermediate wheatgrass and ruderal species such as tansy mustard, clasping pepperweed, blue-eyed Mary, and yellowspine thistle (*Cirsium ochrocentrum*). Most of these lands are currently leased for seasonal cattle grazing.

Aquatic Habitats. Aquatic habitats within the analysis area include the Lost River, freshwater marsh, seasonal wetlands, sedge wet meadows, wet meadows, stock ponds, and agricultural canals.

The Lost River watershed is a closed, interior basin covering approximately 3,000 square miles of the Klamath River watershed in southern Oregon and Northern California. The headwaters originate east of the Clear Lake Reservoir in Modoc County, California, and flow approximately 75 miles to the Tulelake Sump. Seasonal flows in the Lost River are controlled by releases from the Clear Lake Dam. The Lost River was the only fish-bearing perennial habitat observed in proximity to the analysis area.

Several intermittent creeks were observed in the analysis area during field surveys. These creeks were dry at the time of the, but had defined bed and bank features. Most of the drainages either lacked vegetation or contained only sparse upland vegetation within the channel. Several irrigation canals have been excavated to facilitate surface drainage and water transport for agricultural crops and pasture lands in the basin areas. These channels appear to be routinely maintained and were largely devoid of vegetation.

Freshwater marsh habitat was characterized by a mosaic of perennial, emergent monocots and areas of open water. Species such as cattail (*Typha latifolia*) and bulrush (*Scirpus* sp.) are found in the deeper areas where sedges (*Juncus* sp.) and rushes (*Carex* sp.) are found in the seasonally-flooded areas around the perimeter of the marsh. These wetlands occur on the somewhat poorly-drained soil formed in alluvial lacustrine sediments. A hardpan is present between 20 and 40 inches and the water table is typically shallow, ranging from 1 to 3.5 feet below the ground surface (NRCS, 1985).

Sedge wet meadow habitat is characterized by seasonal inundation, with surface water present during the winter and early spring, but absent by the end of the growing season. This habitat type occurs on soil derived from weathered diatomite, tuff, and basalt (NRCS, 1985). The vegetation is characterized by a dense cover of low-growing monocots such as sedges and rushes. A few forb species such as dock (*Rumex crispus*), mouse-tail (*Myosurus minimus*) and Bach's downingia (*Downingia bacigalupii*) were observed along the outer margins during field surveys, but accounted for only a minimal amount of the total vegetative cover. Aquatic buttercup (*Ranunculus aquatilus*) was present where there was open water.

Wet meadow habitats occurred on poorly-drained clay soil that formed in sediments from weathered tuff and basalt (NRCS, 1985). This habitat is characterized by the presence of surface water during the winter and early spring, and the absence of water during the summer months. Characteristic vegetation includes species such as tufted hairgrass (*Deschampsia cespitosa*), Baltic rush (*Juncus balticus*), and sedges (*Carex* spp.). Some areas have been disked and planted with pasture grasses such as tall fescue, timothy (*Phleum pratense*), and meadow foxtail (*Alopecurus pratensis*).

Stock ponds were observed in areas where berms had been constructed within natural drainages to retain water for livestock. The hydrology in these areas was variable, with some ponds containing several inches of water and other areas dry at the time of the survey. Vegetation in these areas included sedges, rushes, aquatic buttercup, and dock.

Developed Areas. Developed areas include residential, agricultural, and industrial sites within the analysis area such as farm homes, dairies, the PG&E GTN compressor station, and Captain Jack Substation. The natural vegetation has been extensively disturbed in these areas.

Oregon Department of Fish and Wildlife Habitat Categories. The ODFW habitat classification system, as described in OAR 635-415-0025, ranks habitats according to six categories based on their relative distribution, importance to fish and wildlife, and mitigation potential. Each ODFW habitat category is associated with specific mitigation goals and standards. Habitats identified within 0.25 mile of the analysis area and associated pipelines and electric transmission lines were assigned to one of the six habitat categories (Figure 3.4-2).

Definitions. To assign each habitat in the analysis area to an ODFW habitat category, determinations must be made for each habitat regarding whether it is "essential," "limited," or "important."

- *Essential habitat* is defined as "any habitat or set of habitat conditions which if diminished in quality or quantity, would result in depletion of fish or wildlife species."
- *Limited habitat* is defined as "an amount insufficient or barely sufficient to sustain wildlife populations over time."
- *Important habitat* is defined as "any habitat recognized as a contributor to sustaining fish and wildlife populations on a physiographic province basis over time."
- *Species* is all members of an individual taxon.
- *Population* is an interacting group of individuals of the same species occupying a defined geographic area.

The following ODFW habitat categorizations were developed by applying the ODFW definitions after consultation with ODFW staff (McEwen, 2002). A complete description of ODFW habitat classifications is found in Table 3.4-3.

ODFW Habitat Category 1. The proposed Energy Facility would not impact any Category 1 habitats. Category 1 is considered irreplaceable, essential habitat for fish and wildlife species. No plant communities or landforms identified in the analysis area were considered to be Category 1 habitats.

ODFW Habitat Category 2. Category 2 is considered essential and limited habitat for fish and wildlife species. The Lost River provides essential habitat for the Federal and state-listed Endangered shortnose sucker (*Chasmistes brevirostris*) and Lost River sucker (*Deltistes luxatus*). Certain wetland areas including freshwater marsh and sedge wet meadows, provide important habitat for a variety of species. Natural wetland habitats are relatively rare in the Klamath Ecological Province, making them important.

Areas classified by Klamath County as high-density winter mule deer range are designated as Category 2 habitat and are limited in Klamath County. Most of these areas provide important foraging habitat for mule deer and pronghorn antelope. A variety of birds (including migratory species and raptors) and small mammals also forage in this habitat type. Approximately 46 acres of impacts may occur in high-density deer range. However, of the County-mapped high-density deer winter range that would be permanently disturbed by the Facility, a portion (approximately 13.9 acres) actually consists of fallow agricultural fields which provide minimal habitat and forage value for wintering deer. These areas do not provide biological value consistent with their Category 2 designation.[13] Nonetheless, the project proponent has evaluated and mitigated for them as Category 2 lands.

High-density winter mule deer range is covered by Klamath County's Significant Resource Overlay (SRO), which is discussed in Section 3.10, Land Use Plans and Policies.

ODFW Habitat Category 3. Category 3 is considered essential or important, but of limited habitat value for wildlife. The Category 3 habitats identified in the analysis area include juniper-sagebrush, sagebrush-steppe, and ponderosa pine habitats. The vegetation in these areas is characterized by relatively intact natural plant communities. Contiguous areas dominated by native vegetation generally provide better habitat for native fish and wildlife species than areas that have been altered by human activity or have become dominated by nonnative plant species (Johnson and O'Neal, 2001).

Certain wetland habitats such as wet meadows and intermittent creeks provide important seasonal habitat for a variety of wildlife species and are considered to be Category 3 habitats.

Medium-density winter mule deer range is classified as Category 3 habitat. This habitat is similar to the Category 2 habitat, but may not contain the quality or quantity of foraging habitat or cover to warrant a higher category status. A variety of birds (including migratory species and raptors) and mammals forage in this habitat type. Medium-density winter mule deer range is covered by Klamath County's SRO, which is discussed in Section 3.10, Land Use Plans and Policies. Approximately 29.9 acres of impacts may occur in areas classified as Category 3 habitats.

ODFW Habitat Category 4. Category 4 includes those habitats that are important, but not essential or limited. The western juniper woodland with a sparse understory consisting primarily of sparse non-native annual grasses and forbs is of relatively low value for wildlife and considered Category 4 habitat. This area is adjacent to the high-density winter mule deer range and may be used as a migration corridor, but provides minimal forage value. This type of habitat may provide mule deer bedding and hiding cover.

Agricultural canals are classified as Category 4 habitats. These areas provide minimal habitat value for fish and aquatic species, but are considered part of the Lost River watershed and therefore important to the overall water quality of the region.

Cultivated crops, irrigated pasture, unimproved pasture, fallow fields, and ruderal areas are classified as Category 4 habitat. These areas have been altered by human activity and generally support few or no native plant species, but provide habitat for a variety of wildlife species. These areas also provide foraging habitat for mule deer and pronghorn antelope. A variety of birds including migratory species and raptors forage in agricultural fields and

[13] The County mapped high-density deer winter range at a very gross scale and created winter range boundaries based on property lines rather than habitat delineations. Accordingly, some lesser-value land is included on the maps. In the present case, if the 57.6 acres referred to in the text were to be rated based on biological criteria rather than inclusion on the County maps, they would be rated Category 4.

pastures. Approximately 32.8 acres of impacts may occur in areas classified as Category 4 habitats.

ODFW Habitat Category 5. No Category 5 habitat was identified within the analysis area. Category 5 has high potential to become either essential or important habitat for fish and wildlife. No plant communities or landforms identified in the analysis area were considered to be Category 5 habitats.

ODFW Habitat Category 6. Category 6 habitat has low potential to become essential or important for fish and wildlife. Developed areas such as residential areas, dairy farms, and electrical substations and natural gas pumping stations are considered to provide low-value habitat for wildlife species. No landforms identified in the analysis area were considered to be Category 6 habitats.

3.4.1.2 Plant and Animal Species

Plant and Animal Species in the Project Area. The area around the Energy Facility supports a variety of plant and animal life. A survey of areas in the vicinity of the Energy Facility was conducted in May 2002 to identify and document animal and plant species occurring within the Energy Facility site and adjacent features. Additional surveys were conducted in June and July 2002. Table 3.4-4 provides a listing of animal species observed during the survey; Table 3.4-2 provides a listing of plant species, including those identified as noxious weeds by the Oregon Department of Agriculture (ODA). Some of the species identified as occurring or having the potential to occur in the area are listed by state or Federal regulations as having special protection status. These are described below under the heading “Special-Status Species.” Species that are listed as state or Federal threatened and endangered species are also described below.

Noxious Weeds. The following noxious weeds have been observed in the Facility area and have the potential to spread as a result of increased disturbance, inhibit natural regeneration of desirable species, and reduce the success of revegetation efforts:

- Bull thistle (*Cirsium vulgare*)—Widespread, but not abundant in the project area
- Field bindweed (*Convolvulus arvensis*)—Common in fallow agricultural fields, but limited distribution in the project area
- Medusa-head (*Taeniatherum caput-medusae*)—Limited to the area around Captain Jack Substation; species is present, but not abundant
- Quack grass (*Elytrigia repens*)—Limited distribution in the project area in pastures and along roadsides
- Scotch thistle (*Onopordum acanthium*)—Locally common in disturbed areas, limited where dense native vegetation is present
- Musk thistle (*Carduus nutans*)—Locally common in disturbed areas, limited where dense native vegetation is present

Other non-native, weedy species common in the Facility area included:

- Yellow spine thistle (*Cirsium ochrocentrum*)—Common in fallow agricultural fields

- Cheatgrass (*Bromus tectorum*)—Locally common in highly disturbed areas, but limited where dense native vegetation is present
- Tansy mustard (*Descurainia sophia*)—Common in fallow agricultural fields and highly disturbed areas
- Field pepperweed (*Lepidium campestre*)—Common in fallow agricultural fields
- Tumble mustard (*Sisymbrium altissimum*)—Common in fallow agricultural fields
- Tubercled crowfoot (*Ranunculus testiculatus*)—Common in some highly disturbed areas
- Common mullein (*Verbascum thapsus*)—Locally abundant in areas of recent development

Special-Status Species. Special-status species are those identified by Federal or state resource agencies as requiring special protective management measures due to potential threats to their continued survival. In the Energy Facility area, both Federal and state special-status species occur. Federal and state designations for special-status species are discussed briefly below. Table 3.4-5 shows Federal and state special-status species identified by Federal and state agencies as having the potential to be present in the Facility area. Species identified by the Oregon Natural Heritage Program (ONHP) and the Nature Conservancy Natural Heritage Network are also shown in Table 3.4-5. In addition, Table 3.4-5 notes whether those species, or suitable habitat for those species, were observed during the survey conducted in June and July of 2002.

The state of Oregon designates a number of categories of special-status species. Agencies with jurisdiction over these species are ODFW and the ONHP. Categories of special-status species include:

- ODFW
  - C - Candidate for state listing as Threatened or Endangered
  - V - Vulnerable, species for which listing as threatened or endangered is not believed to be imminent, and can be avoided through protective measures and monitoring.
  - U - Undetermined status, more information is needed to determine the conservation status of the species
  - P - Peripheral or naturally rare species, species on the edge of their natural range in Oregon, or have naturally low populations within the state
- ONHP
  - 1—Taxa are threatened, endangered throughout their range
  - 2—Taxa which are threatened or endangered in Oregon, but more secure elsewhere
  - 3—Review list, taxa for which more information is needed to determine the conservation status
  - 4—Species which are of conservation concern, but are not currently threatened or endangered

- BLM
  - BS—Bureau Sensitive in Oregon and Washington—species that could easily become endangered or extinct in Oregon and Washington, and are eligible for Federal or state listing or candidate status
  - BSO—Bureau Sensitive in Oregon—same as above but specific to Oregon
  - BSW—Bureau Sensitive in Washington—same as above but specific to Washington
  - BA—Bureau Assessment in Oregon and Washington—species that are not presently eligible for official Federal or state status but are of concern in Oregon and Washington
  - BAO—Bureau Assessment in Oregon—same as above but specific to Oregon
  - BAW—Bureau Assessment in Washington—same as above but specific to Washington
  - BT—Bureau Tracking in both Oregon and Washington—an early warning for species that may become of concern in the future in Oregon and Washington
  - BTO—Bureau Tracking in Oregon—same as above but specific to Oregon
  - BTW—Bureau Tracking in Washington—same as above but specific to Washington

Special-status species observed in the analysis area included the pygmy rabbit (*Brachylagus idahoensis*), American white pelican (*Pelecanus erythrorhynchos*), and the greater sandhill crane (*Grus canadensis*). In addition to these species, there were unconfirmed sightings of the sagebrush lizard (*Sceloporus graciosus*) and tricolored blackbird (*Agelaius tricolor*) during the surveys. Evidence of little brown bats (*Myotis* sp.) was also observed in several old structures south of the water supply pipeline alignment. No special status plant species were found, and no sites are known to occur on adjacent BLM land. As documented in Table 3.4-4, suitable habitat for a number of other species was observed during the visit, although the species themselves were not seen. Species descriptions for these additional species are found in Appendix C.

Pygmy Rabbit. Pygmy rabbit habitat consists of areas dominated by sagebrush with deep, friable, sandy soil (Verts and Carraway, 1998). Several areas with open sagebrush cover within the analysis area were identified as potential habitat for pygmy rabbits. These habitat areas were surveyed extensively and pygmy rabbits were observed at three locations along the proposed electric transmission line alignment. The first sighting was documented just west of the proposed electric transmission line approximately 2.5 miles north of the Captain Jack Substation, the second observation was just north of Captain Jack Substation, and the third observation was in the northern portion of the electric transmission line approximately 1 mile southwest of the Energy Facility site (Figure 3.4-3).

Northern Sagebrush Lizard. The northern sagebrush lizard inhabits high elevation sites throughout most of southern and central Oregon, but is seldom found above 6,000 feet (Nussbaum et al., 1983 and Brown et al., 1995). Northern sagebrush lizards are often found in open areas, such as sagebrush-steppe with plentiful light and shady hiding places among shrubs, rocks, or roots. They are often associated with volcanic rocks, which absorb heat and allow for efficient thermoregulation. Suitable habitat was present throughout much of the analysis area and a single northern sagebrush lizard was potentially identified on the northern portion of the proposed Energy Facility site (Figure 3.4-3).

American White Pelican. During breeding season, American white pelicans are found at inland lakes and marshes. A predator-free island is required for nesting. During nonbreeding seasons, they may occur on almost any body of water, including oceans (Marshall, 1992, Paullin et al., 1988). Five white pelicans were observed at high altitude, circling over the proposed Energy Facility site. A single white pelican carcass was found approximately 1,250 feet east of the electric transmission line about 2 miles southwest of the Energy Facility site (Figure 3.4-3). Several white pelicans were also observed in the Lost River, several miles west of the analysis area.

Tricolored Blackbird. Tricolored blackbirds are found in freshwater marshes with emergent vegetation (cattails and bulrushes) or in thickets of wouldows or other shrubs such as Himalayan blackberry, growing in and around wetland areas. Tricolored blackbirds are often found breeding in the company of red-winged blackbirds (*Agelaius phoenicus*) (Orians, 1961). Tricolored blackbirds were potentially identified in a flock of red-winged blackbirds in a freshwater marsh approximately 1,200 feet southeast of the Babson well site (Figure 3.4-3).

Greater Sandhill Crane. Sandhill cranes would nest in marshes and wet meadows or in drier grasslands and pastures, including irrigated hay meadows (Littlefield and Paullin, 1990.). A single sandhill crane was observed foraging adjacent to a freshwater marsh approximately 1,200 feet southeast of the water supply well system site (Figure 3.4-3).

Little Brown Bat. *Myotis* species are closely associated with water and are generally found in moist forests and riparian woodlands. This bat may also use structures such as abandoned buildings, barns, and houses for roosts (Fenton and Barclay, 1980). Evidence of little brown bats was observed in several abandoned buildings approximately 300 feet south of the proposed water supply pipeline (Figure 3.4-3).

Federally and State Protected Threatened and Endangered Species. The Endangered Species Act (ESA) is the primary Federal law protecting animal and plant species believed to be in danger of extinction. The ESA establishes a process for designating species for protection and for ensuring that Federal actions do not jeopardize the continued existence of species "listed" under the ESA. The Act includes prohibitions against "taking" individuals of a listed species, and authorizes the Federal government to deny funding and permit approvals for projects or actions that would result in such a taking. The ESA designates species under one of several categories of protection: endangered, threatened, proposed for listing, candidate for listing, and species of concern. Endangered and threatened species are fully protected by the provisions of the Act; species proposed for listing are generally afforded the same level of protection as listed species; and candidate species and species of concern are under study for listing, but are not afforded the level of protection ESA provides listed species.

These species are listed or being considered for listing as threatened or endangered, pursuant to the Federal ESA. The only sensitive species observed in the field or known to occur at or near the proposed Energy Facility site or along the pipeline and electric transmission line easements is the bald eagle. No special-status plant species were found during surveys conducted in 2001 and 2002. See Table 3.4-6 for a list of threatened, endangered, and candidate species known or suspected to occur in the analysis area. See Figure 3.4-4 for a map of rare, threatened, and endangered species locations.

Bald Eagle. The bald eagle is known to occur in the analysis area and suitable nesting habitat was identified within the ponderosa pine (*Pinus ponderosa*) habitat for a 1.3-mile section of the electric transmission line approximately 2 miles north of the Captain Jack Substation. No nests were observed during surveys conducted in 2001 and 2002. Nest locations are found in tall trees and rocky cliffs, and may be located as far as 10 miles from foraging areas (Csuti et al., 1997). Approximately 80 percent of the nest locations in the Klamath River Basin are in ponderosa pine habitat (Anthony et al., 1982). With the exception of the area described earlier, none of the areas potentially impacted by the Energy Facility provides suitable nesting habitat for bald eagles. Suitable foraging habitat (small mammals, and carrion in the form of pronghorn antelope, wintering and resident deer, and cattle) occurs on the Energy Facility site and near associated linear facilities.

During the mid-June surveys for nesting birds and raptors, two adult and two juvenile bald eagles were observed at McFall Reservoir, approximately 0.75 mile east of the electric transmission line. On June 11, 2002, Steve Hayner (biologist for the Bureau of Land Management) reported a nest site at McFall Reservoir to Frank B. Isaacs, Senior Faculty Research Assistant at Oregon State University. Mr. Isaacs is a recognized bald eagle expert in this region. At this time two mostly feathered chicks, two adults, and four juvenile bald eagles were observed (Isaacs, 2002). Adult and juvenile bald eagles were also observed flying and foraging over the water supply well area, the water supply pipeline, the electric transmission line, and the Energy Facility site. On July 9, 2002, six juvenile and one adult bald eagle were observed at McFall Reservoir.

3.4.1.3 Wetlands

Information on wetlands was obtained from review of U.S. Geological Survey (USGS) 7.5-minute quadrangles, aerial photographs, National Wetland Inventory (NWI) maps, and soil maps for Klamath County, Oregon. No regional or local wetland maps have been prepared for the Energy Facility (Cary, 2001). Field investigations and wetland delineations were conducted between May 6 and May 10, 2002.

Waters of the state are defined as natural waterways, including tidal and nontidal bays, intermittent creeks, constantly flowing streams, lakes, wetlands, and other bodies of water in the state, navigable and nonnavigable. Wetlands are defined as “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 and wetland habitat identified in the study area included the Lost River, freshwater marsh, seasonal wetlands and creeks, and agricultural canals. A summary of wetland areas identified is provided in Table 3.4-7. Waters-of-the-state and wetland locations are shown in Figure 3.4-5. A wetland delineation report was filed with the U.S.

Army Corps of Engineers (Eugene, Oregon) and the Oregon Division of State Lands (Bend, Oregon) on August 22, 2003.

The Lost River. The Lost River is described under "Aquatic Habitats" in Section 3.4.1.1. The proposed natural gas and water supply pipelines would be located approximately 900 feet and 1,500 feet south of the Lost River, respectively. The proposed Energy Facility site is more than 1.3 miles south of the Lost River.

Freshwater Marsh. The freshwater marsh habitat is described in Section 3.4.1.1. East Langell Valley Road creates the eastern boundary of the wetland feature. This habitat type was observed approximately 900 feet south of the water supply well system site at the east end of the proposed water supply pipeline.

Seasonal Wetland. The only seasonal wetland area observed in the immediate vicinity of the Energy Facility was Dry Lake. This feature is located approximately 200 feet west of the middle of the proposed electric transmission line route. The wetland was observed in a slight topographic depression where surface water is present for extended periods early in the growing season, but is likely absent by the end of the season in most years. The vegetation was characterized by a dense cover of rushes (*Eleocharis* sp.) and sedges (*Juncus* sp.). Surrounding vegetation consisted of western juniper (*Juniperus occidentalis*), low sagebrush (*Artemisia arbuscula*) Sandberg's bluegrass (*Poa secunda*), Idaho fescue (*Festuca idahoensis*), and bluebunch wheatgrass (*Pseudoroegneria spicata*).

Seasonal Creeks. Seasonal creeks are typically characterized by relatively narrow, but well-defined channels in which surface water is present for extended periods of time early in the growing season, but is absent by the end season in most years (Cowardin et al., 1979). Five seasonal creeks were observed in the areas where Energy Facility features are located.

Seasonal Creek #1. Seasonal creek #1 is an unnamed drainage along the electric transmission line route just south of where the northern portion of the electric transmission route turns south. The channel was incised between 12 and 18 inches with an average width of 5 feet bank-to-bank. No water was present at the time of the survey. The substrate was characterized by dense cobbles underlain by sandy soil. Sandberg's bluegrass (*Poa secunda*) was scattered throughout the channel. No suitable fish habitat was observed in this area.

Seasonal Creek #2 (Wright Creek). Wright Creek is a seasonal drainage located in the approximate middle of the electric transmission line easement. The creek channel was approximately 20 feet wide, with water depth ranging between 0 and 6 inches. The substrate was characterized by sandy soil with scattered cobbles. The channel was densely vegetated with rushes, sedges, and moss. Other plant species observed included dock (*Rumex crispus*.) and mouse-tail (*Myosurus minimus*). No suitable fish habitat was observed in this area.

Seasonal Creek #3. Seasonal creek #3 is an unnamed drainage along the west side of a section of the southern portion of the electric transmission line. The drainage was characterized by an incised channel approximately 12 to 18 inches deep and 4 feet wide, with defined bed and bank features. The sandy soil of the channel was covered by a dense layer of pine needle thatch and sparse upland vegetation such as cheatgrass (*Bromus tectorum*), yarrow (*Achillea millefolium*), and sagebrush (*Artemisia arbuscula*). No water was observed in the channel at the time of the survey. A small stock pond (approximately 15 by

25 feet) was observed 2 miles north of Captain Jack Substation. Approximately 6 to 12 inches of water was present in the basin at the time of the survey. No vegetation was observed within the ponded area. No suitable fish habitat was present.

Seasonal Creek #4. Seasonal creek #4 was observed along the natural gas pipeline on the west side of a dairy, approximately 3,150 feet northwest of the PG&E GTN compressor station. This feature crosses under Harpold Road through a 36-inch-diameter, corrugated metal culvert. On the south side of the road, the creek channel is weakly expressed and lacks a well-defined bed and bank. No water was observed in this section of the creek and the channel is devoid of vegetation. With the exception of western juniper observed adjacent to the creek, the surrounding landscape is generally devoid of vegetation. On the north side of the road, the creek is channelized and diverted to the east along the south end of an alfalfa field for approximately 1,200 feet, at which point the channel turns north and continues for an additional 1,500 feet where it empties into the Lost River. The realigned portion of the creek channel is approximately 8 feet wide and apparently used for agricultural runoff. A few areas of intermittent ponding were observed in the channel resulting from irrigation of the adjacent alfalfa fields. No vegetation was observed in the channel at the time of the survey. The proposed natural gas pipeline would cross under a portion of the realigned channel that flows north into the Lost River, approximately 1,600 feet west of West Langell Valley Road. No evidence of recent flow was observed at the time of the survey.

Seasonal Creek #5. Seasonal creek #5 was observed on the west side of the PG&E GTN Bonanza compressor station, approximately 200 feet west of the proposed natural gas pipeline. No water was observed at the time of the survey, and with the exception of a few scattered clumps of intermediate wheatgrass (*Elytrigia intermedia*), the channel was devoid of vegetation. The channel passes under Harpold Road through a 10-foot-by-6 foot cement box culvert, where it continues roughly northwest through a horse pasture for approximately 500 feet, after which the channel is realigned and diverted due west into the Lost River. No evidence of recent flow was observed at the time of the survey.

Agricultural Canals. Six agricultural drainages were observed in the vicinity of the Energy Facility. These areas have been excavated to facilitate surface drainage and water transport for agricultural crops and pasturelands in the basin areas. These channels appear to be routinely maintained.

Agricultural Canal #1. Agricultural canal #1 was observed along the southeastern boundary of the proposed Energy Facility site. This earthen canal was approximately 14 feet wide and 2 to 3 feet deep. Approximately 4 inches of ponded water were present at the time of the survey. Vegetation within the channel included canary grass (*Phalaris* sp.) and spikerush (*Eleocharis* sp.). Soil in this area includes Calimums and Laki-Henly loams. This soil ranges from well-drained to somewhat poorly drained. No suitable fish habitat was observed in this area. Adjacent land use is wheat grass pasture.

Agricultural Canal #2. Agricultural canal #2 is a small, earthen irrigation canal located approximately 25 feet north of the proposed water supply pipeline at the easternmost extent of the alignment, adjacent to the Babson Well. The channel ranges between 3 and 4 feet wide and is between 1 and 2 feet deep. No vegetation was observed in the channel. Soil in this area is mapped as Calimus loams and Stukel-Capona loams, both of which are well-drained.

Grazing in both improved and unimproved pasture is the predominant land use in the adjacent areas.

Agricultural Canal #3. Agricultural canal #3 was observed along the proposed water supply pipeline approximately 450 feet west of East Langell Valley Road. This feature is an earthen irrigation canal approximately 15 feet wide with 2 to 3 feet of water flowing through the channel at the time of the survey. No vegetation was observed in the channel at the time of the survey. Soil in this area is mapped as Stukel-Capona loams, and is well-drained. Grazing in both improved and unimproved pasture is the predominant land use in the adjacent areas.

Agricultural Canal #4. Agricultural canal #4 is located approximately 2,000 feet west of Teare Lane and 50 feet south of the proposed water supply pipeline. This shallow, earthen canal is approximately 12 feet wide and 2 to 3 feet deep. Approximately 2 to 3 inches of ponded water were observed in the channel at the time of the survey. Grasses such as Kentucky bluegrass (*Poa pretense*), beardgrass (*Polypogon* sp.), and sedges were observed in the channel. Soil in this area is mapped as Laki Loam, and is moderately well-drained. Adjacent land uses in this area include pasture, hay crops, and western juniper-low sagebrush rangeland.

Agricultural Canal #5. Agricultural canal #5 is located approximately 100 feet south of the proposed water supply pipeline parallel to canal #4. This earthen channel was approximately 10 feet wide and 4 feet deep. No water was present at the time of the survey and the channel was devoid of vegetation. Soil in this area is mapped as Laki Loam, and is moderately well drained. Adjacent land uses in this area include pasture, hay crops, and western juniper-low sagebrush rangeland.

Agricultural Canal #6. Agricultural canal #6 is located approximately 30 feet south of Harpold Road, on the east side of the dairy and on the north side of an irrigated alfalfa field along the natural gas pipeline. This shallow, earthen canal was approximately 15 feet wide and 2 feet deep. Some grasses, sedges, and rushes were observed in the channel. Ponded water to a depth of 6 inches was observed at the west end of the canal, and was likely the result of irrigation runoff from the adjacent field. Soil in this area is mapped as Henley loams, and is somewhat poorly-drained.

3.4.2 Environmental Consequences and Mitigation Measures

Temporary (construction-related) and permanent impacts to habitats are quantified in Table 3.4-1. Temporary impacts from the proposed Energy Facility would result from construction of features of the Energy Facility and temporary construction parking and laydown areas. Permanent impacts over the 30-year operating life of the Energy Facility would occur at the Energy Facility site, the water supply well system, and at transmission tower locations and along the access roads for the electric transmission line. A summary of potential impacts and proposed mitigation measures for special-status species is presented in Table 3.4-8. There would be no impacts to any special-status species. As described below, the Energy Facility would have no significant unavoidable adverse impacts on vegetation and wildlife.

Impact 3.4.1. Construction and operation of the proposed Energy Facility could cause a temporary or permanent loss of vegetation and wildlife habitat.

Assessment of Impact. The Energy Facility would be located in a fallow agricultural field that has minimal habitat value. However, a portion of the field is mapped by Klamath County as high-density mule deer winter range and accordingly is classified conservatively as Category 2. There are 13.9 acres of Category 2 land. However, the soil is poor quality and non-native species such as intermediate wheatgrass have been planted in some areas as forage. The Energy Facility would also impact 4.2 acres of Category 3 land and 32.5 acres of Category 4 land (including the stormwater infiltration basin). The Category 3 areas consist entirely of fallow fields. Category 4 areas are characterized by ruderal and non-native species such as intermediate wheatgrass, tansy mustard, and clasping pepperweed. The high-density mule deer winter range (ODFW Category 2 habitat) and the medium-density mule deer winter range (ODFW Category 3 habitat) are within Klamath County's Big Game Winter Range SRO, which is discussed in Section 3.10.

Wastewater would be land applied to a 31-acre site that is fallow agricultural land (Category 2). The wastewater would be used during the growing season to irrigate pasture for cattle grazing, but the area would also be accessible to wildlife. This acreage is not included in the overall project impacts because it consists of existing fallow fields and would be irrigated only during the growing season providing forage for deer and antelope and cover for game birds. Approximately 5.7 acres would be temporarily impacted by an access road and pipeline to the irrigated fields. Permanent impacts would be 0.5 acre of Category 2 habitat.

A 4.7-acre stormwater infiltration basin would be constructed adjacent to the Energy Facility. This basin lies entirely in Category 4 designated habitat and is included in the overall impacts related to the Energy Facility.

The electric transmission line would be approximately 7.2 miles in length and would originate from the Energy Facility site to the Captain Jack Substation. The majority of the electric transmission line easement would be in Category 2 and 3 juniper-sagebrush habitat. Category 3 and 4 habitat types within the electric transmission line easement include ponderosa pine, sagebrush-steppe, fallow fields, and unimproved pasture. A total of 38 lattice-type transmission towers would be used along the alignment. Each tower would rest on four concrete footings. The total tower area would cover approximately 3,600 square feet. Construction of towers would require clearing of the vegetation within the easement at each tower location. The cleared areas would be revegetated with grasses and shrubs once construction has been completed. The open lattice structure of the towers would allow for wildlife use of the area under the towers.

For safe and reliable operation, vegetation above 10 feet within the 154-foot easement would be cleared. Wooded habitat types within the easement include Category 2 high-density deer range, Category 3 juniper-sagebrush, and Category 3 ponderosa pine forest. Removal of juniper trees is expected to provide an overall benefit to the habitat by improving understory growth of grasses and shrubs (Sitter, 2002). Permanent clearing in nonwooded habitats would be limited to the construction or improvement of access roads to the proposed tower locations.

Approximately 4.9 miles of existing and 6.6 miles of new access roads would be used for construction and operation of the electric transmission line. In some areas, existing roads may require improvements such as limited widening or surfacing with gravel. The existing roads would be mostly on privately owned land and the project proponent has access agreements to use the existing roads. Construction of new roads would occur entirely within the 154-foot easement where possible to minimize additional clearing. The project proponent would place locked gates at the entry and exit points of the new roads to control harassment and displacement of wildlife species.

A 4.1-mile natural gas pipeline would extend from the PG&E GTN compressor station to the Energy Facility site. The construction easement for the gas pipeline would be 80 feet wide. Construction of the natural gas pipeline would result in temporary impacts to approximately 43.8 acres, including approximately 13.1 acres of Category 2 high-density winter deer range (fallow field and juniper-sagebrush), 27.1 acres of Category 4 habitat, and 3.6 acres of Category 6 habitat. Other impacted general habitat types include 23.9 acres of agricultural crops, 9.0 acres of juniper-sagebrush, 0.8 acre of pasture, 3.5 acres of fallow fields, 3.0 acres of ruderal habitat, and 3.6 acres of developed land. There would be no permanent disturbance for the natural gas pipeline. Topography and vegetation would be returned to preconstruction conditions following construction.

A 2.8-mile water supply pipeline would extend from the water supply well system to the Energy Facility site. The construction easement for the water supply pipeline would be 60 feet wide. Construction of the water supply pipeline would result in temporary impacts to approximately 19.4 acres, including 6.6 acres of Category 2 habitat (juniper-sagebrush and fallow fields), approximately 1.8 acres of Category 3 habitat, and 11.0 acres of Category 4 habitat. Approximately 10.2 acres of juniper-sagebrush habitat along the easement has an understory of native shrubs, grasses, and forbs. Other habitats that would be temporarily impacted include approximately 6.3 acres of irrigated pasture, 1.4 acres of agricultural crops, 2.9 acres of fallow field, 0.8 acres of fallow field, and 0.7 acre of ruderal habitat. Of the 11.9 acres of juniper-sagebrush, 5 acres has been heavily grazed and the understory vegetation is sparse and contains non-native annual species such as cheatgrass and tansy mustard.

During operations, the Energy Facility would use water for steam generation, demineralized water production, potable water and sanitary systems, and service water. During construction, water would be used for dust suppression, compaction, vehicle and equipment cleanup, testing and commissioning of the Energy Facility systems, and miscellaneous construction-related uses. The water supply well system would consist of an existing well and two additional water supply wells. The water supply well system would permanently impact 0.3 acre of Category 4, irrigated pasture land on the east side of East Langell Valley Road. The pasture has been heavily grazed.

<u>Recommended Mitigation Measures</u>. To the extent practicable, the Energy Facility site, the natural gas pipeline, water supply pipeline, and electric transmission line would be located in disturbed areas or in areas with minimal habitat value. In addition, the following measures would be used to reduce, avoid, and mitigate for impacts to natural habitats, wildlife, and native plant species:

- Workers would be given environmental training to inform them of wildlife and habitat issues. This training would include information about sensitive wildlife, plants, and habitat areas as well as the required precautions to avoid and minimize impacts. Such measures shall include maintaining reasonable driving speeds to avoid harassing or accidentally striking wildlife. Construction personnel would be instructed to be particularly cautious and to drive at slower speeds from 1 hour before sunset to 1 hour after sunrise when some wildlife species are the most active. Speed limits would be posted on signs throughout the construction zone. Sensitive habitat areas would be identified in the field with appropriate signs and flagging.
- Where feasible, construction would be limited in natural areas during the breeding period of deer and antelope (April through September), as well as the nesting period of raptors (May through September).
- Maps would be prepared to show sensitive areas that are off-limits during the construction phase.
- Signs would be posted around the perimeters of any sensitive habitat areas to be avoided.
- To the extent practicable, the final design of the transmission tower locations within the ponderosa pine habitat would minimize habitat impacts by avoiding densely wooded areas.
- Construction of new roads for the electric transmission line would remain within the cleared easement where possible to minimize additional clearing.
- Following construction, topography and vegetation would be returned to preconstruction condition or better in areas of temporary disturbance. In areas where natural vegetation is removed, native perennial bunchgrasses, sagebrush, bitterbrush, and curly-leaf mountain mahogany would be planted according to a revegetation plan. A proposed mitigation plan is included in Appendix A to the Biological Assessment (which is Appendix A to this EIS).
- Certified "weed free" seed mixes and mulches would be used for restoration and revegetation.
- Revegetation seed mixes and habitat enhancement locations would be developed in consultation with ODFW and BLM.
- Wildlife watering troughs would be used to encourage use of mitigation areas by wildlife.
- Preventive measures would be employed to reduce the introduction of noxious weeds by construction vehicles (e.g., washing vehicles before bringing them to the site and other best management practices).
- Grading and clearing of vegetation would be limited to the minimum extent necessary for practical and safe working areas.

- Fences that are temporarily removed for construction purposes would be replaced with antelope-friendly fence (design to be approved by ODFW and U.S. Fish and Wildlife Service).

Figure 3.4-6 shows the proposed mitigation area for vegetation and wildlife. In addition, the proposed project would restore 91 acres of fallow agricultural land to high-quality deer habitat and another 145 acres of habitat would be improved (see Section 3.10 for additional information).

Impact 3.4.2. Construction and operation of the proposed Energy Facility would cause noise and lighting that could disturb wildlife; however, biological surveys of the Energy Facility site found no evidence of wildlife species that would be uniquely sensitive to noise.

Assessment of Impact. The proposed Energy Facility site would be located in a rural and relatively quiet area with ambient background noise at approximately 20 to 30 dBA. Peaks exceed 70 dBA near farm equipment.

Biological surveys of the Energy Facility site found no evidence of wildlife species that would be uniquely sensitive to noise. Because the Energy Facility site would be located in a low area (relative to surrounding topography), noise impacts to nearby habitat areas would be limited in geographic area and would likely be minor. Based on the available research and the estimated noise level increase during operations, it is unlikely that operation of the Energy Facility would result in adverse effects on the wildlife-inhabiting areas near the Energy Facility site.

No specific regulation has been identified for the Energy Facility site that applies to noise levels in wildlife areas. Noise regulations typically apply to noise-sensitive property defined in human terms such as residences, schools, churches, and hospitals. It is possible that a new noise source could cause reduced wildlife use of surrounding habitat, thereby reducing the value of that habitat. In assessing this possibility, potential impacts to wildlife generally are evaluated on a physiological and behavioral level.

Noise during construction would be temporary and may cause some wildlife species to reduce their use of nearby habitats (behavioral) during the construction period (an indirect disturbance). Some species, such as nesting birds and deer, may modify their behavior during the day when construction noise is present by modifying foraging and nesting locations slightly. The extent of these indirect disturbances would depend on the particular tolerances of species.

Animals are more likely to habituate to operational noise than to construction noise. It is expected that the species currently inhabiting the area around the Energy Facility site would become habituated to the consistent and slight increase in the ambient noise level that would occur during operations. The closest habitat area for wildlife, including the wildlife mitigation area, would be approximately 2,500 feet from the Energy Facility. A noise level of 40 dBA is predicted at this distance. This level is well below the reported levels (80 to 100 dB sound pressure level [SPL]) known to be detrimental to wildlife. Approximately half of the wildlife mitigation area would be within the 40 dBA contour and the remaining half would be below 40 dBA. Operation of the Energy Facility would not impact the wildlife mitigation area.

Operation of the Energy Facility would result in an increase in ambient light. The disturbance effects would be localized to the immediate area of the Energy Facility and wildlife is expected to habituate to these changes. Low-impact directional lighting would be used to focus the light directly toward the Energy Facility, thus reducing ambient light into adjacent areas.

Recommended Mitigation Measures. Workers would be given environmental training to inform them of wildlife and habitat issues. This training would include information about sensitive wildlife, plants, and habitat areas as well as the required precautions to avoid and minimize impacts. Such measures shall include maintaining reasonable driving speeds to avoid harassing or accidentally striking wildlife. Construction personnel would be instructed to be particularly cautious and to drive at slower speeds from 1 hour before sunset to 1 hour after sunrise when some wildlife species are the most active. Speed limits would be posted on signs throughout the construction zone. Sensitive habitat areas would be identified in the field with appropriate signs and flagging.

Where feasible, construction would be limited in natural areas during the breeding period of deer and antelope (April through September), as well as the nesting period of raptors (May through September).

The topographic position of the proposed Energy Facility would minimize indirect effects of noise and ambient light on adjacent habitats.

Impact 3.4.3. Bald Eagles and other birds could be injured or killed by collisions with power lines.

Assessment of Impact. The Energy Facility may impact the bald eagle as a result of collisions with the electric transmission lines. To reduce the potential of avian collisions, the project proponent would provide mitigation by installing bird flight diverters (BFDs) on the top static wires along the entire electric transmission line. BFDs on overhead groundwires have reduced collisions in the range of 57 percent to 89 percent (Avian Power Line Interaction Committee, 1994).

Critical factors in determining the potential for a strike include the height of the towers and lines compared with the normal flight behavior of the bird, wing-loading and its effects on maneuverability, visibility, and the number of times a bird crosses the electric transmission line during daily flight. Collisions by raptors and songbirds are considered to be low due to the maneuverability and flight behavior of these birds (APLIC, 1994). Most areas with high rates of collisions are located close or parallel to areas used by waterfowl (high-wing-load birds) with adverse sight conditions (e.g., fog and low clouds). Collisions typically occur when birds are moving between foraging areas and resting areas during bad weather conditions.

The electric transmission line would not pose risk of electrocution to raptors. The towers would be designed and constructed with adequate separation between phase conductors and conductors to ground so that it would be physically impossible for a bird’s wings to bridge any space that would result in the conduction of current. With these design features, there should be no risk of electrocution from the electric transmission line.

Electric transmission lines may allow for population increases of some raptors in areas where natural nesting substrate is limiting (APLIC, 1996). Unlike nests on cliffs with southern exposures, tower nests on beams and cross-braces offer shading for the birds (Anderson, 1975; Nelson and Nelson, 1976; Steenhof et al., 1993). In addition, the height of the nests and their openness (compared to a heat-absorbing cliff) provide air circulation for cooling. Tower-nesting raptors may also benefit by increased protection from ground predators and range fires (Steenhof et al., 1993).

A biological assessment has been developed for potential impacts to bald eagles and is included in Appendix B.

Recommended Mitigation Measures. No mitigation measures beyond those described in the impacts section above are needed.

Impact 3.4.4. Construction and operation of the proposed Energy Facility would disturb less than 0.5 acre of wetlands.

Assessment of Impact. Construction of the electric transmission line access road would require placement of culverts and minor amounts of fill material in three intermittent creeks affected by the proposed project. No other fill or removal would occur in any of the wetland features identified within the Energy Facility area. None of the drainages identified within the Energy Facility area are fish-bearing streams or designated as a Scenic Waterway. No other wetland features would be impacted.

Seasonal Creek #1. This drainage would be crossed in two locations by a 14- to 16-foot-wide access road for construction and maintenance of the electric transmission line. The roadbed would be 14 to 16 feet wide. A culvert would be placed under the roadway to allow for uninterrupted flow of the drainage.

Seasonal Creek #2 (Wright Creek). This drainage would be crossed by the 14- to 16-foot-wide electric transmission line access road. A culvert would be installed to ensure the uninterrupted flow of water through the channel.

Seasonal Creek #3. This channel would be crossed by the 14- to 16-foot-wide electric transmission line access road. A culvert would be placed within the channel to facilitate uninterrupted water flow.

Recommended Mitigation Measures. Impacts to wetland features, including agricultural canals, would be avoided using conventional boring techniques to install the water supply and natural gas pipelines. Erosion control measures would be used where necessary to prevent impacts to wetland areas in close proximity to work areas. Existing grades and drainages would be preserved.

Fill material placed in the seasonal creek to facilitate vehicle access along the electric transmission line would be the minimum amount necessary to allow crossing of the channel. Culverts would be placed under the roadway to facilitate and maintain existing drainage.

Impact 3.4.4. For the process wastewater management alternative by beneficial use of the water for irrigated pasture, constituents in the process wastewater would not be expected to be toxic to wildlife.

Assessment of Impact. A Screening-Level Ecological Risk Assessment (ERA) following EPA and ODEQ guidance was conducted to determine the potential risk to plants, soil invertebrates, and wildlife from the wastewater application. Soil screening-level values for plants, invertebrates, birds, and mammals were available from ODEQ (2001) for many of the inorganic wastewater constituents. For birds, cobalt, iron, silver, thallium, and tin were lacking ODEQ screening values, but studies from which benchmarks could be developed for these metals were available. Similarly, iron, silver, tin, cyanide, and phenol benchmarks were developed for mammals from other sources. Unlike the ODEQ screening values, which are presented as mg constituent per kg soil, these benchmarks are presented as a dose (mg constituent/kg body weight/day) to the receptor. For comparison of these benchmarks, doses based on the maximum soil concentration, literature-derived wildlife parameters (i.e., diet, body weight, food ingestion rate, and soil ingestion rate), and literature-derived bioaccumulation factors for wildlife food items (i.e., plants and arthropods) were calculated for one bird (western meadowlark) and one mammal (deer mouse) for which exposure is likely to be high.

This assessment is included in Appendix C to the biological assessment (which is Appendix C to this EIS). The process wastewater constituents evaluated, except aluminum, barium, boron, chromium III, copper, fluoride, iron, manganese, molybdenum, and nickel, passed the screening evaluation and would be considered to present no risk to ecological receptors.

After further evaluation, background concentrations were found to be the primary driver for screening failures of aluminum, barium, chromium III, copper, fluoride, iron, manganese, and nickel, with negligible incremental contributions of these constituents to the risk estimation. Considering the bioavailability of boron to plants (less than 5 percent of total boron) substantially reduced the risk estimation for boron. Although both incremental and total (incremental + background) boron concentrations continued to exceed screening levels for sensitive plant species, incremental and total exposures were below toxicity thresholds for invertebrates and for boron-tolerant plant species when adjusted for boron bioavailability. Estimated maximum concentrations of molybdenum exceeded the soil benchmark for plants; however, risk to terrestrial plants from molybdenum exposure is considered low because of the low exceedance of the screening value and the highly conservative assumptions applied to the risk estimation. Thus, none of the constituents evaluated are considered to present significant risk to ecological receptors.

Recommended Mitigation Measures. No mitigation measures are recommended because, given the current information, there would not be a significant risk to ecological receptors.

3.4.3 Cumulative Impacts

In the Klamath Ecological Province, past and present agricultural development has had a substantial impact on the amount of native plant communities in areas like the Energy Facility site. These areas have been overgrazed and soil productivity is low. Biodiversity has been reduced by the loss and fragmentation of native habitats. Of the 108.7 acres permanently impacted, approximately 49 acres have been previously impacted by farming practices and the remaining acreage has been grazed by livestock periodically in the past.

The proposed project would not add to the cumulative degradation of the area's habitat, but would rather improve it. The project proposes to restore 91 acres of fallow field to high-quality deer habitat and to improve habitat values on another 145 acres of Facility-owned property. In addition, 31 acres would be irrigated with project wastewater. This irrigated area would produce forage crops for cattle, deer, and antelope.

Construction of the electric transmission line would require the filling and placement of culverts in three small intermittent drainages. This construction and filling would impact less than 0.5 acre of wetlands. This impact would contribute to cumulative impacts to wetlands in the vicinity of the project.

The construction of the transmission towers and electrical lines may result in potential cumulative impacts on eagles, other raptors, and songbirds. To minimize the potential cumulative impacts, mitigation measures as identified in Section 3.4.2 would be implemented.

TABLE 3.4-1
Acreage of Permanent and Temporary Impacts by Habitat

Feature	Total	Habitat Category ODFW 2	Habitat Category ODFW 3	Habitat Category ODFW 4	Habitat Category ODFW 5	Habitat Category ODFW 6	Juniper-Sage	Sage-Steppe	Pine	Ag Field	Pasture	Unimproved Pasture	Fallow	Ruderal	Developed
Permanent Disturbance During the 30-Year Operating Life of the Energy Facility															
Energy Facility Site	50.6	13.9	4.2	32.5									50.6		
Water supply well system	0.3			0.3							0.3				
Water supply pipeline	0.0														
Natural gas pipeline	0.0														
Electric transmission line	57.3	31.6	25.7				31.6	10.4	12.4			2.1	0.8		
Access road to pasture	0.5	0.5											0.5		
Total	**108.7**	**46.0**	**29.9**	**32.8**	**0.0**	**0.0**	**31.6**	**10.4**	**12.4**	**0.0**	**0.3**	**2.1**	**51.9**	**0.0**	**0.0**
Temporary and Permanent Disturbance															
Energy Facility (includes infiltration basin)	50.6	13.9	4.2	32.5									50.6		
Construction parking/laydown	71.0	19.7	6.4	44.9									71.0		
Subtotal—Energy Facility Site	121.6	33.6	10.6	77.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	121.6	0.0	0.0
Water supply well system	1.3			1.3							1.3				
Water supply pipeline	19.4	6.6	1.8	11.0			10.2			1.4	6.3		0.8	0.7	
Natural gas pipeline	43.8	13.1		27.1		3.6	9.0			23.9	0.8		3.5	3.0	3.6
Electric transmission line	64.9	36.3	28.6				35.2	12.2	14.0			2.4	1.1		
Access road to pasture	0.5	0.5											0.5		
Irrigation pipeline to pasture	5.2	4.8		0.4									5.2		
Total	**256.7**	**94.9**	**41.0**	**117.2**	**0.0**	**3.6**	**54.4**	**12.2**	**14.0**	**25.3**	**8.4**	**2.4**	**132.7**	**3.7**	**3.6**

TABLE 3.4-2
Plant Species Observed During Botanical Surveys of the Analysis Area
*(Taxonomy follows Hickman 1993. An * indicates species is an Oregon Department of Agriculture List B noxious weed.)*

Scientific Name	Common Name	Native/ Non-native	Habit
Apiaceae			
Lomatium nudicaule	Pestle lomatium	Native	Perennial
Lomatium triternatum	Lewis' lomatium	Native	Perennial
Lomatium utriculatum	Common lomatium	Native	Perennial
Perideridia oregana	Oregon yampah	Native	Perennial
Asclepiadaceae			
Asclepias speciosa	Showy milkweed	Native	Perennial
Asteraceae			
Achillea millefolium	Yarrow	Native	Perennial
Agoseris glauca	Pale agoseris	Native	Perennial
Antennaria rosea	Rosy pussytoes	Native	Perennial
Anthemis arvensis	Corn chamomile	Non-native	Annual
Artemisia arbuscula	Low sagebrush	Native	Shrub
Artemisia tridentata	Big sagebrush	Native	Shrub
Balsamorhiza sagittata	Arrow-leaved balsam-root	Native	Perennial
Bidens cernua var. *cernua*	Nodding bur-marigold	Native	Perennial
Blepharipappus scaber	Blepharipappus	Native	Annual
*Carduus nutans**	Musk thistle	Non-native	Perennial
Chrysothamnus nauseosus	Grey rabbitbrush	Native	Shrub
Chrysothamnus viscidiflorus	Green rabbitbrush	Native	Shrub
*Cirsium ochrocentrum**	Yellow-spine thistle	Non-native	Perennial
*Cirsium vulgare**	Bull thistle	Non-native	Bien.
Crepis acuminata	Tapertip hawksbeard	Native	Perennial
Crepis modocensis	Low hawksbeard	Native	Perennial
Crocidium multicaule	Spring gold	Native	Annual
Erigeron bloomeri	Scabland fleabane	Native	Perennial
Erigeron filifolius var. *filifolius*	Thread-leaved fleabane	Native	Perennial
Eriophyllum lanatum	Wooly sunflower	Native	Perennial
Microseris laciniata	cutleaf silverpuffs	Native	Perennial
Microseris nutans	Nodding microseris	Native	Perennial
Onopordum acanthium ssp. *acanthium**	Scotch thistle	Non-native	Bien.
Psilocarphus brevissimus	Dwarf wooly-heads	Native	Annual
Senecio canus	Grey groundsel	Native	Perennial
Senecio integerrimus var. *exaltatus*	Western groundsel	Native	Perennial

TABLE 3.4-2
Plant Species Observed During Botanical Surveys of the Analysis Area
*(Taxonomy follows Hickman 1993. An * indicates species is an Oregon Department of Agriculture List B noxious weed.)*

Scientific Name	Common Name	Native/ Non-native	Habit
Senecio integerrimus var. *major*	Lambstongue groundsel	Native	Perennial
Stenotus stenophyllus	Narrow -leaf goldenweed	Native	Annual
Taraxacum officinale	Dandelion	Non-native	Perennial
Tragopogon dubius	Goat's beard	Non-native	Perennial
Wyethia angustifolia	Narrow-leaf mule ears	Native	Perennial
Boraginaceae			
Amsinckia sp.	Fiddleneck	---	---
Cryptantha ambigua	Basin cryptantha	Native	Annual
Cryptantha sp.	Cryptantha	---	---
Hackelia cusickii	Cusicks stickseed	Native	Perennial
Lithospermum ruderale	Stoneseed	Native	Perennial
Plagiobothrys stipitatus	Popcorn flower	Native	Annual
Brassicaceae			
Alyssum alyssoides	Small alyssum	Non-native	Annual
Arabis X*divaricarpa*	Rockcress	Non-native	Perennial
Descurainia sophia	Tansy mustard	Non-native	Annual
Idahoa scapigera	Flat-pod	Native	Annual
Lepidium campestre	Field pepperweed	Non-native	Annual
Lepidium perfoliatum	Clasping pepperweed	Non-native	Annual
Phoenicaulis cheiranthoides	Daggerpod	Native	Perennial
Sisymbrium altissimum	Tumble mustard	Non-native	Annual
Campanulaceae			
Downingia sp.	Downingia	---	---
Caprifoliaceae			
Sambucus mexicana	Blue elderberry	Native	Shrub
Caryophyllaceae			
Arenaria aculeata	Needleleaf sandwort	Native	Perennial
Arenaria congesta var. *congesta*	Ballhead sandwort	Native	Perennial
Silene sp.	Campion	---	---
Chenopodiaceae			
Chenopodium album	Lambs quarters	Non-native	Annual
Salsola tragus	Russian thistle	Non-native	Annual
Convolvulaceae			
*Convolvulus arvensis**	Field bindweed	Non-native	Annual

TABLE 3.4-2
Plant Species Observed During Botanical Surveys of the Analysis Area
*(Taxonomy follows Hickman 1993. An * indicates species is an Oregon Department of Agriculture List B noxious weed.)*

Scientific Name	Common Name	Native/ Non-native	Habit
Cupressaceae			
Juniperus occidentalis	Western juniper	Native	Tree
Cyperaceae			
Carex filifolia	Thread-leaf sedge	Native	Perennial
Carex sp.	Sedge	---	---
Eleocharis macrostachya	Creeping spikerush	Native	Perennial
Scirpus acutus	Tule	Native	Perennial
Dryopteridaceae			
Cystopteris fragilis	Fragile fern	Native	Fern
Euphorbiaceae			
*Euphorbia esula**	Leafy spurge	Non-native	Perennial
Fabaceae			
Astragalus curvicarpus var. *curvicarpus*	Curvepod milkvetch	Native	Perennial
Astragalus filipes	Basalt milkvetch	Native	Perennial
Astragalus purshii	Pursh's milkvetch	Native	Perennial
Lupinus lepidus var. *sellulus*	Prairie lupine	Native	Perennial
Lupinus leucophyllus	Velvet lupine	Native	Perennial
Medicago sativa	Alfalfa	Non-native	Perennial
Melilotus indica	Sour clover	Non-native	Annual
Vicia americana	American vetch	Non-native	Annual
Gentianaceae			
Swertia albicaulis	Whitestem gentian	Native	Perennial
Geraniaceae			
Erodium cicutarium	Storksbill	Non-native	Annual
Grossulariaceae			
Ribes velutinum	Desert gooseberry	Native	Shrub
Hydrophyllaceae			
Hydrophyllum capitatum	Alpine waterleaf	Native	Perennial
Nemophila pedunculata	Meadow nemophila	Native	Annual
Phacelia hastata	Silverleaf phacelia	Native	Perennial
Phacelia heterophylla ssp. *virgata*	Varileaf phacelia	Native	Perennial
Phacelia linearis	Threadleaf phacelia	Native	Annual
Juncaceae			
Juncus balticus	Baltic rush	Native	Perennial

TABLE 3.4-2
Plant Species Observed During Botanical Surveys of the Analysis Area
*(Taxonomy follows Hickman 1993. An * indicates species is an Oregon Department of Agriculture List B noxious weed.)*

Scientific Name	Common Name	Native/ Non-native	Habit
Lamiaceae			
Agastache urticifolia	Nettle-leaved horsemint	Native	Perennial
Marrubium vulgare	Horehound	Non-native	Perennial
Lemnaceae			
Lemna minor	Duckweed	Native	Perennial
Liliaceae			
Calochortus macrocarpus	Sagebrush mariposa lily	Native	Perennial
Fritillaria atropurpurea	Spotted fritillary	Native	Perennial
Smilacina racemosa	Western Solomon’s seal	Native	Perennial
Zigadenus venenosus var. *venenosus*	Death camas	Native	Perennial
Linaceae			
Hesperolinon micranthum	Threadstem flax	Native	Annual
Linum lewisii	Western blue flax	Native	Perennial
Loasaceae			
Mentzelia veatchiana	Veatchs blazingstar	Native	Annual
Malvaceae			
Malva neglecta	Common mallow	Non-native	Perennial
Sidalcea oregana	Oregon checker mallow	Native	Perennial
Onagraceae			
Camissonia tanacetifolia	Tansy-leaved evening primrose	Native	Perennial
Clarkia rhomboidea	Forest clarkia	Native	Annual
Pinaceae			
Pinus ponderosa	Ponderosa pine	Native	Tree
Poaceae			
Achnatherum thurberianum	Thurber’s needlegrass	Native	Perennial
Alopecurus pratensis	Meadow foxtail	Non-native	Perennial
Agropyron desertorum	Desert crested wheatgrass	Non-native	Perennial
Agrostis exarata	Spike bentgrass	Native	Perennial
Beckmannia syzigachne	Slough grass	Native	Annual
Bromus madritensis ssp. *rubens*	Red brome	Non-native	Annual
Bromus tectorum	Cheat grass	Non-native	Annual
Deschampsia danthonioides	Annual hairgrass	Native	Annual
Elymus elymoides	Squirreltail	Native	Perennial
Elytrigia elongata	Tall wheatgrass	Non-native	Perennial

TABLE 3.4-2
Plant Species Observed During Botanical Surveys of the Analysis Area
*(Taxonomy follows Hickman 1993. An * indicates species is an Oregon Department of Agriculture List B noxious weed.)*

Scientific Name	Common Name	Native/ Non-native	Habit
Elytrigia intermedia	Intermediate wheatgrass	Non-native	Perennial
*Elytrigia repens**	Quack grass	Non-native	Perennial
Festuca arundinacea	Tall fescue	Non-native	Perennial
Festuca idahoensis	Idaho fescue	Native	Perennial
Hordeum murinum spp. *leporinum*	Farmers foxtail	Non-native	Annual
Leymus triticoides	Creeping wildrye	Native	Perennial
Poa pratensis	Kentucky bluegrass	Non-native	Perennial
Poa secunda	Bluegrass	Native	Perennial
Polypogon monspeliensis	Annual beardgrass	Non-native	Annual
Pseudoroegneria spicata	Bluebunch wheatgrass	Native	Perennial
Secale cereale	Cereal rye	Non-native	Annual
*Taeniatherum caput-medusae**	Medusa head	Non-native	Annual
Polemoniaceae			
Collomia grandiflora	Mountain collomia	Native	Annual
Ipomopsis aggregata	Scarlet gilia	Native	Perennial
Navarretia leucocephala	White-headed navarretia	Native	Annual
Phlox diffusa	Spreading phlox	Native	Perennial
Polygonaceae			
Eriogonum sphaerocephalum var. *halimioides*	Rock buckwheat	Native	Perennial
Eriogonum umbellatum	Sulfur-flower buckwheat	Native	Perennial
Rumex crispus	Curly dock	Non-native	Perennial
Portulacacaea			
Claytonia perfoliata	Miner’s lettuce	Native	Annual
Potomagetonaceae			
Potamogeton sp.	Pondweed	---	---
Primulaceae			
Dodecatheon conjugens	Shooting star	Native	Perennial
Dodecatheon pulchellum	Dark-throat shooting star		Perennial
Ranunculaceae			
Adonis aestivalis	Summer pheasant’s eye	Non-native	Annual
Delphinium nuttallianum	Dwarf larkspur	Native	Perennial
Myosurus minimus	Mouse-tail	Native	Annual
Ranunculus aquatilus	Aquatic buttercup	Native	Perennial
Ranunculus glaberrimus	Sagebrush buttercup	Native	Perennial

TABLE 3.4-2
Plant Species Observed During Botanical Surveys of the Analysis Area
*(Taxonomy follows Hickman 1993. An * indicates species is an Oregon Department of Agriculture List B noxious weed.)*

Scientific Name	Common Name	Native/ Non-native	Habit
Ranunculus testiculatus	Tubercled crowfoot	Non-native	Annual
Rosaceae			
Amelanchier alnifolia	Service-berry	Native	Shrub
Cercocarpus ledifolius	Mountain mahogany	Native	Perennial
Geum triflorum	Old man’s beard	Native	Perennial
Prunus subcordata	Klamath Plum	Native	Perennial
Purshia tridentata	Antelope bitterbrush	Native	Shrub
Rosa woodsii	Interior rose	Native	Shrub
Rubiaceae			
Galium aparine	Common bedstraw	Native	Annual
Galium sp.	Bedstraw	---	---
Salicaceae			
Populus tremuloides	Quaking aspen	Native	Tree
Saxifragaceae			
Lithophragma parviflorum	Woodland star	Native	Perennial
Scrophulariaceae			
Castilleja linariifolia	Desert paintbrush	Native	Perennial
Collinsia parviflora	Blue-eyed Mary	Native	Annual
Penstemon laetus	Mountain blue penstemon	Native	Perennial
Penstemon rydbergii var. *oreocharis*	Meadow beardtongue	Native	Perennial
Penstemon speciosus	Showy penstemon	Native	Perennial
Verbascum thapsus	Common mullein	Non-native	Perennial
Veronica anagallis-aquatica	Water speedwell	Non-native	Perennial
Veronica peregrina var. *xalapensis*	Purslane speedwell	Native	Annual
Solonaceae			
Nicotiana attenuata	Coyote tobacco	Native	Annual
Typhaceae			
Typha latifolia	Broad-leaved cattail	Native	Perennial
Valerianaceae			
Plectritis brachystemon	Short-spurred plectritis	Native	Annual
Violaceae			
Viola bakeri	Baker’s violet	Native	Perennial

TABLE 3.4-3
Oregon Department of Fish and Wildlife Mitigation Policy Habitat Classification

Habitat Category	Definition	Mitigation Goal
1	Irreplaceable, essential habitat for a fish or wildlife species, population, or a unique assemblage of species and is limited on a physiographic province or site-specific basis, depending on the individual species, population, or unique assemblage	No loss of either habitat quantity or quality
2	Essential habitat for a fish or wildlife species, population, or a unique assemblage of species and is limited on a physiographic province or site-specific basis, depending on the individual species, population, or unique assemblage	If impacts are unavoidable, no net loss of either habitat quantity or quality and to provide a net benefit of habitat quantity or quality
3	Essential habitat for fish and wildlife, or important habitat for fish and wildlife that is limited on a physiographic province or site-specific basis, depending on the individual species or population	No net loss of either habitat quantity or quality
4	Important habitat for fish and wildlife species	No net loss in either existing habitat quantity or quality
5	Habitat for fish and wildlife having high potential to become either essential or important habitat.	If impacts are unavoidable, to provide a net benefit in habitat quantity or quality
6	Habitat that has low potential to become essential or important for fish and wildlife	Minimize impacts

Source: OAR 635-415-0025

TABLE 3.4-4
Wildlife Species Observed During Field Surveys Within the Analysis Area

Common Name	Scientific Name	Observed Habitat*
Birds		
Pied-billed grebe	*Podilymbus podiceps*	WO
American white pelican	*Pelecanus erythrorhynchos*	T, P
Great blue heron	*Ardea herodias*	WO
Sandhill crane	*Grus canadensis*	WO
Green-winged teal	*Anas crecca*	WO
Mallard	*Anas platyrhynchos*	WO, T
Northern shoveler	*Anas clypeata*	WO
American wigeon	*Anas americana*	WO
Bufflehead	*Bucephala albeola*	WO
Common merganser	*Mergus merganser*	WO
Turkey vulture	*Cathartes aura*	P, GP, WO, T
Bald eagle	*Haliaeetus leucocephalus*	WO, P, T, GP
Northern harrier	*Circus cyaneus*	WO, GP, P
Sharp-shinned hawk	*Accipiter striatus*	T
Cooper's hawk	*Accipiter cooperii*	T
Red-tailed hawk	*Buteo jamaicensis*	T, WO, GP, P
Swainson's hawk	*Buteo swainsoni*	WO, T, GP, P
Rough-legged hawk	*Buteo lagopus*	WO, GP, P
California quail	*Callipepla californica*	WO, P
American coot	*Fulica americana*	WO
Killdeer	*Charadrius vociferus*	T, WO, GP, P
Wouldet	*Catoptrophorus semipalmatus*	WO
Common snipe	*Gallinago gallinago*	WO
Gull	*Larus* sp.	WO, P, GP
Forster's tern	*Sterna forsteri*	WO
Rock dove	*Columba livia*	WO, GP
Mourning dove	*Zenaida macroura*	T, GP
Great horned owl	*Bubo virginianus*	T
Common nighthawk	*Chordeiles minor*	T
Anna's hummingbird	*Calypte anna*	T, WO
Calliope hummingbird	*Stellula calliope*	T
Red-breasted sapsucker	*Sphyrapicus ruber*	T
Downy woodpecker	*Picoides pubescens*	T
Northern flicker	*Colaptes auratus*	T, WO, GP, P
Say's phoebe	*Sayornis saya*	T
Ash-throated flycatcher	*Myiarchus cinerascens*	T, WO
Western kingbird	*Tyrannus verticalis*	WO, GP, P, T
Cliff swallow	*Hirundo pyrrhonota*	WO, GP
Steller's jay	*Cyanocitta stelleri*	WO, T, P
Western scrub jay	*Aphelocoma coerulescens*	P, T, WO
Black-billed magpie	*Pica pica*	T, WO, GP, P
American crow	*Corvus brachyrhynchos*	GP
Common raven	*Corvus corax*	WO
Black-capped chickadee	*Parus atricapillus*	T
Mountain chickadee	*Parus gambeli*	P
White-breasted nuthatch	*Sitta carolinensis*	T
Rock wren	*Salpinctes obsoletus*	T
Ruby-crowned kinglet	*Regulus calendula*	T
Western bluebird	*Sialia mexicana*	WO, P
Mountain bluebird	*Sialia currucoides*	T

TABLE 3.4-4
Wildlife Species Observed During Field Surveys Within the Analysis Area

Common Name	Scientific Name	Observed Habitat*
American robin	*Turdus migratorius*	WO, T
Northern mockingbird	*Mimus polyglottos*	WO, P
Loggerhead shrike	*Lanius ludovicianus*	GP
European starling	*Sturnus vulgaris*	WO, P
Warbling vireo	*Vireo gilvus*	WO, P
Yellow-rumped warbler	*Dendroica coronata*	WO
Western tanager	*Piranga ludoviciana*	WO, T
Spotted towhee	*Pipilo maculatus*	T
Lark sparrow	*Chondestes grammacus*	T, WO, P
Song sparrow	*Melospiza melodia*	WO
Golden-crowned sparrow	*Zonotrichia atricapilla*	T, WO, P
White-crowned sparrow	*Zonotrichia leucophrys*	WO
Dark-eyed junco	*Junco hyemalis*	P
Red-winged blackbird	*Agelaius phoeniceus*	WO
Tricolored blackbird	*Agelaius tricolor*	WO
Western meadowlark	*Sturnella neglecta*	WO, T, GP
Yellow-headed blackbird	*Xanthocephalus xanthocephalus*	WO
Brewer's blackbird	*Euphagus cyanocephalus*	WO
Brown-headed cowbird	*Molothrus ater*	WO
Northern oriole	*Icterus galbula*	WO
House finch	*Carpodacus mexicanus*	GP, P, WO, T
Evening grosbeak	*Coccothraustes vespertinus*	WO, T
Mammals		
Pygmy rabbit	*Brachylagus idahoensis*	T
Nuttall's cottontail	*Sylvilagus nuttallii*	T, P, WO, GP
Black-tailed hare	*Lepus californicus*	WO, P
Least chipmunk	*Tamias minimus*.	T, P
Townsend's ground squirrel	*Spermophilus townsendii*	T, P, WO, GP
California ground squirrel	*Spermophilus beecheyi*	T, P, WO, GP
Golden-mantled ground squirrel	*Spermophilus lateralis*	T
Yellow-bellied marmot	*Marmota flaviventris*	WO, P, T
Northern pocket gopher	*Thomomys talpoides*	P
Ord's kangaroo rat	*Dipodomys ordii*	P
Dusky-footed woodrat	*Neotoma fuscipes*	P
Bushy-tailed woodrat	*Neotoma cinerea*	T
Coyote	*Canis latrans*	T, WO, GP, P
Mule deer	*Odocoileus hemionus*	WO, T, GP, P
Pronghorn	*Antilocapra americana*	T, P
Amphibians and Reptiles		
Western fence lizard	*Sceloporus occidentalis*	P, WO, GP, T
Sagebrush lizard	*Sceloporus graciosus*	P, WO, GP, T
Racer	*Coluber constrictor*	T
Garter snake	*Thamnophis elegans*	T
Bullfrog	*Rana catesbeiana*	W

* Linear types in which species were observed during surveys.

GP = natural gas pipeline route
P = Energy Facility site
T = electric transmission line route
WO = water supply pipeline route overland

TABLE 3.4-5
Special-Status Species Potentially Occurring Within the Analysis Area

Species	FWS	BLM	ODFW ODA	ONHP	Habitat Requirements	Potential Occurrence in Analysis Area
Fish						
Interior redband trout *Oncorhynchus mykiss* sp. *O. newberri*	SoC	BT	V	2	Lake dwelling fish, but would move into tributary rivers and streams to spawn	Lost River watershed, no suitable habitat within the survey area.
Klamath large scale sucker *Chasmistes brevirostris*	SoC	BT	--	2	Inhabits riverine systems, known to inhabit both lentic and lotic environments	Lost River watershed, no suitable habitat within the survey area
Pacific lamprey *Lampetra tridentata*	SoC	BT	SV	2	Anadromous, parasitic species with the period of parasitism occurring in the ocean. Live in fresh water habitats where they are burrowing filter feeders.	Lost River watershed, no suitable habitat within the survey area
Reptiles						
Northern sagebrush lizard *Sceloporus graciosus graciosus*	SoC	BT	V	4	Sagebrush-steppe, juniper woodland, and conifer forest habitats in areas with open ground and rocks for basking	Potential sighting of an individual species on northern portion of proposed Energy Facility site
Northwestern pond turtle *Clemmys marmorata marmorata*	SoC	BS	C	1	Quiet waters such as lakes, ponds, marshes, and slow moving creeks	Pond turtles reported in the vicinity of the Lost River; however, none observed within analysis area
Birds						
Bald Eagle *Haliaeetus leucocephalus*	FT				Nests in large, old-growth trees or dominant live trees with open branches. Most nests are within one mile of water. Roosts communally in winter	Foraging throughout the project area
American white pelican *Pelecanus erythrorhynchos*	--	BA	V	2	Inland lakes and wetlands	Suitable habitat in vicinity; observed flying over proposed Facility site; carcass observed east of proposed electric transmission line
Black tern *Chlidonias niger*	SoC	BT	--	4	Emergent vegetation along marshes, rivers, and ponds	Not observed; Suitable habitat present

TABLE 3.4-5
Special-Status Species Potentially Occurring Within the Analysis Area

Species	FWS	BLM	ODFW ODA	ONHP	Habitat Requirements	Potential Occurrence in Analysis Area
Greater sandhill crane *Grus canadensis tabida*	--	BT	V	4	Marshes, wet meadows, grasslands, irrigated pastures	Suitable habitat present, one foraging bird observed east of water pipeline near freshwater marsh
Lewis' woodpecker *Melanerpes lewis*	SoC	BS	V	4	Oak woodlands, ponderosa pine woodlands, cottonwood riparian forests	Not observed; Suitable habitat along the electric transmission line alignment
Mountain quail *Oreortyx pictus*	SoC	BT	U	4	Open forests and woodlands with dense shrubby undergrowth, chaparral, riparian woodlands	Not observed; Suitable habitat present
Northern goshawk *Accipiter gentilis*	SoC	BS	C	2	Conifer forests with dense canopies, possibly in more open ponderosa pine woodlands and quaking aspen groves	Not observed; Marginal habitat present along electric transmission line alignment
Olive-sided flycatcher *Contopus cooperi*	SoC	BT	V	4	Mixed conifer forests, usually with open, uneven canopy layers	Not observed; Limited habitat along the electric transmission line alignment
Tricolored blackbird *Agelaius tricolor*	SoC	BA	P	2	Dense emergent vegetation or in wouldow or other shrubs in and around wetland areas	Potential sightings of individuals approximately 1,200 feet southwest of the Babson well site
Western sage grouse *Centrocercus urophasianus*	SoC	BT	V	1	Sagebrush-steppe	Not observed; suitable habitat present
White-headed woodpecker *Picoides albolarvatus*	SoC	--	C	4	Ponderosa pine and mixed conifer forests	Not observed; Suitable habitat along the electric transmission line alignment
Wouldow flycatcher *Empidonax traillii adastus*	SoC	BT	--	4	Brush thickets along stream and marshes, shrubs along the margins of forests and grasslands in areas close to water	No suitable habitat present
Yellow rail *Coturnicops noveboracensis*	SoC	BS	C	2	Freshwater wetlands, with emergent vegetation, usually in areas surrounded by wouldows	Not observed; Limited habitat present south of water supply alignment

TABLE 3.4-5
Special-Status Species Potentially Occurring Within the Analysis Area

Species	FWS	BLM	ODFW ODA	ONHP	Habitat Requirements	Potential Occurrence in Analysis Area
Mammals						
Fringed myotis *Myotis thysanodes*	SoC	BT	V	2	Sagebrush-grass steppe, oak and pinyon juniper woodlands	Not observed; Suitable habitat present
Long-eared myotis *Myotis evotis*	SoC	BT	U	4	Coniferous forests, does occur in semiarid shrublands, sage, chaparral, agricultural areas	Not observed; Suitable habitat present
Long-legged myotis *Myotis volans*	SoC	BT	U	4	Primarily in coniferous forests, also seasonally in desert habitats	None observed; Suitable habitat present
Pallid bat *Antrozous pallidus*	--	BT	V	3	Arid and semiarid, lowland habitats such as desert scrub, grasslands, and oak woodlands	Not observed; Suitable habitat present
Pronghorn antelope *Antilocapra americana*	--	--		--	Grasslands, sagebrush flats, and shad-scale covered valleys of the central and southeastern part of Oregon. Low sagebrush is an important habitat component.	Observed in analysis area; and along electric transmission line alignment, and on the Energy Facility site
Pygmy rabbit *Brachylagus idahoensis*	SoC	--	V	2	Sagebrush-steppe in areas with deep friable soil	Observed in analysis area; three sightings along the electric transmission line alignment
Silver-haired bat *Lasionycteris noctivagans*	SoC	BT	U	4	Mixed conifer/hardwood forests, in winter and during seasonal migrations in low elevation, more xeric habitats	Not observed; Suitable habitat present
Small-footed myotis *Myotis ciliolabrum*	SoC	BT	U	4	Deserts, chaparral, riparian zones, and western coniferous forest; most common above pinyon-juniper forest	Not observed; Suitable habitat present
Townsend's big-eared bat *Corynorhinus townsendii*	SoC	--	C	2	Sagebrush-grass steppe, agricultural areas, near caves and structures for roosting	Not observed; potential foraging areas is present
Yuma myotis *Myotis yumanensis*	SoC	BT	--	4	Variety of habitats including arid scrublands and deserts, forests	Suitable habitat present; likeliest species to be night roosting near Babson Well

TABLE 3.4-5
Special-Status Species Potentially Occurring Within the Analysis Area

Species	FWS	BLM	ODFW ODA	ONHP	Habitat Requirements	Potential Occurrence in Analysis Area
Invertebrates						
Apatania tavala Cascades apatanian caddisfly	SoC	--	--	4		
California floater (mussel) *Anodonta californiensis*	SoC	BT	--	3	Shallow areas of lakes, reservoirs and streams with sandy or muddy substrates	No suitable habitat present
Cockrell's striated disc (snail) *Discus shimeki cockerelli*	SoC	BT	--	--	Montane environments at elevations between 7,000 and 12,000 feet under rocks and dead wood in a variety of habitat types	No suitable habitat present
Homoplectra schuhi Schuh's homoplectran caddisfly	SoC	--	--	3		
Lake of the Woods pebblesnail and Lost River pebblesnail *Fluminicola sp.*	--	SMA	--	1	Spring fed tributaries in the Klamath watershed, gravelly or cobble substrates	No suitable habitat present
Lost River springsnail *Pyrgulopsis sp.*	--	--	--	1	Cold flowing waters with high dissolved oxygen and gravelly or cobbly substrates	No suitable habitat present
Peaclam *Pisidium ultramontanum*	SoC	BS	--	--	Lakes, rivers and streams lacking dense vegetation with high dissolved oxygen, and sparse macrophytic vegetation, sand/gravel substrates.	No suitable habitat present
Plants						
American pillwort *Pilularia americana*	--	--	--	2	Vernal pools and along the margins of lakes, ponds and reservoirs at elevations below 5,500 feet	Not observed; Some habitat present, known to occur along margins of reservoirs east of analysis area.
Baker's globe mallow *Illiama bakerii*	--	--	--	1	Chaparral, sagebrush and juniper woodland habitats at elevations between 3,000 and 8,500 feet	Not Observed, Suitable habitat present

TABLE 3.4-5
Special-Status Species Potentially Occurring Within the Analysis Area

Species	FWS	BLM	ODFW ODA	ONHP	Habitat Requirements	Potential Occurrence in Analysis Area
Bellinger's meadowfoam *Limnanthes floccossa* ssp. *Bellingeriana*	--	--	C	1	Vernal pools, moist meadows and seeps in open pine-oak woodlands at elevations between 900 and 4,000 feet	Not observed; Limited habitat present
Blue-leaved penstemon *Penstemon glaucinus*	--	--	--	1	High elevation lodgepole and white fir forests	No suitable habitat; All known populations occur on 6400 acres of Federal lands managed by the Fremont NF, Winema NF and the BLM.
Columbia yellowcress *Rorippa columbiae*	--	--	C	1	Along streams, lakes, wet meadows and other seasonally saturated areas at elevations between 4,000 and 6,000 feet	Not observed; Suitable habitat present
Creeping woody rock cress *Arabis suffrutescens var horizontalis*	SoC	--	C	1	Sagebrush scrub, Yellow pine forest and red fir forest at elevations less than 5,000 feet	Not observed; Suitable habitat present
Disappearing monkeyflower *Mimulus evanescens*	SoC	--	C	1	Great basin scrub, lower montane conifer forest, pinyon juniper woodland; gravelly, rocky; vernally moist areas at elevations between 4,000 and 6,000 feet	Not observed; Suitable habitat present
Flaccid sedge *Craex leptalea*	--	--	--	3	Bogs, fens, marshes, swamps, seeps and wet meadows at elevations less than 2,500 feet	Not observed; Limited habitat present; above known elevation range of species
Fringed campion *Silene nuda ssp. Insectivora*	--	--	--	4	Meadows in ponderosa / lodgepole pine forest openings at elevations between 4,000 and 6,000 feet	Meadows in ponderosa / lodgepole pine forest openings
Greene's Mariposa lily *Calachortus greenei*	SoC	--	C	1	Oak woodland, pinyon juniper woodland, coniferous forest, meadows and seeps, volcanic soil, at elevations between 3,000 and 6,500	Not observed; Suitable habitat present
Green-flowered wild ginger *Asarum wagneri*	--	--	C	1	Mixed conifer and lodgepole pine forests at elevations ranging from 4,500 to 8,500 feet	Not observed; Limited habitat present

TABLE 3.4-5
Special-Status Species Potentially Occurring Within the Analysis Area

Species	FWS	BLM	ODFW ODA	ONHP	Habitat Requirements	Potential Occurrence in Analysis Area
Green-tinged paintbrush *Castilleja chlorotica*	--	--	--	1	Dry gravelly slopes, and grassy openings in ponderosa pine or lodgepole pine forests at elevations between 5,000 and 8,200 feet	Not observed; Suitable habitat present
Howell's false caraway *Perideridia howellii*	--	--	--	4	Ponderosa pine, mixed conifer, meadows, along streams and on moist slopes at elevations between 2,000 and 5,000 feet	Not observed; Suitable habitat present
Lady slipper orchid *Cypripedium fasciculatum*	SoC	SMC	C	C/1	Open conifer forest at elevations, generally acidic soil, at elevations between 500 and 7,500 feet	Not observed; Limited habitat present
Least phacelia *Phacelia minutissima*	--	--	C	1	Open, ephemerally moist areas in meadows, sagebrush-steppe, lower montane forests and riparian areas at elevations between 4,000 and 8,000 feet	Not observed; Suitable habitat present
Lemmon's catchfly *Silene lemmonii*	--	--	--	3	Oak woodlands and conifer forests at elevations between 2,800 and 9,000 feet	Not observed; Suitable habitat present
Long-bearded Mariposa lily *Calachortus longebarbatus*	--	--	--	1	Meadows or along the edges of ponderosa pine, lodgepole pine forests and in juniper woodlands at elevations between 4,000 and 6,000 feet	Meadows in ponderosa / lodgepole pine forest openings
Mountain lady's slipper *Cypripedium montanum*	--	SMC	--	4	Mixed conifer forests and woodlands at elevations ranging from 300 to 6,000 feet	Not observed; Suitable habitat present
Mt. Mazama collomia *Collomia mazama*	--	--	--	1	Alpine meadows and on slopes in association with mixed conifer, true fir and lodgepole pine forests, generally on open or disturbed areas at elevations generally above 5,000 feet	No suitable habitat present

TABLE 3.4-5
Special-Status Species Potentially Occurring Within the Analysis Area

Species	FWS	BLM	ODFW ODA	ONHP	Habitat Requirements	Potential Occurrence in Analysis Area
Newberry's gentain *Gentiana newberryi*	--	--	--	2	Vernally wet to dry, subalpine and alpine meadows, along mountain streams at elevations between 5,000 and 12,000 feet	No suitable habitat present
Playa phacelia *Phacelia inundata*	SoC	--	--	1	Sagebrush scrub, yellow pine forests, alkali sinks and playas, on alkaline soil 4,500 to 6,000 feet.	Not observed; Limited habitat present
Profuse –flowered mensa mint *Pogogyne floribunda*	SoC	--	--	1	Vernal pools, seasonal lakes and intermittent drainages at elevations between 3,200 and 5,000 feet	Not observed; limited habitat present
Prostrate buckwheat *Erigonum procidum*	SoC	--	C	1	Dry, rocky slopes, and flats within juniper-sagebrush and Jeffery pine woodlands at elevations between 4,000 and 8,500 feet	Not observed; Suitable habitat present
Rafinesque's pondweed *Potamogeton diversifolius*	--	--	--	2	Ponds, streams and reservoirs below 8,000 feet	Not observed; Limited habitat present
Red-root yampah *Perideridia erythrorhiza*	SoC	--	C	1	Meadows, pastures, and open areas in pine-oak woodlands at elevations less than 5,000 feet	Not observed; Suitable habitat present
Salt heliotrope *Heliotropum curvassavicum*	--	--	--	3	Many different plant communities at elevations less than 7,000 feet, but is generally associated with saline soil	Not observed; Suitable habitat present
Shockley's ivisia *Ivesia shockleyi*	--	--	--	2	Open gravelly, rocky areas associated with subalpine fir and pine forests, at elevations between 9,000 and 13,000 feet	No suitable habitat present
Short-podded thelypody *Thelypodium brachycarpum*	--	--	--	2	Irrigated pasture, sagebrush shrub, pond and stream edges; adjacent to ponderosa pine forests; alkali soil at elevations between 3,000 and 6,500 feet	Not observed; Suitable habitat present

TABLE 3.4-5
Special-Status Species Potentially Occurring Within the Analysis Area

Species	FWS	BLM	ODFW ODA	ONHP	Habitat Requirements	Potential Occurrence in Analysis Area
Slender bulrush *Scirpus heterochaetus*	--	--	--	3	Marshes, swamps and around lake edges, in lower montane conifer forests at elevations around 5,000 feet	Not observed; Limited habitat present
Tricolor monkeyflower *Mimulus tricolor*	--	--	--	2	Moist flats on wet clay soil and in vernal pools within woodlands and grasslands, at elevations less than 5,000 feet	Not observed; Limited habitat present
Warner Mountain bedstraw *Gallium serpenticum* var. *warnerense*	--	--	--	2	Meadows and seeps, pinyon / juniper woodland, conifer forest and rocky talus at elevations between 4,500 and 9,000 feet	Not observed; Suitable habitat present

United States Fish and Wildlife Service (FWS)
SoC Federal Species of Concern

Bureau of Land Management, Klamath Falls Resource Area Special Status Species (BLM)
BA Bureau Tracking Species
BS Bureau Assessment Species
BS Bureau Sensitive Species
SMA Survey and Manage Category A Species
SMB Survey and Manage Category B Species
SMC Survey and Manage Category C Species

Oregon Department of Fish and Wildlife (ODFW) / Oregon Department of Agriculture (ODA)
C Candidate for state listing as threatened or endangered
V Vulnerable species for which listing as threatened or endangered is not believed to be imminent
U Undetermined status; more information is needed to determine the conservation status of the species
P Peripheral or naturally rare species, species on the edge of their natural range in Oregon, or have naturally low populations within the state

Oregon Natural Heritage Program (ONHP)
1 Taxa that are threatened or endangered throughout their range
2 Taxa that are threatened or endangered in Oregon, but more secure elsewhere
3 Review list, taxa for which more information is needed to determine the conservation status
4 Species that are of conservation concern, but are not currently threatened or endangered

TABLE 3.4-6
Threatened, Endangered, and Candidate Species Known or Suspected to Occur in the Analysis Area

Species	USFWS Status	ODFW Status	Available Habitat in the Analysis Area	Detected in Analysis Area
Bald Eagle (*Haliaeetus leucocephalus*)	T, AD	T	Yes, foraging habitat	Yes, observed throughout the Energy Facility site and its associated linear facilities.
Shortnose Sucker (*Chasmistes brevirostris*)	E	E	No*	No
Lost River Sucker (*Deltistes luxatus*)	E	E	No*	No
Gentner's Fritillaria (*Fritillaria gentneri*)	E	E	No	No
Peck's Milk-Vetch (*Astragalus peckii*)	SoC	T	Yes	No
Applegate's Milk-Vetch (*Astragalus applegatei*)	E	E	No	No
Pumice Grape Fern (*Botrychium pumicola*)	T	T	No	No
Oregon Spotted Frog (*Rana pretiosa*)	C	SC	No	No

AD=candidate for delisting, C=candidate for listing, E=endangered, SC=critical species, SoC=species of concern, T=threatened

ODFW=Oregon Department of Fish and Wildlife
USFWS=U.S. Fish and Wildlife Service

*Species may occur in the Lost River watershed, which is in the proximity of the analysis area.

TABLE 3.4-7
Wetland Features in the Analysis Area

Wetland	Classification*	Description	Location	Area of Impact
Lost River	R2ABH	Regulated riverine habitat, flow controlled by Clear Lake Dam	Approximately 1.3 miles north of proposed Energy Facility site, and 900 feet east of Babson well site	None
Freshwater Marsh	PEMF/PEMC	Cattails, bulrush, and open water habitat	Approximately 900 feet south of water supply pipeline, on the west side of East Langell Valley Road	None
Seasonal Wetland	PEMF	Shallow, seasonally flooded depression. Vegetation characterized by sedges and rushes.	Approximately 200 feet west of electric transmission line easement, approximately 2 miles south of proposed Energy Facility site	None
Seasonal Creek #1	None	Narrow, cobbly drainage channel. Vegetation characterized by Sandberg's bluegrass.	Just south of where the northern portion of the electric transmission route turns south	0.003 acre
Wright Creek	PEMA	Shallow channel, characterized by sedges, rushes, and moss	Approximately 1.7 miles southwest of the Energy Facility along the electric transmission line route	0.01 acre
Seasonal Creek #3	PABHh (stock pond only)	Narrow shallow drainage and associated stock pond, no wetland plants	Approximately 4 south of the Energy Facility site on the east side of existing natural gas pipeline easement	0.003 acre
Seasonal Creek #4	PEMCx	Realigned seasonal creek, now used for agricultural drainage	Along natural gas pipeline, approximately 0.3 mile from West Langell Valley Road, in alfalfa fields	None
Seasonal Creek #5	PEMC	Dry creek channel, lacking vegetation	Approximately 200 feet west of natural gas pipeline at PG&E GTN compressor station	None
Agricultural Canal #1	NA	Agricultural drainage canal, along edge of pasture	On adjacent property at southeast end of the proposed Energy Facility site	None
Agricultural Canal #2	NA	Lateral irrigation canal within pastureland	Approximately 25 feet north of natural gas pipeline, near Babson well	None
Agricultural Canal #3	R4SBFx	Water conveyance canal	Approximately 450 feet east of East Langell Valley Road along water supply pipeline	None
Agricultural Canal #4	NA	Two to 3 inches of water present, some grasses and sedges within channel	Within irrigated pasture, approximately 0.5 mile east of Teare Lane	None

TABLE 3.4-7
Wetland Features in the Analysis Area

Wetland	Classification*	Description	Location	Area of Impact
Agricultural Canal #5	R2ABFx	Dry earthen ditch, no vegetation observed	Within irrigated pasture, approximately 0.5 mile east of Teare Lane and 100 feet south of water supply pipeline	None
Agricultural Canal #6	NA	Few inches of ponded water at west end, lacking vegetation	South side of Harpold Road, at north end of alfalfa field, south of natural gas pipeline	None

* National Wetland Inventory (NWI) Abbreviations (Cowardin et al., 1979)

PABHh—Palustrine, Aquatic Bed, Permanently Flooded, Impounded
PEMF—Palustrine Emergent, Semipermanently Flooded
PEMC—Palustrine Emergent, Seasonally Flooded
PEMCx—Palustrine Emergent, Seasonally Flooded, Excavated
R2ABFx—Riverine, Lower Perennial, Aquatic Bed, Semipermanently Flooded, Excavated
R2ABH—Riverine, Lower Perennial, Aquatic Bed, Permanently Flooded
R4SBFx—Riverine, Streambed, Semipermanently Flooded, Excavated

TABLE 3.4-8
Summary of Potential Impacts and Proposed Mitigation for Special-Status Species Potentially Occurring Within the Analysis Area

Species	USFWS	ODFW/ ONHP	Habitat Requirements	Potential Occurrence in Analysis Area	Potential Impacts	Proposed Mitigation
Fish	**Potential Impacts**			**Proposed Mitigation**		
	Construction of new access roads along the transmission line corridor would result in less than 0.5 acre of impact to intermittent creeks.			Construction during the dry season is recommended as a mitigation measure to avoid the presence of fish and minimize erosion and sedimentation. Culverts would be installed to ensure the uninterrupted flow of water through the channel.		
Interior redband trout *Oncorhynchus mykiss* sp. *O. newberrii*	SoC	V/2	Lake dwelling fish, but would move into tributary rivers and streams to spawn	No suitable habitat present	No impacts	No mitigation
Klamath large scale sucker *Chasmistes brevirostris*	SoC	--/2	Inhabits riverine systems, known to inhabit both lentic and lotic environments	No suitable habitat present	No impacts	No mitigation
Pacific lamprey *Lampetra tridentata*	SoC	SV/2	Anadromous, parasitic species with the period of parasitism occurring in the ocean. Live in fresh water habitats where they are burrowing filter feeders.	No suitable habitat present	No impacts	No mitigation
Wildlife	**Potential Impacts**			**Proposed Mitigation**		
	Construction and operation of the proposed Energy Facility could cause a temporary or permanent loss of vegetation and wildlife habitat. Construction and operation of the proposed Energy Facility would cause noise and lighting that could disturb wildlife. Bald eagles and other birds could be injured or killed by collisions with power lines. Construction and operation of the proposed Energy Facility would disturb wetlands.			To the extent practicable, the facilities would be located in disturbed areas or in areas with minimal habitat value. Mitigation measures would be implemented during construction to the minimum extent of area needed for practical and safe working areas, to identify off-limits area, and revegetate disturbed areas. Workers would receive training regarding wildlife and habitat and safe vehicle speeds. Where feasible, construction would be limited in natural areas during the breeding period of deer and antelope (April-September), as well as the nesting period of raptors (May –September). Low-impact directional lighting would be used to reduce ambient light into adjacent areas. Flight diverters would be installed on the top shield wires. Facility water sources (a potential draw for waterfowl) would be designed to discourage avian use. Towers would be designed and constructed so that it would be physically impossible for a bird's wings to bridge any space that would result in the conduction of current. Directional boring techniques and a minimum amount of fill would be used to avoid impacts to wetlands. Erosion control measures would be implemented to protect wetlands and existing grades and drainages would be preserved (including culverts under roadways).		

TABLE 3.4-8
Summary of Potential Impacts and Proposed Mitigation for Special-Status Species Potentially Occurring Within the Analysis Area

Species	USFWS	ODFW/ ONHP	Habitat Requirements	Potential Occurrence in Analysis Area	Potential Impacts	Proposed Mitigation
Reptiles						
Northern sagebrush lizard *Sceloporus graciosus graciosus*	SoC	V/4	Sagebrush-steppe, juniper woodland, and conifer forest habitats in areas with open ground and rocks for basking	Observed on northern portion of proposed Energy Facility site	Possible disturbance by noise and/or lighting Temporary and/or permanent loss of habitat	Low-impact directional lighting would be used to reduce ambient light into adjacent areas. To the extent practicable, the facilities would be located in disturbed areas or in areas with minimal habitat value. Mitigation measures would be implemented, such as re-planting sagebrush in areas vegetation removed.
Northwestern pond turtle *Clemmys marmorata marmorata*	SoC	C/1	Quiet waters such as lakes, ponds, marshes, and slow moving creeks	Pond turtles observed in the vicinity of the Lost River; however, none observed within analysis area	Possible disturbance by noise and/or lighting	Low-impact directional lighting would be used to reduce ambient light into adjacent areas.
Birds						
American white pelican *Pelecanus erythrorhynchos*	--	V/2	Inland lakes and wetlands	Suitable habitat in vicinity; observed flying over proposed Facility site; carcass observed east of proposed electric transmission line	Temporary and/or permanent loss of habitat. Possible disturbance by noise and/or lighting. Could be injured or killed by collisions with power lines.	To the extent practicable, the facilities would be located in disturbed areas or in areas with minimal habitat value. Mitigation measures including restoration would be implemented. Low-impact directional lighting would be used to reduce ambient light into adjacent areas. Facility water sources (a potential draw for waterfowl) would be designed to discourage avian use. Bird flight diverters would be added to the top ground wires of the transmission line.
Bald eagle *Haliaeetus leucocephalus*	FT		Nests in large, old-growth trees or dominant live trees with open branches. Most nests are within one mile of water. Roosts communally in winter	Known to occur in the analysis area and suitable nesting habitat was identified within the ponderosa pine (Pinus ponderosa) habitat for a 1.3-mile section of the electric transmission line approximately 2 miles north of the Captain Jack Substation. No nests	Temporary and/or permanent loss of habitat. Possible disturbance by noise and/or lighting Could be injured or killed by collisions with power lines.	To the extent practicable, the facilities would be located in disturbed areas or in areas with minimal habitat value. Mitigation measures including restoration would be implemented. Where feasible, construction would be limited in natural areas during the nesting period of raptors (May –September). Low-impact directional lighting would be used to reduce ambient light into adjacent areas. Bird flight diverters would be added to the top

TABLE 3.4-8
Summary of Potential Impacts and Proposed Mitigation for Special-Status Species Potentially Occurring Within the Analysis Area

Species	USFWS	ODFW/ ONHP	Habitat Requirements	Potential Occurrence in Analysis Area	Potential Impacts	Proposed Mitigation
				were observed during surveys conducted in 2002.		ground wires of the transmission line.
Black tern *Chlidonias niger*	SoC	--/4	Emergent vegetation along marshes, rivers, and ponds	Not observed; Suitable habitat present	No impacts	No mitigation
Greater sandhill crane *Grus canadensis tabida*	--	V/4	Marshes, wet meadows, grasslands, irrigated pastures	Suitable habitat present, one foraging bird observed east of water pipeline near freshwater marsh	Possible disturbance by noise and/or lighting Temporary and/or permanent loss of habitat. Could be injured or killed by collisions with power lines.	To the extent practicable, the facilities would be located in disturbed areas or in areas with minimal habitat value. Mitigation measures including restoration would be implemented. Low-impact directional lighting would be used to reduce ambient light into adjacent areas. Bird flight diverters would be added to the top ground wires of the transmission line.
Lewis' woodpecker *Melanerpes lewis*	SoC	V/4	Oak woodlands, ponderosa pine woodlands, cottonwood riparian forests	Not observed; Suitable habitat along the electric transmission line alignment	Possible disturbance by noise and/or lighting Temporary and/or permanent loss of habitat. Could be injured or killed by collisions with power lines.	To the extent practicable, the facilities would be located in disturbed areas or in areas with minimal habitat value. Mitigation measures including restoration would be implemented. Low-impact directional lighting would be used to reduce ambient light into adjacent areas. Risk of collisions by songbirds are considered to be low due to maneuverability and flight behavior. Bird flight diverters would be added to the top ground wires of the transmission line.
Mountain quail *Oreortyx pictus*	SoC	U/4	Open forests and woodlands with dense shrubby undergrowth, chaparral, riparian woodlands	Not observed; Suitable habitat present	Possible disturbance by noise and/or lighting Temporary and/or permanent loss of habitat.	To the extent practicable, the facilities would be located in disturbed areas or in areas with minimal habitat value. Mitigation measures including restoration would be implemented. Low-impact directional lighting would be used to reduce ambient light into adjacent areas.
Northern goshawk *Accipiter gentilis*	SoC	C/2	Conifer forests with dense canopies, possibly in more open ponderosa pine woodlands and	Not observed; Marginal habitat present along electric transmission line	Possible disturbance by noise and/or lighting Temporary and/or permanent loss of habitat.	To the extent practicable, the facilities would be located in disturbed areas or in areas with minimal habitat value. Mitigation measures including restoration would be implemented.

TABLE 3.4-8
Summary of Potential Impacts and Proposed Mitigation for Special-Status Species Potentially Occurring Within the Analysis Area

Species	USFWS	ODFW/ ONHP	Habitat Requirements	Potential Occurrence in Analysis Area	Potential Impacts	Proposed Mitigation
			quaking aspen groves	alignment	Could be injured or killed by collisions with power lines.	Where feasible, construction would be limited in natural areas during the nesting period of raptors (May –September). Low-impact directional lighting would be used to reduce ambient light into adjacent areas. Risk of collisions by raptors with lines are considered to be low due to maneuverability and flight behavior. Bird flight diverters would be added to the top ground wires of the transmission line.
Olive-sided flycatcher *Contopus cooperi*	SoC	V/4	Mixed conifer forests, usually with open, uneven canopy layers	Not observed; Limited habitat along the electric transmission line alignment	Possible disturbance by noise and/or lighting Temporary and/or permanent loss of habitat. Could be injured or killed by collisions with power lines.	To the extent practicable, the facilities would be located in disturbed areas or in areas with minimal habitat value. Mitigation measures including restoration would be implemented. Low-impact directional lighting would be used to reduce ambient light into adjacent areas. Risk of collisions by songbirds are considered to be low due to maneuverability and flight behavior. Bird flight diverters would be added to the top ground wires of the transmission line.
Tricolored blackbird *Agelaius tricolor*	SoC	P/2	Dense emergent vegetation or in willow or other shrubs in and around wetland areas	Observed approximately 1,200 feet southwest of the Babson well site	Possible disturbance by noise and/or lighting Temporary and/or permanent loss of habitat. Could be injured or killed by collisions with power lines.	Low-impact directional lighting would be used to reduce ambient light into adjacent areas. Risk of collisions by songbirds are considered to be low due to maneuverability and flight behavior. Bird flight diverters would be added to the top ground wires of the transmission line.
Western sage grouse *Centrocercus urophasianus*	SoC	V/1	Sagebrush-steppe	Not observed; suitable habitat present	Possible disturbance by noise and/or lighting Temporary and/or permanent loss of habitat.	To the extent practicable, the facilities would be located in disturbed areas or in areas with minimal habitat value. Mitigation measures including restoration would be implemented. Low-impact directional lighting would be used to reduce ambient light into adjacent areas.
White-headed	SoC	C/4	Ponderosa pine and	Not observed;	Possible disturbance by	To the extent practicable, the facilities would be

TABLE 3.4-8
Summary of Potential Impacts and Proposed Mitigation for Special-Status Species Potentially Occurring Within the Analysis Area

Species	USFWS	ODFW/ ONHP	Habitat Requirements	Potential Occurrence in Analysis Area	Potential Impacts	Proposed Mitigation
woodpecker *Picoides albolarvatus*			mixed conifer forests	Suitable habitat along the electric transmission line alignment	noise and/or lighting Temporary and/or permanent loss of habitat. Could be injured or killed by collisions with power lines.	located in disturbed areas or in areas with minimal habitat value. Mitigation measures including restoration would be implemented. Low-impact directional lighting would be used to reduce ambient light into adjacent areas. Risk of collisions by songbirds are considered to be low due to maneuverability and flight behavior. Bird flight diverters would be added to the top ground wires of the transmission line.
Willow flycatcher *Empidonax trailli adastus*	SoC	--/4	Brush thickets along stream and marshes, shrubs along the margins of forests and grasslands in areas close to water	No suitable habitat present	No impacts	No mitigation
Yellow rail *Coturnicops noveboracensis*	SoC	C/2	Freshwater wetlands, with emergent vegetation, usually in areas surrounded by willows	Not observed; Limited habitat present south of water supply alignment	Possible disturbance by noise and/or lighting Temporary and/or permanent loss of habitat.	To the extent practicable, the facilities would be located in disturbed areas or in areas with minimal habitat value. Mitigation measures including restoration would be implemented. Low-impact directional lighting would be used to reduce ambient light into adjacent areas.
Mammals						
Fringed myotis *Myotis thysanodes*	SoC	V/2	Sagebrush-grass steppe, oak and pinyon juniper woodlands	Not observed; Suitable habitat present	Possible disturbance by noise and/or lighting Temporary and/or permanent loss of habitat.	To the extent practicable, the facilities would be located in disturbed areas or in areas with minimal habitat value. Mitigation measures including restoration would be implemented. Low-impact directional lighting would be used to reduce ambient light into adjacent areas.
Long-eared myotis *Myotis evotis*	SoC	U/4	Coniferous forests, does occur in semiarid shrublands, sage, chaparral, agricultural areas	Not observed; Suitable habitat present	Possible disturbance by noise and/or lighting Temporary and/or permanent loss of habitat.	To the extent practicable, the facilities would be located in disturbed areas or in areas with minimal habitat value. Mitigation measures including restoration would be implemented. Low-impact directional lighting would be used to reduce ambient light into adjacent areas.
Long-legged myotis	SoC	U/4	Primarily in coniferous	None observed;	Possible disturbance by	To the extent practicable, the facilities would be

TABLE 3.4-8
Summary of Potential Impacts and Proposed Mitigation for Special-Status Species Potentially Occurring Within the Analysis Area

Species	USFWS	ODFW/ ONHP	Habitat Requirements	Potential Occurrence in Analysis Area	Potential Impacts	Proposed Mitigation
Myotis volans			forests, also seasonally in desert habitats	Suitable habitat present	noise and/or lighting Temporary and/or permanent loss of habitat.	located in disturbed areas or in areas with minimal habitat value. Mitigation measures including restoration would be implemented. Low-impact directional lighting would be used to reduce ambient light into adjacent areas.
Mule deer *Odocoileus hemionus*	--	--	Early and intermediate successional stages of most forest, woodland, and brush habitats. Prefers mosaic of various-aged vegetation.	Mapped by Klamath County as high-density mule deer winter range	Possible disturbance by noise and/or lighting Permanent loss of wintering range	To the extent practicable, the facilities would be located in disturbed areas or in areas with minimal habitat value. Mitigation measures including restoration would be implemented. Where feasible, construction would be limited in natural areas during the breeding period of deer and antelope (April-September). Low-impact directional lighting would be used to reduce ambient light into adjacent areas.
Pallid bat *Antrozous pallidus*	--	V/3	Arid and semiarid, lowland habitats such as desert scrub, grasslands, and oak woodlands	Not observed; Suitable habitat present	Possible disturbance by noise and/or lighting Temporary and/or permanent loss of habitat.	To the extent practicable, the facilities would be located in disturbed areas or in areas with minimal habitat value. Mitigation measures including restoration would be implemented. Low-impact directional lighting would be used to reduce ambient light into adjacent areas.
Pronghorn *Antilocapra americana*	--	--	Grasslands, sagebrush flats, and shad-scale covered valleys of the central and southeastern part of Oregon. Low sagebrush is an important habitat component.	Observed in analysis area; and along electric transmission line alignment, and on the Energy Facility site	Possible disturbance by noise and/or lighting Temporary and/or permanent loss of habitat.	To the extent practicable, the facilities would be located in disturbed areas or in areas with minimal habitat value. Mitigation measures including restoration would be implemented. Where feasible, construction would be limited in natural areas during the breeding period of deer and antelope (April-September). Low-impact directional lighting would be used to reduce ambient light into adjacent areas.
Pygmy rabbit *Brachylagus idahoensis*	SoC	V/2	Sagebrush-steppe in areas with deep friable soil	Observed in analysis area; three sightings along the electric transmission line alignment	Possible disturbance by noise and/or lighting Temporary and/or permanent loss of habitat.	To the extent practicable, the facilities would be located in disturbed areas or in areas with minimal habitat value. Mitigation measures including restoration would be implemented. Low-impact directional lighting would be used to reduce ambient light into adjacent areas.

TABLE 3.4-8
Summary of Potential Impacts and Proposed Mitigation for Special-Status Species Potentially Occurring Within the Analysis Area

Species	USFWS	ODFW/ ONHP	Habitat Requirements	Potential Occurrence in Analysis Area	Potential Impacts	Proposed Mitigation
Silver-haired bat *Lasionycteris noctivagans*	SoC	U/4	Mixed conifer/hardwood forests, in winter and during seasonal migrations in low elevation, more xeric habitats	Not observed; Suitable habitat present	Possible disturbance by noise and/or lighting Temporary and/or permanent loss of habitat.	To the extent practicable, the facilities would be located in disturbed areas or in areas with minimal habitat value. Mitigation measures including restoration would be implemented. Low-impact directional lighting would be used to reduce ambient light into adjacent areas.
Small-footed myotis *Myotis ciliolabrum*	SoC	U/4	Deserts, chaparral, riparian zones, and western coniferous forest; most common above pinyon-juniper forest	Not observed; Suitable habitat present	Possible disturbance by noise and/or lighting Temporary and/or permanent loss of habitat.	To the extent practicable, the facilities would be located in disturbed areas or in areas with minimal habitat value. Mitigation measures including restoration would be implemented. Low-impact directional lighting would be used to reduce ambient light into adjacent areas.
Townsend's big-eared bat *Corynorhinus townsendii*	SoC	C/2	Sagebrush-grass steppe, agricultural areas, near caves and structures for roosting	Not observed; potential foraging areas present	Possible disturbance by noise and/or lighting Temporary and/or permanent loss of foraging habitat.	To the extent practicable, the facilities would be located in disturbed areas or in areas with minimal habitat value. Mitigation measures including restoration would be implemented. Low-impact directional lighting would be used to reduce ambient light into adjacent areas.
Yuma myotis *Myotis yumanensis*	SoC	--/4	Variety of habitats including arid scrublands and deserts, forests	Suitable habitat present; likeliest species to be night roosting near Babson Well	Possible disturbance by noise and/or lighting Temporary and/or permanent loss of habitat.	To the extent practicable, the facilities would be located in disturbed areas or in areas with minimal habitat value. Mitigation measures including restoration would be implemented. Low-impact directional lighting would be used to reduce ambient light into adjacent areas.
Invertebrates						
California floater (mussel) *Anodonta californiensis*	SoC	--/3	Shallow areas of lakes, reservoirs and streams with sandy or muddy substrates	No suitable habitat present	No impacts	No mitigation
Cockerell's striated disc (snail) *Discus shimeki cockerelli*	SoC	--/--	Montane environments at elevations between 7,000 and 12,000 feet under rocks and dead wood in a variety of habitat types	No suitable habitat present	No impacts	No mitigation

TABLE 3.4-8
Summary of Potential Impacts and Proposed Mitigation for Special-Status Species Potentially Occurring Within the Analysis Area

Species	USFWS	ODFW/ ONHP	Habitat Requirements	Potential Occurrence in Analysis Area	Potential Impacts	Proposed Mitigation
Lake of the Woods pebblesnail and Lost River pebblesnail *Fluminicola sp.*	--	--/1	Spring fed tributaries in the Klamath watershed, gravelly or cobble substrates	No suitable habitat present	No impacts	No mitigation
Lost River springsnail *Pyrgulopsis sp.*	--	--/1	Cold flowing waters with high dissolved oxygen and gravelly or cobbly substrates	No suitable habitat present	No impacts	No mitigation
Peaclam *Pisidium ultramontanum*	SoC	--/--	Lakes, rivers and streams lacking dense vegetation with high dissolved oxygen, and sparse macrophytic vegetation, sand/gravel substrates.	No suitable habitat present	No impacts	No mitigation
Plants	**Potential Impacts**			**Proposed Mitigation**		
	Construction and operation of the proposed Energy Facility would disturb soil, existing vegetation, and a very small area of wetlands.			Mitigation measures would be implemented during construction to the minimum extent of area needed for practical and safe working areas, to identify off-limits area, and revegetate disturbed areas. Workers would receive training regarding wildlife and habitat and safe vehicle speeds. Directional boring techniques and a minimum amount of fill would be used to avoid impacts to wetlands.		
American pillwort *Pilularia americana*	--	--/2	Vernal pools and along the margins of lakes, ponds and reservoirs at elevations below 5,500 feet	Not observed; Some habitat present, known to occur along margins of reservoirs east of analysis area.	Possible harm from construction of Facility features	To the extent practicable, the facilities would be located in disturbed areas or in areas with minimal habitat value. Mitigation measures including restoration would be implemented.
Baker's globe mallow *Illiama bakerii*	--	--/1	Chaparral, sagebrush and juniper woodland habitats at elevations between 3,000 and 8,500 feet	Not Observed, Suitable habitat present	Possible harm from construction of Facility features	To the extent practicable, the facilities would be located in disturbed areas or in areas with minimal habitat value. Mitigation measures including restoration would be implemented.
Bellinger's meadowfoam *Limnanthes floccossa* ssp. *bellingeriana*	--	C/1	Vernal pools, moist meadows and seeps in open pine-oak woodlands at elevations between 900 and 4,000 feet	Not observed; Limited habitat present	Possible harm from construction of Facility features	To the extent practicable, the facilities would be located in disturbed areas or in areas with minimal habitat value. Mitigation measures including restoration would be implemented.

TABLE 3.4-8
Summary of Potential Impacts and Proposed Mitigation for Special-Status Species Potentially Occurring Within the Analysis Area

Species	USFWS	ODFW/ ONHP	Habitat Requirements	Potential Occurrence in Analysis Area	Potential Impacts	Proposed Mitigation
Blue-leaved penstemon *Penstemon glaucinus*	--	--/1	High elevation lodgepole and white fir forests	No suitable habitat; All known populations occur on 6400 acres of Federal lands managed by the Fremont NF, Winema NF and the BLM.	No impacts	No mitigation
Columbia yellowcress *Rorippa columbiae*	--	C/1	Along streams, lakes, wet meadows and other seasonally saturated areas at elevations between 4,000 and 6,000 feet	Not observed; Suitable habitat present	Possible harm from construction of Facility features	To the extent practicable, the facilities would be located in disturbed areas or in areas with minimal habitat value. Mitigation measures including restoration would be implemented.
Creeping woody rock cress *Arabis suffrutescens var horizontalis*	SoC	C/1	Sagebrush scrub, Yellow pine forest and red fir forest at elevations less than 5,000 feet	Not observed; Suitable habitat present	Possible harm from construction of Facility features	To the extent practicable, the facilities would be located in disturbed areas or in areas with minimal habitat value. Mitigation measures including restoration would be implemented.
Disappearing monkeyflower *Mimulus evanescens*	SoC	C/1	Great basin scrub, lower montane conifer forest, pinyon juniper woodland; gravelly, rocky; vernally moist areas at elevations between 4,000 and 6,000 feet	Not observed; Suitable habitat present	Possible harm from construction of Facility features	To the extent practicable, the facilities would be located in disturbed areas or in areas with minimal habitat value. Mitigation measures including restoration would be implemented.
Flaccid sedge *Craex leptalea*	--	--/3	Bogs, fens, marshes, swamps, seeps and wet meadows at elevations less than 2,500 feet	Not observed; Limited habitat present; above known elevation range of species	Possible harm from construction of Facility features	To the extent practicable, the facilities would be located in disturbed areas or in areas with minimal habitat value. Mitigation measures including restoration would be implemented.
Fringed campion *Silene nuda ssp. insectivora*	--	--/4	Meadows in ponderosa/ lodgepole pine forest openings at elevations between 4,000 and 6,000 feet	Meadows in ponderosa/ lodgepole pine forest openings	Possible harm from construction of Facility features	To the extent practicable, the facilities would be located in disturbed areas or in areas with minimal habitat value. Mitigation measures including restoration would be implemented.
Greene's Mariposa lily *Calachortus greenei*	SoC	C/1	Oak woodland, pinyon juniper woodland, conif-erous forest, meadows	Not observed; Suitable habitat present	Possible harm from construction of Facility features	To the extent practicable, the facilities would be located in disturbed areas or in areas with minimal habitat value. Mitigation measures

TABLE 3.4-8
Summary of Potential Impacts and Proposed Mitigation for Special-Status Species Potentially Occurring Within the Analysis Area

Species	USFWS	ODFW/ ONHP	Habitat Requirements	Potential Occurrence in Analysis Area	Potential Impacts	Proposed Mitigation
			and seeps, volcanic soil, at elevations between 3,000 and 6,500			including restoration would be implemented.
Green-flowered wild ginger *Asarum wagneri*	--	C/1	Mixed conifer and lodgepole pine forests at elevations ranging from 4,500 to 8,500 feet	Not observed; Limited habitat present	Possible harm from construction of Facility features	To the extent practicable, the facilities would be located in disturbed areas or in areas with minimal habitat value. Mitigation measures including restoration would be implemented.
Green-tinged paintbrush *Castilleja chlorotica*	--	--/1	Dry gravelly slopes, and grassy openings in pon-derosa pine or lodgepole pine forests at elevations between 5,000 and 8,200 feet	Not observed; Suitable habitat present	Possible harm from construction of Facility features	To the extent practicable, the facilities would be located in disturbed areas or in areas with minimal habitat value. Mitigation measures including restoration would be implemented.
Howell's false caraway *Perideridia howellii*	--	--/4	Ponderosa pine, mixed conifer, meadows, along streams and on moist slopes at elevations between 2,000 and 5,000 feet	Not observed; Suitable habitat present	Possible harm from construction of Facility features	To the extent practicable, the facilities would be located in disturbed areas or in areas with minimal habitat value. Mitigation measures including restoration would be implemented.
Lady slipper orchid *Cypripedium fasciculatum*	SoC	C/1	Open conifer forest at elevations, generally acidic soil, at elevations between 500 and 7,500 feet	Not observed; Limited habitat present	Possible harm from construction of Facility features	To the extent practicable, the facilities would be located in disturbed areas or in areas with minimal habitat value. Mitigation measures including restoration would be implemented.
Least phacelia *Phacelia minutissima*	--	C/1	Open, ephemerally moist areas in meadows, sagebrush-steppe, lower montane forests and riparian areas at elevations between 4,000 and 8,000 feet	Not observed; Suitable habitat present	Possible harm from construction of Facility features	To the extent practicable, the facilities would be located in disturbed areas or in areas with minimal habitat value. Mitigation measures including restoration would be implemented.
Lemmon's catchfly *Silene lemmonii*	--	--/3	Oak woodlands and conifer forests at elevations between 2,800 and 9,000 feet	Not observed; Suitable habitat present	Possible harm from construction of Facility features	To the extent practicable, the facilities would be located in disturbed areas or in areas with minimal habitat value. Mitigation measures including restoration would be implemented.
Long-bearded	--	--/1	Meadows or along the	Meadows in ponderosa /	Possible harm from	To the extent practicable, the facilities would be

TABLE 3.4-8
Summary of Potential Impacts and Proposed Mitigation for Special-Status Species Potentially Occurring Within the Analysis Area

Species	USFWS	ODFW/ ONHP	Habitat Requirements	Potential Occurrence in Analysis Area	Potential Impacts	Proposed Mitigation
Mariposa lily *Calachortus longebarbatus*			edges of ponderosa pine, lodgepole pine forests and in juniper woodlands at elevations between 4,000 and 6,000 feet	lodgepole pine forest openings	construction of Facility features	located in disturbed areas or in areas with minimal habitat value. Mitigation measures including restoration would be implemented.
Mountain lady's slipper *Cypripedium montanum*	--	--/4	Mixed conifer forests and woodlands at elevations ranging from 300 to 6,000 feet	Not observed; Suitable habitat present	Possible harm from construction of Facility features	To the extent practicable, the facilities would be located in disturbed areas or in areas with minimal habitat value. Mitigation measures including restoration would be implemented.
Mt. Mazama collomia *Collomia mazama*	--	--/1	Alpine meadows and on slopes in association with mixed conifer, true fir and lodgepole pine forests, generally on open or disturbed areas at elevations generally above 5,000 feet	No suitable habitat present	No impacts	No mitigation
Newberry's gentain *Gentiana newberryi*	--	--/2	Vernally wet to dry, subalpine and alpine meadows, along mountain streams at elevations between 5,000 and 12,000 feet	No suitable habitat present	No impacts	No mitigation
Playa phacelia *Phacelia inundata*	SoC	--/1	Sagebrush scrub, yellow pine forests, alkali sinks and playas, on alkaline soil 4,500 to 6,000 feet.	Not observed; Limited habitat present	Possible harm from construction of Facility features	To the extent practicable, the facilities would be located in disturbed areas or in areas with minimal habitat value. Mitigation measures including restoration would be implemented.
Profuse -flowered mensa mint *Pogogyne floribunda*	SoC	--/1	Vernal pools, seasonal lakes and intermittent drainages at elevations between 3,200 and 5,000 feet	Not observed; limited habitat present	Possible harm from construction of Facility features	To the extent practicable, the facilities would be located in disturbed areas or in areas with minimal habitat value. Mitigation measures including restoration would be implemented.
Prostrate buckwheat *Erigonum procidum*	SoC	C/1	Dry, rocky slopes, and flats within juniper-sagebrush and Jeffery pine woodlands at elevations between 4,000	Not observed; Suitable habitat present	Possible harm from construction of Facility features	To the extent practicable, the facilities would be located in disturbed areas or in areas with minimal habitat value. Mitigation measures including restoration would be implemented.

TABLE 3.4-8
Summary of Potential Impacts and Proposed Mitigation for Special-Status Species Potentially Occurring Within the Analysis Area

Species	USFWS	ODFW/ ONHP	Habitat Requirements	Potential Occurrence in Analysis Area	Potential Impacts	Proposed Mitigation
			and 8,500 feet			
Rafinesque's pondweed *Potamogeton diversifolius*	--	--/2	Ponds, streams and reservoirs below 8,000 feet	Not observed; Limited habitat present	Possible harm from construction of Facility features	To the extent practicable, the facilities would be located in disturbed areas or in areas with minimal habitat value. Mitigation measures including restoration would be implemented.
Red-root yampah *Perideridia erythrorhiza*	SoC	C/1	Meadows, pastures, and open areas in pine-oak woodlands at elevations less than 5,000 feet	Not observed; Suitable habitat present	Possible harm from construction of Facility features	To the extent practicable, the facilities would be located in disturbed areas or in areas with minimal habitat value. Mitigation measures including restoration would be implemented.
Salt heliotrope *Heliotropum curvassavicum*	--	--/3	Many different plant communities at elevations less than 7,000 feet, but is generally associated with saline soil	Not observed; Suitable habitat present	Possible harm from construction of Facility features	To the extent practicable, the facilities would be located in disturbed areas or in areas with minimal habitat value. Mitigation measures including restoration would be implemented.
Shockley's ivisia *Ivesia shockleyi*	--	--/2	Open gravelly, rocky areas associated with subalpine fir and pine forests, at elevations between 9,000 and 13,000 feet	No suitable habitat present	No impacts	No mitigation
Short-podded thelypody *Thelypodium brachycarpum*	--	--/2	Irrigated pasture, sagebrush shrub, pond and stream edges; adjacent to ponderosa pine forests; alkali soil at elevations between 3,000 and 6,500 feet	Not observed; Suitable habitat present	Possible harm from construction of Facility features	To the extent practicable, the facilities would be located in disturbed areas or in areas with minimal habitat value. Mitigation measures including restoration would be implemented.
Slender bulrush *Scirpus heterochaetus*	--	--/3	Marshes, swamps and around lake edges, in lower montane conifer forests at elevations around 5,000 feet	Not observed; Limited habitat present	Possible harm from construction of Facility features	To the extent practicable, the facilities would be located in disturbed areas or in areas with minimal habitat value. Mitigation measures including restoration would be implemented.
Tricolor monkeyflower\] *Mimulus tricolor*	--	--/2	Moist flats on wet clay soil and in vernal pools within woodlands and	Not observed; Limited habitat present	Possible harm from construction of Facility features	To the extent practicable, the facilities would be located in disturbed areas or in areas with minimal habitat value. Mitigation measures

TABLE 3.4-8
Summary of Potential Impacts and Proposed Mitigation for Special-Status Species Potentially Occurring Within the Analysis Area

Species	USFWS	ODFW/ ONHP	Habitat Requirements	Potential Occurrence in Analysis Area	Potential Impacts	Proposed Mitigation
			grasslands, at elevations less than 5,000 feet			including restoration would be implemented.
Warner Mountain bedstraw *Gallium serpenticum* var. *warnerense*	--	--/2	Meadows and seeps, pinyon/juniper woodland, conifer forest and rocky talus at elevations between 4,500 and 9,000 feet	Not observed; Suitable habitat present	Possible harm from construction of Facility features	To the extent practicable, the facilities would be located in disturbed areas or in areas with minimal habitat value. Mitigation measures including restoration would be implemented.

USFWS = United States Fish and Wildlife Service
SoC = Federal Species of Concern

Oregon Department of Fish and Wildlife (ODFW)

C Candidate for state listing as threatened or endangered

V Vulnerable species for which listing as threatened or endangered is not believed to be imminent, and can be avoided through protective measures and monitoring.

U Undetermined status; more information is needed to determine the conservation status of the species

P Peripheral or naturally rare species, species on the edge of their natural range in Oregon, or have naturally low populations within the state

Oregon Natural Heritage Program (ONHP)

1 Taxa that are threatened or endangered throughout their range

2 Taxa that are threatened or endangered in Oregon, but more secure elsewhere

3 Review list, taxa for which more information is needed to determine the conservation status

4 Species that are of conservation concern, but are not currently threatened or endangered

Figure 3.4-1
11 x 17
Color
Front

Figure 3.4-1
11 x 17
Color
Back

Figure 3.4-2
11 x 17
Color
Front

Figure 3.4-2
11 x 17
Color
Back

Figure 3.4-3
11 x 17
Color
Front

Figure 3.4-3
11 x 17
Color
Back

Figure 3.4-4
11 x 17
Color
Front

Figure 3.4-4
11 x 17
Color
Back

Figure 3.4-5
11 x 17
Color
Front

Figure 3.4-5
11 x 17
Color
Back

Figure 3.4-6
11 x 17
Color
Front

Figure 3.4-6
11 x 17
Color
Back

3.5 Fish

Surface waters within the project area support various species of fish, including two federally and state-listed endangered species, shortnose sucker (*Chasmistes brevirostris*) and Lost River sucker (*Deltistes luxatus*), both of which are found in the Lost River watershed in proximity to the project area. Water for the Energy Facility would be taken from a deep aquifer that does not have a connection to surface waters. Because there would be no withdrawals from surface water bodies, construction and operation of the Energy Facility would not affect fisheries resources in the area.

The information presented in this section is based on the studies and analysis conducted for the SCA as amended by Amendments No. 1 and No. 2, filed with EFSC on July 25, 2003, and October 15, 2003, respectively.

3.5.1 Affected Environment

3.5.1.1 Aquatic Habitat

The project area is located within the Klamath Ecological Province (East Cascades Ecoregion), on the eastern side of the Cascade Mountains. The Facility site lies within the Klamath River Basin. Aquatic habitats in the proximity to the analysis area include the Lost River, freshwater marsh, seasonal wetlands, sedge wet meadows, wet meadows, stock ponds, and agricultural canals.

The Lost River watershed is a closed, interior basin covering approximately 3,000 square miles of the Klamath River watershed in southern Oregon and Northern California. The headwaters originate east of the Clear Lake Reservoir in Modoc County, California, and flow approximately 75 miles to the Tulelake Sump. Seasonal flows in the Lost River are controlled by releases from the Clear Lake Dam. The Lost River was the only fish-bearing perennial habitat observed in proximity to the analysis area.

Several intermittent creeks were observed during field surveys. These creeks were dry at the time of the field survey, but had defined bed and bank features. Most of the drainages either lacked vegetation or contained only sparse upland vegetation within the channel. Several irrigation canals have been excavated to facilitate surface drainage and water transport for agricultural crops and pasture lands in the basin areas. These channels appear to be routinely maintained and were largely devoid of vegetation.

Freshwater marsh habitat was characterized by a mosaic of perennial, emergent monocots, and areas of open water. Species such as cattail (*Typha latifolia*) and bulrush (*Scirpus* sp.) are found in the deeper areas where sedges (*Juncus* sp.) and rushes (*Carex* sp.) are found in the seasonally-flooded areas around the perimeter of the marsh. These wetlands occur on the somewhat poorly-drained soil formed in alluvial lacustrine sediments. A hardpan is present between 20 and 40 inches and the water table is typically shallow, ranging from 1.0 to 3.5 feet below ground surface (NRCS, 1985).

Sedge wet meadow habitat is characterized by seasonal inundation, with surface water present during the winter and early spring, but absent by the end of the growing season. This habitat type occurs on soil derived from weathered diatomite, tuff, and basalt (NRCS, 1985). The vegetation is characterized by a dense cover of low-growing monocots such as sedges and rushes. A few forb species such as dock (*Rumex crispus*), mouse-tail (*Myosurus minimus*), and Bach's downingia (*Downingia bacigalupii*) were observed along the outer margins during field surveys, but accounted for only a minimal amount of the total vegetative cover. Aquatic buttercup (*Ranunculus aquatilus*) was present where there was open water.

Wet meadow habitats occurred on poorly-drained clay soil that formed in sediments from weathered tuff and basalt (NRCS, 1985). This habitat is characterized by the presence of surface water during the winter and early spring, and the absence of water during the summer months. Characteristic vegetation includes species such as tufted hairgrass (*Deschampsia cespitosa*), Baltic rush (*Juncus balticus*), and sedges (*Carex* spp.). Some areas have been disked and planted with pasture grasses such as tall fescue, timothy (*Phleum pratense*), and meadow foxtail (*Alopecurus pratensis*).

Stock ponds were observed in areas where berms had been constructed within natural drainages to retain water for livestock. The hydrology in these areas was variable, with some ponds containing several inches of water and other areas dry at the time of the survey. Vegetation in these areas included sedges, rushes, aquatic buttercup, and dock.

Groundwater in the vicinity of the proposed project is contained in a shallow aquifer system and a deep aquifer system. Groundwater quality within the shallow aquifer varies to some degree depending on local soil conditions and degree of connectivity between ground and surface waters. Since July 1991, fecal coliform has been found in several of the town of Bonanza's domestic wells. According to OWRD, studies compiled by Klamath County hypothesize that consecutive drought years forced farmers and ranchers to irrigate more heavily with groundwater. The aquifer drawdown permitted infusions of Lost River water, which carried in the contaminants.

The proposed project, however, would utilize deep zone groundwater. The deep zone groundwater is of high quality, with very low dissolved solids and no parameters suggesting interaction with shallow groundwater and surface water. Two aquifer tests demonstrated a lack of impact to the shallow aquifer and surface water from pumping groundwater out of the deep aquifer (see Section 3.3.1.2 for more details on the aquifer tests).

3.5.1.2 Shortnose Sucker and Lost River Sucker

Shortnose Sucker. The shortnose sucker was listed as Endangered on July 18, 1998. This species is endemic to the upper Klamath Basin of southern Oregon and northern California. Shortnose suckers are found in numerous lakes and rivers throughout the region including Upper Klamath Lake, the Clear Lake Reservoir, Gerber Reservoir, Tulelake, the Klamath River, and the Lost River system. Primarily a lake-dwelling fish, the shortnose sucker spawns between February and May in river habitats with gravelly substrates such as the Sprague, Wouldiamson, and Wood Rivers, as well as Crooked Creek and the Clear Lake watershed. Shoreline areas with a mosaic of open water, emergent vegetation, and woody structures are important for larval development. The shortnose sucker is a bottom feeder whose diet includes detritus, zoo plankton, algae, and aquatic invertebrates.

Historically, shortnose suckers were abundant throughout the Klamath Basin (Federal Register, 1998)). However, dams, diversion structures, irrigation canals, and development of the Klamath Basin has resulted in habitat fragmentation and population isolation. Additional factors leading to the population decline include loss of wetland habitat, hybridization, predation, and competition from exotic fish species and poor water quality. Hyper-eutrophication of lake habitats appears to be a principle factor in poor recruitment of this species (Federal Register, 1998).

The shortnose sucker has been reported in the Lost River above Harpold Reservoir, approximately 4 miles southeast of the Energy Facility site and at Big Springs approximately 2.5 miles north of the Energy Facility site (USFWS, 1993). No fish-bearing streams or lakes were identified in the immediate project area.

Lost River Sucker. The Lost River sucker was listed as Endangered on July 18, 1998 (USFWS, 1993). This species is endemic to the upper Klamath Basin of southern Oregon and northern California. The Lost River sucker is found Upper Klamath Lake, Clear Lake Reservoir, Tulelake, the Klamath River, and the Lost River up to the Anderson-Rose Dam. The Lost River sucker has also been reported in the Lost River above Harpold Reservoir, approximately 4 miles southeast of the Energy Facility site and at Big Springs approximately 2.5 miles north of the Energy Facility site. The Lost River sucker is a lake-dwelling fish that spawns between February and May in tributary rivers and streams with gravelly substrates. Shoreline habitats with open water intermixed with emergent vegetation are important for larval and juvenile development. This species feeds on a variety of aquatic invertebrates, algae, detritus, and zoo plankton found on lake bottoms.

Dams, diversion structures, irrigation canals, and development have resulted in habitat fragmentation and population isolation. Competition and predation by exotic species, wetland drainage, poor water quality, and eutrophication have also contributed to the decline of this species.

The nearest populations of the Lost River sucker are known from the Sprague River and Upper Klamath Lake, both of which are approximately 20 miles to the north and west of the project area, respectively. No fish-bearing lakes or streams are present in the project area.

3.5.2 Environmental Consequences and Mitigation Measures

The elements of the proposed Facility that could affect fisheries resources would be construction or operation practices that diverted surface waters, impaired water quality, or damaged aquatic habitat.

<u>Impact 3.5.1. Construction of new access roads along the electric transmission line would result in less than 0.5 acre of impact to intermittent creeks.</u>

<u>Assessment of Impact</u>. Access roads for the electric transmission line would cross three intermittent creeks. During construction of the access roads, culverts would be placed in the channel at creek crossings to allow uninterrupted seasonal water flows and eliminate potential damage to creek channels from construction and operation maintenance vehicles.

No other impacts to salmonids, other fish, or aquatic habitats are expected as a result of construction, operation, and retirement of the proposed Energy Facility. Less than 0.5 acre of wetland would be impacted by access roads along the electric transmission line. Aquatic resources along the natural gas and water supply pipeline would be avoided by using conventional bore techniques. No water or wastewater would be discharged to seasonal or perennial aquatic habitats, and no surface water would be withdrawn for construction or operation activities. As demonstrated by the aquifer testing, deep system withdrawals would not impact shallow system water levels and there would not be a discharge or process water/wastewater to the shallow groundwater system or surface water. Facility operations would not have an impact on existing groundwater quality or surface water quality.

Recommended Mitigation Measures. Construct access roads and install culverts during summer months when water is not flowing in the creek to avoid the presence of fish and minimize erosion and sedimentation.

In addition to the above mitigation measure, a number of mitigation measures have been incorporated into the proposed project as described below.

- Workers would be given environmental training to inform them of wildlife and habitat issues. This training would include information about sensitive wildlife, plants, and habitat areas as well as the required precautions to avoid and minimize impacts.
  - Maps would be prepared to show sensitive areas that are off-limits during the construction phase.
  - Signs would be posted around the perimeters of any sensitive habitat areas to be avoided.
- Following construction, topography and vegetation would be returned to preconstruction condition or better in areas of temporary disturbance. In areas where natural vegetation is removed, native perennial bunchgrasses and sagebrush would be planted according to a revegetation plan.
- Revegetation seed mixes and habitat enhancement locations would be developed in consultation with ODFW.
- Grading and clearing of vegetation would be limited to the minimum extent necessary for practical and safe working areas.
- In addition, permanently disturbed habitat would be restored, enhanced, and protected in accordance with ODFW habitat mitigation goals and pursuant to a revegetation plan.
- The water supply well system would be isolated from the shallow zone aquifer and surface water features.
- Sidecast material would remain within the construction corridors.
- Silt fencing and other barriers would be employed to limit lateral spread of soil when material must be sidecast in habitat areas within the construction corridor.
- Gates would be installed on the new access roads to restrict unauthorized access.

- Construction vehicles would remain on the roadbed and road shoulder whenever possible.
- Erosion control measures to be employed during Facility construction include:
  - Installing sediment fence or straw bale barriers at downslope side of excavations and disturbed areas
  - Straw mulching and discing at locations adjacent to the road that have been affected
  - Providing temporary sediment traps downstream of intermittent creek crossings
  - Planting designated seed mixes at affected areas adjacent to the road
- Areas that are affected by the construction would be seeded when there is adequate soil moisture. They would be reseeded in the spring if a healthy cover crop does not grow. The sediment fence and check dams would remain in place until the affected areas are well vegetated and the risk of erosion has been eliminated.
- Construction activities would be regulated by an erosion control plan and NPDES General Construction Permit 1200-C, which would require best management practices to minimize impacts from erosion or other impacts to soil.
- Measures to be employed in order to reduce the potential for water and wind erosion and sediment runoff include:
  - Limiting haul trucks to designated roadways
  - Using temporary erosion and sediment control measures, such as silt fences, straw bales, mulch, and slope breakers, and maintaining these features throughout construction and restoration
  - Watering or covering exposed soil, stockpiles, and roads during construction
  - Installing permanent erosion control measures, as necessary, during construction, cleanup, and restoration
  - Stripping and separately storing topsoil for replacement and replanting after installation of pipelines not buried within roads
  - Revegetating construction areas

3.5.3 Cumulative Impacts

The proposed Facility would have no adverse effect on fish and would not contribute any cumulative impacts to this element of the environment.

3.6 Traffic and Circulation

Potential effects of the proposed Facility on traffic and circulation would be increased traffic congestion, damage to state highways or county roads, increased traffic hazards, or impairment of access due to construction activities. As described below, the Facility would have no significant unavoidable adverse impacts on transportation and circulation. Impacts during construction of the Facility would be temporary and localized; no significant impacts would occur during Facility operation.

The information presented in this section is based on the studies and analysis conducted for the SCA as amended by Amendments No. 1 and No. 2, filed with EFSC on July 25, 2003, and October 15, 2003, respectively.

3.6.1 Affected Environment

3.6.1.1 Roadway System and Levels of Service

The existing network of roads surrounding the proposed Facility includes West Langell Valley Road, East Langell Valley Road, Harpold Road, Oregon Route (OR) 70 (ODOT #23), OR 50, and OR 140, as shown in Figure 3.6-1. These local roads currently have low average daily traffic volumes and low average yearly accident rates (1 to 5 annually). Levels of service are generally A or B, which are considered a high level of operation. These five roads have a high-quality asphalt surface. Table 3.6-1 shows the roadway system in the Facility area and its existing conditions (including roadway classifications, traffic volumes, and levels of service) in 2001. Klamath County does not have a peak-hour level-of-service standard for its rural roadways.

Weight and load limits exist on some of the roadways near the Energy Facility site because of bridges, irrigation canals, and river crossings along some of the roads.

3.6.1.2 Truck Traffic

During the peak harvest season, trucks transport grain, hay, alfalfa, and potatoes to the grain silos and other locations south of the Energy Facility site.

3.6.1.3 Railway Facilities

Burlington Northern Santa Fe (BNSF) provides regional rail freight service in the area. The closest rail access to the Energy Facility site is a rail line spur near the town of Malin.

3.6.2 Environmental Consequences and Mitigation Measures

Potential impacts during construction and operation could include increased traffic congestion, damage to state highways or county roads, increased traffic hazards, or impairment of access due to construction activities.

<u>Impact 3.6.1. During construction, roadways in the vicinity of the Energy Facility would experience a decrease in level of service (LOS).</u>

<u>Assessment of Impact</u>. During the 23-month construction period, up to 835 daily trips, including trips generated by construction vehicles and by Facility employees, would be

added to existing traffic levels on area roadways (Table 3.6-2). Of these, up to 420 trips would occur during the evening (PM) peak hour. Primary impacts would be to roads surrounding the proposed Energy Facility site and connecting the site to Klamath Falls, which are likely to be the most traveled. A large proportion of the permanent and temporary workforce would be located in Klamath Falls because of its concentrated population and housing options. Construction equipment would be transported from the BNSF rail line spur near the town of Malin along OR 50 to Harpold Road, then via West Langell Valley Road to the Energy Facility site.

Substantial construction-related impacts on the local roads are not expected because the existing roadway capacity is adequate to accommodate the additional traffic volumes. As shown in Table 3.6-3, levels of service on most area roadways would drop to B or C as a result of the additional construction traffic. However, roadways would continue to maintain an acceptable level of traffic operation, even during the evening peak period. To minimize impacts, Facility-related construction activities would be scheduled so that construction traffic would occur during off-peak hours; a carpool program would be offered to minimize single-occupancy vehicle use by construction workers.

Where traffic disruptions were necessary, detour plans, warning signs, and traffic diversion equipment would be used to improve safety. One lane of travel would be open and maintained with licensed flaggers used to direct traffic.

Recommended Mitigation Measures. No measures beyond those included in the proposed project are recommended.

Impact 3.6.2. Vehicles weighing more than 80,000 pounds (maximum legal load limit) could cause some visible damage to county roads.

Assessment of Impact. The weight of construction vehicles could result in damage to the asphalt roads that would be used for access to the Facility. To help mitigate this potential impact, roads used for heavy vehicle traffic would be videotaped before and after use to identify any damage to the road. If damage occurs as a result of vehicles carrying heavy loads, the road would be restored to its previous condition.

Recommended Mitigation Measures. No measures beyond those included in the proposed project are recommended.

Impact 3.6.3. Operation of the Energy Facility would generate additional traffic.

Assessment of Impact. Traffic during operation of the Energy Facility would depend on the alternative selected for process wastewater management. Traffic during operations would be the same with either of the following alternatives: evaporation in an onsite, lined evaporation pond or beneficial use of the water for irrigated pasture. If the storing and hauling to a WWTP for offsite disposal alternative is selected, additional truck trips would be required.

Operation of the Facility would generate less than four truck trips per week (not including truck trips for process wastewater disposal) and approximately 20 PM peak-hour worker trips daily (Tables 3.6-4 and 3.6-5). To assess potential impacts, a traffic analysis was performed and evaluated against standard levels of service. The results of the analysis are shown in Table 3.6.5, which summarizes the LOS for local roadways during the construction period. As shown in Table 3.6-5, traffic during Facility operation would not substantially reduce the LOS on the roadways or create a substantial impact on local traffic.

An additional 5 to 9 truck trips per day would be required if the storing and hauling to a WWTP for offsite disposal alternative is selected. The proposed route for these wastewater trips into and out of the Energy Facility would be along West Langell Valley Road, Harpold Road (north of West Langell Valley Road), Oregon Highway 70 (west of Harpold Road), and Oregon Highway 140 (west of OR 70). Accounting for a two-way trip, this would generate an additional 10 to 18 trips per day along each of the roads. Although, these trips can reasonably be assumed to occur throughout the day, to be conservative it was assumed that all of these trips occur in the PM peak hour. This change is expected to not cause any noticeable impacts and the roadway level of service would not substantially reduce the LOS on the roadways or create a substantial impact on local traffic.

Recommended Mitigation Measures. No measures are recommended.

3.6.3 Cumulative Impacts

The analysis of present traffic on the roads in the vicinity of the proposed project indicates there would not be a significant impact as a result of the project. The minor increase in traffic would result in minor cumulative impacts. In addition, there are no known reasonably foreseeable actions that would increase traffic in the vicinity of the project and lead to additional cumulative impacts.

TABLE 3.6-1
2001 Conditions of Affected Roadways

Roadway	Classification	No. of Lanes	Average Daily Volume[a]	Hourly Design Capacity[b]	PM Peak-Hour Volume[c]	PM Peak-Hour LOS
*West Langell Valley Road (south of Harpold Road)	Rural-Minor Arterial	2	400	2,800	40	A
*Harpold Road (north of West Langell Valley Road)	Rural-Minor Arterial	2	400	2,800	40	A
*Harpold Road (south of West Langell Valley Road)	Rural-Minor Arterial	2	400	2,800	40	A
*East Langell Valley Road	Rural-Minor Arterial	2	400	2,800	40	A
OR 50 (east of Harpold Road)	Major-Collector	2	1,500	2,800	150	A
OR 50 (west of Harpold Road)	Major-Collector	2	1,500	2,800	150	A
OR 70 (east of Harpold Road/Carol Avenue)	Urban-Collector	2	1,900	2,800	190	A
OR 70 (west of Harpold Road)	Urban-Collector	2	870	2,800	90	A
OR 140 (east of OR 70)	Major-Collector	2	3,100	2,800	310	B
OR 140 (west of OR 70)	Major-Collector	2	3,300	2,800	330	B

[a] Estimated number of vehicles per day in both directions.
[b] Maximum number of vehicles per hour in both directions for level of service (LOS) E.
[c] Vehicles per hour in both directions.

Source: *Highway Capacity Manual*, 2000

TABLE 3.6-2
Total Daily Construction-Related Vehicle Trip Generation

Type of Vehicle	Average Daily Vehicle Trips	Average PM Peak	Peak Daily Vehicle Trips	PM Peak on Peak Day
Construction Vehicles	45	25	155	80
Worker Vehicles * *- Average Workforce of 352*	545	275	-	-
- Peak Workforce of 543	-	-	835	420

* This analysis assumes an average vehicle occupancy (AVO) of 1.3.

TABLE 3.6-3
Daily and Peak Hour Traffic Volumes and LOS with Energy Facility Construction Impacts

		Daily			PM Peak				
Roadway	**Background Traffic**	**Number of Construction Worker Trips**	**Number of Construction Vehicles**	**Combined Traffic**	**Construction Worker Trips**	**Construction Vehicles**	**Background Traffic**	**Combined PM Peak**	**LOS**
West Langell Valley Road (south of Harpold Road)	400	835	155	1,390	420	80	40	540	C
Harpold Road (north of West Langell Valley Road)	400	835	155	1,390	420	80	40	540	C
Harpold Road (south of West Langell Valley Road)	400	835	155	1,390	420	80	40	540	C
East Langell Valley Road	400	835	155	1,390	420	80	40	540	C
OR 50 (east of Harpold Road)	1,500	835	155	2,490	420	80	150	650	C
OR 50 (west of Harpold Road)	1,500	835	155	2,490	420	80	150	650	C
OR 70 (east of Harpold Road/Carol Avenue)	1,900	835	155	2,890	420	80	190	690	C
OR 70 (west of Harpold Road)	870	835	155	1,860	420	80	90	590	C
OR 140 (east of OR 70)	3,100	835	155	4,090	420	80	310	810	C
OR 140 (west of OR 70)	3,300	835	155	4,290	420	80	330	830	C
West Langell Valley Road (south of Harpold Road)	400	715	100	1,215	360	50	40	450	B
Harpold Road (north of West Langell Valley Road)	400	715	100	1,215	360	50	40	450	B

TABLE 3.6-4
Estimated Truck Traffic at the Energy Facility During Operation

Delivery Type	Number and Occurrence of Trucks
Aqueous ammonia	2 per week
Condensed polisher waste	1 per month
Cleaning chemicals	1 per month
Trash pickup	1 per week
Sanitary waste	1 per year
Wastewater transport*	5 to 9 per day

* Applies only if storage and haul to wastewater treatment plant (WWTP) option is selected.

TABLE 3.6.5
Existing and Future Peak-Hour Traffic Volumes and LOS with and without Energy Facility Impacts

	2000 Existing PM Peak		**2004 PM Peak *without* Energy Facility**		**2004 PM Peak *with* Energy Facility**	
	Traffic Volumes	**LOS**	**Traffic Volumes**	**LOS**	**Traffic Volumes***	**LOS**
West Langell Valley Road (south of Harpold Road)	40	A	45	A	65/83	A
Harpold Road (north of West Langell Valley Road)	40	A	45	A	65/83	A
Harpold Road (south of West Langell Valley Road)	40	A	45	A	65/65	A
East Langell Valley Road	40	A	45	A	65/65	A
OR 50 (east of Harpold Road)	150	A	165	A	185/185	A
OR 50 (west of Harpold Road)	150	A	165	A	185/185	A
OR 70 (east of Harpold Road/Carol Avenue)	190	A	210	A	230/230	A
OR 70 (west of Harpold Road)	90	A	100	A	120/138	A
OR 140 (east of OR 70)	310	B	342	B	360/360	B
OR 140 (west of OR 70)	330	B	365	B	385/403	B

* 65/83: Traffic volume without process wastewater truck trips/traffic volume with process wastewater truck trips.

LOS = level of service
Estimated 1 percent growth factor for 2004.
Source: Oregon Department of Transportation

Figure 3.6-1
11 x 17
Color
Front

Figure 3.6-1
11 x 17
Color
Back

3.7 Air Quality

The proposed Energy Facility would use advanced combined-cycle gas turbine technology, clean-burning natural gas, and high-efficiency air emission control technology. Air quality modeling was conducted for the Facility using standard EPA modeling techniques and meteorological data collected at the site. Impacts for all of the criteria pollutants were well below the applicable ambient air quality standards. Therefore, it was concluded that no significant air quality impacts would occur near the Energy Facility.

Cumulative impact analysis indicated that emissions from the Energy Facility, combined with those of other existing sources in the area, would not result in concentrations above the federally mandated National Ambient Air Quality Standards (NAAQS) or Prevention of Significant Deterioration (PSD) increment levels for the criteria pollutants analyzed. In addition, the analysis identified no cumulative impacts to visibility in Class I areas resulting from Energy Facility emissions combined with those of other power generating and related facilities in the area.

The information presented in this section is based on the studies and analysis conducted for the SCA as amended by Amendments No. 1 and No. 2, filed with EFSC on July 25, 2003, and October 15, 2003, respectively.

3.7.1 Affected Environment

3.7.1.1 Climate

The proposed Energy Facility would be located in the south-central part of Oregon, near the town of Bonanza, in an area characterized by dry, warm summers and cold winters. Climatic summary data were obtained from the Western Regional Climate Center Web site (www.wrcc.dri.edu/cgi-bin/cliRECtM.pl?orklam) for a site at Klamath Falls, about 23 miles northwest of the Energy Facility site. During the period of data collection, from 1928 to 2001, the annual average precipitation was approximately 13.7 inches, with monthly mean temperatures ranging from 29.8 degrees Fahrenheit (°F) in January to 68.5°F in July.

A meteorological monitoring station was installed at the Energy Facility site in October 2001 to collect data suitable for use in an atmospheric dispersion modeling analysis. The parameters measured included wind speed, wind direction, and temperature. The sensors were mounted on a 32.8-foot-tall tower designed to meet the requirements for collecting onsite data for permitting and modeling under EPA PSD regulations (40 CFR 52.21).

The dispersion modeling analysis performed for the PSD application was for the period of October 28, 2001 through October 28, 2002. As indicated in Figure 3.7-1, predominant winds for the period of record were from the west-northwest (approximately 19 percent) and southeast (approximately 11 percent).

3.7.1.2 Odor

There are no existing operations associated with the Energy Facility site that generate significant odors.

3.7.1.3 Ambient Air Quality Standards

Ambient Standards for Criteria Pollutants. The Clean Air Act of 1970 empowered EPA to establish air quality standards for six common air pollutants: ozone, carbon monoxide (CO), lead, nitrogen dioxide (NO_2), particulates, and sulfur dioxide (SO_2). These are also referred to as criteria pollutants. The standards include primary standards designed to protect public health and secondary standards to protect public welfare. These NAAQS reflect the relationship between pollutant concentrations and health and welfare effects. ODEQ adopted standards similar to the NAAQS, and included standards for SO_2 that are more stringent than the Federal standards. Table 3.7-1 summarizes the Federal and state primary and secondary standards for the six pollutants, and the averaging time for determining compliance with the standards. It also presents the allowable increments (increases above background) under EPA's PSD program that would be applicable to the Energy Facility.

Prevention of Significant Deterioration. ODEQ has been delegated authority to administer the PSD program for major sources constructed or modified within the state. PSD regulations apply to proposed new or modified sources located in an attainment area that have the potential to emit criteria pollutants at a level which would define the source as "major" (40 CFR Part 51). The Energy Facility is a fossil fuel-fired steam electric plant, which is one of 28 categories of facilities considered major if emissions are greater than 100 tons per year of one or more criteria pollutants.

The PSD review process evaluates the potential impacts of the proposed source on ambient air quality and provides a review of the Best Available Control Technology (BACT). PSD restricts the degree of ambient air quality deterioration that is allowed. Increments for criteria pollutants are based on the PSD classification of the area. All areas in the Pacific Northwest are divided into either Class I or Class II areas. Class I areas are specifically identified federally protected wilderness areas and national parks. The PSD rules ensure that the Class I areas experience the least amount of deterioration. Class II areas are designed to allow for moderate, controlled growth.

The Class I areas within 200 kilometers of the Energy Facility site are shown in Table 3.7-2. The area around the Energy Facility site is designated Class II. Class I and Class II PSD increments are shown with the ambient air quality standards in Table 3.7-1.

Federal, State, and Local Emission Limits. As part of the PSD process, emission limits are established for the facility via a PSD permit issued by ODEQ. Emission limits are set based on the BACT determination. The BACT analysis identifies pollutant-specific alternatives for emission control, and the costs and benefits of each alternative technology. ODEQ determines the most appropriate control technology on a case-by-case basis considering the associated economic, energy, and environmental impacts. The utilization of BACT ensures reduced emissions of criteria pollutants. For example, use of natural gas as a fuel is considered BACT for certain pollutants because of its lower emissions over other fuels, such as fuel oil or coal. Combustion controls also reduce criteria pollutants by optimizing combustion and reducing pollutants emitted in the exhaust stream.

The determination of BACT during the ODEQ review of the PSD permit defines the emission limits for the Energy Facility.

Hazardous Air Pollutant Regulations. The Clean Air Act Amendments of 1990 required EPA to list and promulgate National Emission Standards for Hazardous Air Pollutants (NESHAP) in order to control, reduce, or otherwise limit the emissions of hazardous air pollutants from specific source categories. Stationary combustion gas turbines are on the list of source categories that are subject to emission standards if the total hazardous air pollutant (HAP) emissions could exceed the major source thresholds. The Energy Facility would not be above the HAP major source thresholds and so would not be subject to the stationary combustion gas turbine NESHAP. However, even if the NESHAP did apply, EPA has indicated that the lean premix combustion turbine technology to be utilized in the Energy Facility would meet the HAP standards even without consideration of the additional, planned add-on controls. The oxidation catalysts proposed for use at the Energy Facility would provide substantial additional hazardous air pollutant control beyond what EPA is expected to require under the NESHAP.

3.7.1.4 Existing Air Quality

The proposed Energy Facility would be located in an area designated as attainment for all criteria air pollutants. The city of Klamath Falls, located approximately 34 miles to the northwest of the Energy Facility, is currently classified as a nonattainment area for PM_{10} and CO. However, the Oregon Environmental Quality Commission recently passed new rules to have the area reclassified as attainment for PM_{10} and CO. Nonetheless, the Energy Facility performed modeling demonstrating that its emissions would not cause any substantial impacts within the city of Klamath Falls.

There are several major sources of air emissions currently operating within 50 miles of the Energy Facility. A natural gas pipeline compressor station, consisting of two gas-fired turbines, is owned and operated by PG&E Gas Transmission Northwest (Bonanza Station 14) and is located 3.3 miles south of the proposed Energy Facility. These units emit the same pollutants as the combustion turbines and heat recovery steam generators (HRSGs) at COB, although in a smaller quantity. This source is under the jurisdiction of ODEQ's Eastern Regional Office, and is operating under a Title V (of the CAA) operating permit. Data for emissions from this source were obtained from ODEQ for use in the competing source dispersion analysis.

Klamath Cogeneration Project (KCP) is located approximately 22 miles west of the Energy Facility site and consists of two combustion turbines and HRSGs. The Collins Products, LLC, mill is adjacent to the KCP and consists of a variety of wood products sources, with PM_{10} as the primary pollutant. A permit application was recently submitted requesting authority to build the Klamath Generation Facility (KGF) adjacent to the KCP. The KGF would consist of two combustion turbines and HRSGs. It is not known if or when that facility would receive permits or be constructed.

3.7.2 Environmental Consequences and Mitigation Measures

<u>Impact 3.7.1 Construction of the Energy Facility, natural gas pipeline, water supply pipeline, and electric transmission line would result in air emissions of fugitive dust and combustion exhaust.</u>

Emissions during the approximately 23-month construction process would consist of fugitive dust and combustion exhaust emissions from construction equipment and vehicles.

Fugitive dust emissions would result from dust stirred up during site preparation, onsite travel on paved and unpaved surfaces, and during aggregate and soil loading and unloading operations. Wind erosion of disturbed areas could also contribute to fugitive dust.

Combustion emissions would result from diesel-fired construction equipment, various diesel-fueled trucks, diesel-powered equipment (e.g., welding machines, electric generators, air compressors, water pumps), locomotives delivering equipment, and vehicle emissions from workers commuting to the construction site. Emissions could also occur during paving and painting of Energy Facility buildings and equipment.

These emissions would be of a temporary nature, and would be mitigated by use of best management practices to control fugitive dust and other incidental emissions. Controls may include the following actions:

- Use water spray as necessary to prevent visible dust emissions.
- Minimize dust emissions during transport of fill material or soil by wetting down or by ensuring adequate freeboard on trucks.
- Promptly clean up spills of transported material on public roads by frequent use of a street sweeper machine.
- Cover loads of hot asphalt to minimize odors.
- Keep all construction machinery engines in good mechanical condition to minimize exhaust emissions.

These standard measures would avoid significant, construction-related air quality impacts.

Recommended Mitigation Measures. No mitigation measures are recommended beyond those included in the proposed project.

Impact 3.7.2. Operation of the Energy Facility would result in the emission of criteria pollutants.

Combustion turbines and duct burners associated with the HRSGs at the proposed Energy Facility would use natural gas as the only fuel. Combustion of natural gas results in emissions of PM_{10}, NO_X, SO_2, CO, and volatile organic compounds (VOCs). The features listed below, which are incorporated into the Energy Facility design, would be employed to reduce air emissions:

- Combined-cycle technology that would provide energy conversion from natural gas to electricity with efficiencies that exceed 50 percent
- Combined effect of dry low NO_x combustion technology on the combustion gas turbines and Selective Catalytic Reduction (SCR) technology incorporated into the HRSGs that would reduce total NO_x emissions to 2.5 ppmvd
- Oxidation catalyst controls incorporated into the HRSGs that would reduce CO emissions to 2.0 ppmvd and VOCs to 7 lbs/hr from each stack

The Energy Facility would include four combustion turbines, four HRSGs equipped with supplemental duct firing, and other equipment. Supplemental duct firing with low NO_x

burners would be used for additional peaking demand, particularly during the summer months.

Combustion turbines and duct burners associated with the HRSGs would be equipped with dry, low-NO_x (DLN) burners. The NO_x emissions from the combustion turbines and duct burners associated with HRSGs would be further controlled using SCR. Use of SCR, while reducing NO_x emissions, results in ammonia (NH_3) emissions, which are commonly referred to as ammonia slip.

CO emissions from the combustion turbines and duct burners associated with HRSGs would be controlled using an oxidation catalyst. Use of an oxidation catalyst for controlling CO emissions also results in control of VOC emissions.

Table 3.7-3 summarizes the maximum annual emission rates of the criteria pollutants from the combustion turbines, HRSGs, and the fire pump. As a worst-case estimate, the proposed annual emission rates of the various criteria pollutants were based on the maximum short-term emission rates under various operating scenarios times 8,760 hours of operation per year (6,600 hours per year for the duct burners). The maximum hours of operation for the diesel fire pump would be 1 hour per day, 1 day per week, with an annual maximum of 52 hours per year.

An air quality impact assessment was conducted to evaluate compliance of the Energy Facility with applicable regulatory requirements. The assessment was done through an air quality modeling analysis and was described in detail in the PSD permit application (COB Energy Facility, LLC, August 2002), and revised in December 2002 and July 2003.

The air quality modeling was conducted using standard EPA modeling techniques. The EPA-approved Industrial Source Complex Short Term (ISCST3) dispersion model was used with wind data from the onsite meteorological station to model the ambient concentrations of pollutants within roughly 10 miles of the proposed Energy Facility. The EPA-approved CALPUFF model was used to predict pollutant concentrations at long-range receptors more than about 10 miles from the Energy Facility. Results were compared with EPA criteria, including state and Federal ambient air quality standards, Class II significant impact levels, PSD Class I and Class II increments, and proposed EPA Class I significance levels.

Table 3.7-4 summarizes the results of the criteria pollutant air quality analysis. With the addition of conservative background concentrations for 1-hour CO and for 24-hour and annual PM_{10}, impacts for all of the criteria pollutants were well below the applicable ambient air quality standards, and PSD Class II increments or air quality significant impact levels. Therefore, it was concluded that the Energy Facility would cause no significant air quality impacts.

Recommended Mitigation Measures. No mitigation measures are recommended beyond those included in the proposed project.

Impact 3.7.3. Operation of the Energy Facility would result in emissions of greenhouse gases.

Emissions of carbon dioxide (CO_2) for the Energy Facility were estimated as a part of the demonstration of compliance with OAR 345-024-0560, as presented in the SCA. It is estimated that up to 2.7 million tons per year of CO_2 could be emitted from the proposed

Energy Facility. Carbon dioxide emissions greater than 0.675 pounds per kilowatt-hour of net electric power output would be offset as required by OAR 345-024-0550. The excess emissions, 15.349 million tons over 30 years, would be offset by payment of more than $13.6 million to The Climate Trust. The Climate Trust would use these funds to finance CO_2 mitigation projects.

Recommended Mitigation Measures. No mitigation measures are recommended beyond those included in the proposed Energy Facility design.

Impact 3.7.4. Operation of the proposed Energy Facility would result in emissions of hazardous air pollutants.

Table 3.7-5 summarizes HAP emissions from the Energy Facility. Benzene, toluene, xylenes, polycyclic aromatic hydrocarbons (PAH), formaldehyde, and other organic compounds associated with the combustion of natural gas would be released into the atmosphere from the stacks associated with combustion turbines.

The oxidation catalyst used to reduce CO emissions would be effective in controlling volatile organic HAP emissions such as formaldehyde. For this project, it was assumed that the oxidation catalyst would provide 55 percent destruction of volatile organic HAPs, although EPA has indicated that the destruction efficiency could be significantly higher. The NO_x emissions from the combustion turbines and HRSG duct burners would be continuously monitored, allowing continuous feedback to the ammonia supply system. This would allow the levels of ammonia used in the SCR to be adjusted, thus minimizing ammonia slip.

Recommended Mitigation Measures. No mitigation measures are recommended beyond those included in the proposed project.

Impact 3.7.5. Operation of the Energy Facility could Impact Air Quality-Related Values in federally managed Class I areas in the region.

PSD regulations require an assessment of the project's impact to Air Quality Related Values (AQRVs) in Class I areas. AQRVs include regional visibility or haze, the effects of primary and secondary pollutants on sensitive plants, the effects of pollutant deposition on soil and water bodies, and effects associated with secondary aerosol formation. These requirements provide special protection for Class I areas. Table 3.7-1 lists the Class I areas near the Energy Facility site.

The EPA-approved CALPUFF modeling system was used for modeling the long-range transport of pollutants from the generation plant. CALPUFF is EPA's proposed model for predicting long-range transport and dispersion accounting for downwind chemical reactions within the emitted plume. Features of the CALPUFF modeling system include secondary aerosol formation, gaseous and particle deposition, wet and dry deposition processes, complex three-dimensional wind regimes, and the effects of humidity on regional visibility. The modeling procedures used follow the recommendations of the Interagency Agency Workgroup on Air Quality Modeling and the Federal Land Managers Air Quality Related Values Workgroup (Federal Air Quality Land Manager's Workgroup, 2000).

Class I Area Increment Consumption. PSD regulations require the Energy Facility to model air pollutant concentrations at the Class I areas, and compare the modeled concentrations to the allowable PSD Class I increments. Long-range modeling of impacts to the distant Class I areas was done using the CALPUFF modeling system in accordance with Federal guidance and state and Federal review. Table 3.7-6 provides the results of the Class I PSD increment analysis. The modeled maximum concentrations at all Class I areas were well below the allowable Class I increments for all criteria pollutants. The modeled maximum concentrations at all Class I areas were also below the proposed EPA Class I significance levels.

Nitrogen and Sulfur Deposition at Class I Areas. The CALPUFF modeling system was used to estimate the Energy Facility's potential contribution to total nitrogen and sulfur deposition in the Class I areas. Soil, vegetation, and aquatic resources in Class I areas are potentially influenced by nitrogen and sulfur deposition. Federal Guidance indicates that net increases in the annual deposition exceeding 5 kilograms per hectare per year (kg/ha/yr) for nitrogen or 3 kg/ha/yr for sulfur would constitute a significant impact.

Total annual nitrogen and sulfur deposition fluxes were calculated by summing the contributions of the gases directly emitted with the secondary aerosol products formed as predicted by CALPUFF's chemistry and deposition algorithms. The annual deposition fluxes were estimated based on emission rates that assumed that duct firing would occur 6,600 hours per year.

No significant impacts on sulfur and nitrogen deposition rates are predicted to occur as the result of emissions from the proposed Energy Facility. Deposition results for nitrogen and sulfur are summarized in Table 3.7-7 for each Class I area. Incremental deposition rates attributable to the proposed Energy Facility are less than the screening criteria levels currently recommended by Region 6 staff (Mr. Bob Bachman) of the USDA Forest Service for all Class I areas except Gearhart Wilderness Area, which was predicted to slightly exceed the nitrogen deposition screening criterion. These screening criteria are 0.005 kg/hectare per year for nitrogen and 0.003 kg/hectare per year for sulfur at each Class I area, which represent 0.1 percent of the maximum load of 5 kg/hectare per year for nitrogen and 3 kg/hectare per year for sulfur identified in the *Guidelines for Evaluating Air Pollution Impacts on Class I Wilderness Areas in the Pacific Northwest* (USDA Forest Service, May 1992). Based on these deposition modeling results, the proposed Energy Facility has demonstrated that it would not have a significant impact on sulfur and nitrogen deposition rates in the Class I areas.

Regional Haze Assessment. PSD regulations require the Energy Facility to model impacts on regional haze at the nearest Class I areas. Regional haze is generally quantified by measuring the visual range, and converting it to a light extinction coefficient (B_{ext}). A high B_{ext} corresponds to high concentrations of light scattering and light-absorbing compounds. The regional haze assessment was done by modeling the increase in the light extinction coefficient (B_{ext}) at Class I areas and comparing the modeled increases to the background B_{ext} values for existing clean days (typically the 90th percentile clearest day). The CALPUFF regional haze analysis results calculate the maximum predicted change in 24-hour extinction coefficient for each Class I area. Changes to extinction were based on seasonal background data for good visibility days and were adjusted with hourly humidity using the techniques described above. The extinction budgets for the higher episodes in most Class I areas are influenced by nitrates, PM_{10}, and, to a lesser extent, sulfates.

Table 3.7-8 lists the modeling results for the Class I areas that were modeled to determine the maximum increase that is predicted to occur in B_{ext} as the result of the Energy Facility functioning under worst case operating conditions. ODEQ and the Federal Land Managers (FLMs) assess whether the Energy Facility could be expected to significantly impair visibility in a Class I area on a case-by-case basis, taking into account geographic extent, intensity, duration, frequency and time of visibility impairment and how these factors correlate with (1) times of visitor use of the Class I area, and (2) the frequency and timing of natural conditions that reduce visibility. The FLMs use screening levels of 5 percent and 10 percent change in light extinction for single source and cumulative source analyses, respectively. Any source whose impacts, by themselves, are modeled to result in B_{ext} of less than 5 percent (as compared to the cleanest background values) will, as a general matter, be considered to result in no significant impairment. The FLM guidance suggests that the source-specific factors should be considered if a facility models its sole source impacts and determines that under worst-case operating conditions a B_{ext} of greater than 5 percent (as compared to the cleanest background values) could occur on 1 or more days.

Measured data for background B_{ext} values at each Class I area were provided by the FLMs. The modeled changes to light extinction attributable to the Energy Facility were less than the 5 percent screening value for all seasons and Class I areas. According to this criterion, changes to visual conditions in the Class I areas would not be perceptible even when the Energy Facility's combustion gas turbines, HRSG duct-burners, and fire pump were emitting at their short-term peak rates.

Recommended Mitigation Measures. No mitigation measures are recommended beyond those included in the proposed project.

Impact 3.7.6. Operation of the Energy Facility could result in odor emissions.

The proposed Energy Facility would not cause significant odors during normal operation. Natural gas delivered to the Energy Facility would not be odorized. However, if it were odorized, it would be contained within the natural gas pipeline and Energy Facility piping system up to the point of use in the combustion gas turbines and HRSG duct burners, where it would be combusted. The M/R Station would contain equipment handling natural gas pressure reduction. This enclosed structure would contain natural gas detection systems as a method for identifying inadvertent leaks within the building. Other natural gas leak detection equipment would be located in other areas within the Energy Facility site where natural gas leaks could collect so the Energy Facility operators could take action to contain the leak and vent the collected natural gas.

Ammonia used in the SCR system for NO_x control would be the only other potential source of odor, and would occur only in the event of an accidental spill or release. Aqueous ammonia would be used for the SCR, because it would release ammonia gas at a slower rate after a spill than anhydrous ammonia, during which containment operations could be implemented. Unreacted ammonia emissions from the HRSG stacks would be at such low concentrations that they would not cause any perceptible odors offsite.

Recommended Mitigation Measures. No mitigation measures are recommended beyond those included in the proposed project.

3.7.3 Cumulative Impacts

Analyses completed for the project indicate that there would be no significant cumulative adverse impacts to air quality from the proposed Energy Facility.

3.7.3.1 Class II Impacts

Criteria pollutant cumulative impacts to air quality in the Class II areas were analyzed in the PSD application for NO_x, PM_{10}, and 1-hour CO. Dispersion modeling was used to demonstrate that impacts from the proposed project combined with significant sources in the area and other background sources were below the ambient air quality standards and PSD increments. NO_2 concentrations were less than half the ambient air quality standard using a background from Portland, Oregon. Background air quality in the area of the Energy Facility site is notably less than the background air quality used in the analysis. Consequently, an increase in sources similar to a level similar to those in the Portland, Oregon, area could be easily tolerated in the area without threatening ambient air quality.

Twenty-four hour PM_{10} concentrations were two-thirds of the ambient air quality standard and annual concentrations less than half the standard, including background values representative of the Klamath Falls area. A notable increase in emissions from other sources could occur and still show that cumulative impacts were below the ambient air quality standards for PM_{10}. Impacts for 1-hour CO combined with a representative background value were slightly more than one-third of the ambient air quality standard. Substantial growth in CO emissions could occur and result in ambient air quality below the standards. Impacts for SO_2 and 8-hour CO for the proposed Energy Facility alone were below the significant impact level defined by EPA and ODEQ and were not analyzed with other sources. Addition of background values and other sources are not expected to impact the 8-hour ambient air quality standard for CO. Emissions of SO_2 from the proposed Energy Facility are quite low, background emissions are quite low, and concentrations are not a concern in the region. Cumulative impacts are not a concern for SO_2 in this area.

3.7.3.2 Other Potential Projects

Section 2.4 discusses other potential projects in the area. Air emissions from these potential future sources are easily incorporated into the background allowances discussed above and no significant cumulative impacts for criteria pollutants from existing or future sources are anticipated.

3.7.3.3 Class I Impacts

In addition, cumulative impacts to Class I areas were analyzed for the EIS by evaluating the potential degradation to visibility resulting from the emissions from the proposed Energy Facility combined with those of other power generating and related facilities currently existing in the area or currently undergoing evaluation by EFSC. These are the major sources of emission with potential to affect distant Class I areas. Other potential sources such as car emissions were not included because they are not expected to have cumulative impacts on distant Class I areas.

Sources and Emissions Modeled

As in the PSD application, the CALPUFF modeling system was used for this analysis, which is the preferred EPA model for analyzing long-range transport of air emissions. In addition to the Energy Facility emission sources, the Class I cumulative effects analysis evaluated emissions from the nearby PG&E Station 14 in Bonanza and the KCP. To be conservative, the projected emissions from the KGF were modeled as well. Applications were submitted in September 2002 to ODEQ and EFSC requesting authorization to construct the KGF. It is unclear when, or if, that authority will be granted and when, or if, the KGF will be built. Typically, unpermitted sources are not included in such cumulative effects analyses. However, in order to best document the worst-case, long-term impacts to the surrounding Class I areas, the KGF was included in this cumulative effects analysis. The sources and emissions modeled in the cumulative effects analysis are summarized in Table 3.7-9.

Visibility Impacts

The visibility cumulative effects analysis was conducted according to guidance provided in the *Interagency Workgroup on Air Quality Modeling Phase 2 Summary Report and Recommendations for Modeling Long-Range Transport Impacts* (EPA-454/R-98-019) (IWAQM2) and the *Federal Land Managers Air Quality Related Values Work Group Phase I Report* (FLAG) (USFS, NPS, USFWS, 2000). The FLAG document indicates that a change in extinction of less than 10 percent, in a Class I area, from the proposed source plus other nearby sources, should be considered an insignificant impact. Therefore, the same criterion was used for this analysis to indicate whether there would be the potential for an adverse cumulative impact. Table 3.7-10 provides a summary of the percent extinctions in each of 11 Class I areas analyzed. In no Class I area would this value exceed 10 percent. It is concluded that there would be no adverse cumulative impact to any Class I area within 200 kilometers (124 miles) of the proposed Energy Facility site. EPA, ODEQ, and the FLMs assume that if no significant impacts are documented at a location within a 200-kilometer radius, the Energy Facility would not significantly impact any Class I areas.

Deposition Impacts

In the PSD analysis, deposition impacts for the project in the Class I areas were compared to screening criteria recommended by the USDA Forest Service. These criteria represent 0.1 percent of the maximum load identified in *Guidelines for Evaluating Air Pollution Impacts on Class I Wilderness Areas in the Pacific Northwest* (USDA Forest Service, May 1992) as the no injury threshold criteria. The full maximum load identified in this document is appropriate for consideration of cumulative impacts. Cumulative emissions of gaseous pollutants NO_x and SO_2, which are the precursors to deposition compounds of concern, are not 1,000 times greater than the emissions analyzed in the PSD application. Therefore, cumulative impacts to deposition are not anticipated.

TABLE 3.7-1
Ambient Air Quality Standards and Prevention of Significant Deterioration Increments

Pollutant	National Primary	National Secondary	State of Oregon	Class I PSD Increments	Class II PSD Increments
Inhalable Particulate Matter (PM_{10})					
Annual Arithmetic Mean	50 $\mu g/m^3$	50 $\mu g/m^3$	50 $\mu g/m^3$	4 $\mu g/m^3$	17 $\mu g/m^3$
24-hour Average	150 $\mu g/m^3$	150 $\mu g/m^3$	150 $\mu g/m^3$	8 $\mu g/m^3$	30 $\mu g/m^3$
Sulfur Dioxide (SO_2)					
Annual Arithmetic Mean	0.03 ppm	NA	0.02 ppm	2 $\mu g/m^3$	20 $\mu g/m^3$
24-hour Average	0.14 ppm	NA	0.10 ppm	5 $\mu g/m^3$	91 $\mu g/m^3$
3-hour Average	NA	0.5 ppm	0.50	25 $\mu g/m^3$	512 $\mu g/m^3$
Carbon Monoxide (CO)					
8-hour Average	9 ppm	NA	9 ppm	NA	NA
1-hour Average	35 ppm	NA	35 ppm	NA	NA
Ozone (O_3)					
1-hour Average	0.12 ppm	0.12 ppm	0.12 ppm	NA	NA
8-hour Average	0.08 ppm	0.08 ppm	NA	NA	NA
Nitrogen Dioxide (NO_2)					
Annual Average	0.05 ppm	0.05 ppm	0.05 ppm	2.5 $\mu g/m^3$	25 $\mu g/m^3$
Lead (Pb)					
Quarterly Average	1.5 $\mu g/m^3$	1.5 $\mu g/m^3$	1.5 $\mu g/m^3$	NA	NA

Annual standards never to be exceeded; short-term standards not to be exceeded more than once per year unless otherwise noted.

$\mu g/m^3$ = micrograms per cubic meter
ppm = parts per million
NA = not applicable

TABLE 3.7-2
Regional Class I Areas

Class I Area	Distance from Energy Facility Site (kilometers)	State
Three Sisters Wilderness	189	Oregon
Crater Lake National Park	87	Oregon
Diamond Peak Wilderness	156	Oregon
Mountain Lakes Wilderness	58	Oregon
Gearhart Wilderness	52	Oregon
Lava Beds National Monument	41	California
South Warner Wilderness	125	California
Thousand Lakes Wilderness	159	California
Marble Mountain Wilderness	152	California
Lassen Volcanic National Park	176	California
Caribou Wilderness	180	California

TABLE 3.7-3
Maximum Short-Term and Annual Criteria Pollutant Emission Rates

Pollutant	Maximum Short-Term Emission Rate from Fire Pump (lb/hr)	Maximum Short-Term Emission Rate Per Combustion Turbine and HRSG (lb/hr)	Maximum Annual Emission Rate for Energy Facility (tons/yr)
NO_X (as NO_2)	9.06	22.8	354
CO	1.95	19.0	465
SO_2	0.60	1.0	16
VOC	0.74	7.1	96
PM	0.64	14.0	242
PM_{10}	0.64	14.0	242

NO_2 = nitrogen dioxide
NO_x = nitrogen oxide
PM_{10} = particulates less than 10 microns in diameter
SO_2 = sulfur dioxide

TABLE 3.7-4
Modeled Ambient Concentrations for Criteria Pollutants

Pollutant	Averaging Period	Maximum Predicted Concentration ($\mu g/m^3$)	Significant Impact Level ($\mu g/m^3$)	Background Concentration ($\mu g/m^3$)	Total Concentration ($\mu g/m^3$)	Ambient Air Quality Standard[2] ($\mu g/m^3$)	PSD Class II Increment[3] ($\mu g/m^3$)
NO_2	Annual	6.30[1]	1	33.9	40.2	100	25
CO	1-Hour	3,078[1]	2,000	9,620	12,698	40,000	NA
CO	8-Hour	263	500	NA	NA	10,000	NA
PM_{10}	24-Hour	13.11[1]	1	80	93.11	150	30
PM_{10}	Annual	1.55[1]	0.2	18.1	19.65	50	17

[1]Project-only impacts for this pollutant and averaging period exceeded the significant impact level. Maximum predicted concentration includes competing sources.

[2]Compliance assessed by comparing to Total Concentration.

[3]Compliance assessed by comparing to Maximum Predicted Concentration.

$\mu g/m^3$ = micrograms per cubic meter
CO = carbon monoxide
NA = not applicable (because the maximum predicted concentration is below the significant impact level)
NO_2 = nitrogen dioxide; note that modeled value was multiplied by 0.75 to convert from NO_x to NO_2
PM_{10} = particulate matter less than 10 microns in diameter
PSD = Prevention of Significant Deterioration

TABLE 3.7-5
Summary of Hazardous Air Pollutant Emissions

Pollutant	Annual Emission Rate for Combustion Turbines and Duct Burners* (tons/yr)	Annual Emission Rate for Fire Pump (lb/hr)	Annual Emissions (tons/yr)
Benzene	0.17	5.0 E-05	0.17
Formaldehyde	2.96	6.3 E-05	2.98
Hexane	6.85	--	7.33
Naphthalene	0.02		0.02
Toluene	1.73	2.2 E-05	1.73
Acetaldehyde	0.53	4.1 E-05	0.53
Acrolein	0.08	--	0.08
Ethylbenzene	0.42	--	0.42
PAH	0.03	9.0 E-06	0.03
Xylenes (total)	0.85	1.5 E-05	0.85
Dichlorobenzene	0.005	--	0.005
Arsenic	0.002		0.002
Cadmium	0.009		0.010
Chromium	0.012		0.012
Cobalt	0.001		0.001
Manganese	0.003		0.003
Mercury	0.002		0.002
Nickel	0.018		0.018

* Hazardous air pollutant (HAP) emission rates assume oxidation catalyst destruction efficiency of 55 percent for volatile organic HAPs.

TABLE 3.7-6
Modeled Class I Ambient Air Quality Results (Energy Facility Alone)

Area	PM_{10} Annual (μg/m^3)	PM_{10} 24-Hour (μg/m^3)	NO_X Annual (μg/m^3)
Three Sisters Wilderness	0.0006	0.014	0.0001
Crater Lake National Park	0.0028	0.14	0.0019
Diamond Peak Wilderness	0.0008	0.022	0.0002
Mountain Lakes Wilderness	0.0057	0.16	0.005
Gearhart Wilderness	0.011	0.12	0.011
Lava Beds National Monument	0.0032	0.065	0.0011
South Warner Wilderness	0.002	0.027	0.0012
Thousand Lakes Wilderness	0.0014	0.039	0.0007
Marble Mountain Wilderness	0.0013	0.037	0.0007
Lassen Volcanic National Park	0.001	0.033	0.0004
Caribou Wilderness	0.0009	0.015	0.0004
EPA Proposed Class I Significance Level	**0.2**	**0.3**	**0.1**
Class I Increment	**4**	**8**	**2.5**

μg/m^3 = micrograms per cubic meter
EPA = U.S. Environmental Protection Agency
NO_X = nitrogen oxide
PM_{10} = particulates less than 10 microns in diameter

TABLE 3.7-7
Summary of Total Nitrogen and Sulfur Deposition Results (Energy Facility Alone)

Area	Total N kg/(hectare*yr)	Total S kg/(hectare*yr)
Three Sisters Wilderness	0.0003	0.00006
Crater Lake National Park	0.0008	0.0001
Diamond Peak Wilderness	0.0003	0.00006
Mountain Lakes Wilderness	0.002	0.0002
Gearhart Wilderness	0.0058	0.001
Lava Beds National Monument	0.0009	0.0002
South Warner Wilderness	0.0008	0.0001
Thousand Lakes Wilderness	0.0005	0.00007
Marble Mountain Wilderness	0.0004	0.00007
Lassen Volcanic National Park	0.0004	0.00006
Caribou Wilderness	0.0004	0.00005

kg/(hectare*yr) = kilograms per hectare per year
N = nitrogen
S = sulfur

TABLE 3.7-8
Visibility Analysis Results—Maximum Percent Change in Extinction (Energy Facility Alone)

Area	Day	Year	Receptor Coordinate X (km)*	Receptor Coordinate Y (km)*	B_{ext} Modeled (1/Mm)	B_{ext} Background (1/Mm)	Extinction Change (%)
Three Sisters Wilderness	344	1998	201.0	202.656	0.111	17.242	0.64
Crater Lake National Park	344	1998	204.848	93.0	0.659	17.236	3.82
Diamond Peak Wilderness	344	1998	201.0	169.326	0.155	17.242	0.9
Mountain Lakes Wilderness	350	1998	201.51	44.5	0.811	17.056	4.76
Gearhart Wilderness	10	1999	296.0	70.56	0.447	16.876	2.65
Lava Beds National Monument	171	1998	251.6	-14.211	0.187	15.958	1.17
South Warner Wilderness	13	1999	355.073	-54.5	0.203	16.672	1.22
Thousand Lakes Wilderness	8	1999	246.135	-136.258	0.239	16.786	1.42
Marble Mountain Wilderness	357	1998	125.1	-58.817	0.338	16.99	1.99
Lassen Volcanic National Park	8	1999	248.601	-157.379	0.189	16.786	1.12
Caribou Wilderness	339	1998	277.47	-155.593	0.149	16.546	0.9

* Lambert conformal coordinate system with a reference north latitude of 46 degrees and a reference west longitude of 121 degrees and standard parallels of 42.5 and 48 degrees north latitude and standard meridian of 121 degrees west longitude.

B_{ext} = light extinction coefficient
km = kilometers
1/Mm = inverse megameters

TABLE 3.7-9
Sources Included in Cumulative Impacts Analysis

Facility	Source	NO_x (lb/hr)	SO_2 (lb/hr)	PM_{10} (lb/hr)
COB Energy Facility	HRSG 1-4[1]	22.3	1	14
	Gas Heaters 1-4[1]	0.18	0.001	0.014
	Fire Water Pump	0.38	0.025	0.0265
PGE Transmission NW Corporation	Turbine 14[1]	33.2	0.3	0.7
	Turbine 14[2]	45.6	0.3	0.8
Klamath Cogeneration Project[3]	2 HRSG[2]	33	3.3	2
Klamath Generation Facility[3,4]	CT 1-2[2]	7.2	2.3	4.2
	Generator	0.00925	0.045	0.00604
	Fire pump	0.175	0.095	0.0123

[1] Emissions shown are for each of four units.
[2] Emissions shown are for each of two units.
[3] Emissions modeled derived from individual facility air permit applications.
[4] Klamath Generation Facility is permitted, but not yet operating.

-- = No emissions of pollutant from this source.

TABLE 3.7-10
Cumulative Visibility Analysis Results—Maximum Percent Extinction Change

Area	Day	Year	Receptor Coordinate X (km)*	Receptor Coordinate Y (km)*	B_{ext} Modeled (1/Mm)	B_{ext} Background (1/Mm)	Extinction Change (%)
Three Sisters Wilderness	344	1998	184.263	231.959	0.215	17.242	1.24
Crater Lake National Park	344	1998	204.848	93.0	1.094	17.236	6.35
Diamond Peak Wilderness	344	1998	189.0	166.071	0.301	17.242	1.742
Mountain Lakes Wilderness	3	1999	201.881	35.437	1.263	17.074	7.40
Gearhart Wilderness	6	1999	306.0	58.215	0.782	16.876	4.64
Lava Beds National Monument	234	1998	244.238	-18.1	0.240	15.904	1.51
South Warner Wilderness	13	1999	355.073	-54.5	0.341	16.672	2.05
Thousand Lakes Wilderness	8	1999	243.239	-137.576	0.424	16.786	2.53
Marble Mountain Wilderness	357	1998	121.013	-51.4	0.708	16.99	4.17
Lassen Volcanic National Park	339	1998	272.17	-152.876	0.388	16.618	2.34
Caribou Wilderness	339	1998	275.052	-155.605	0.361	16.546	2.18

* Lambert conformal coordinate system with a reference north latitude of 46 degrees and a reference west longitude of 121 degrees and standard parallels of 42.5 and 48 degrees north latitude and standard meridian of 121 degrees west longitude.

B_{ext} = light extinction coefficient
km = kilometers
1/Mm = inverse megameters

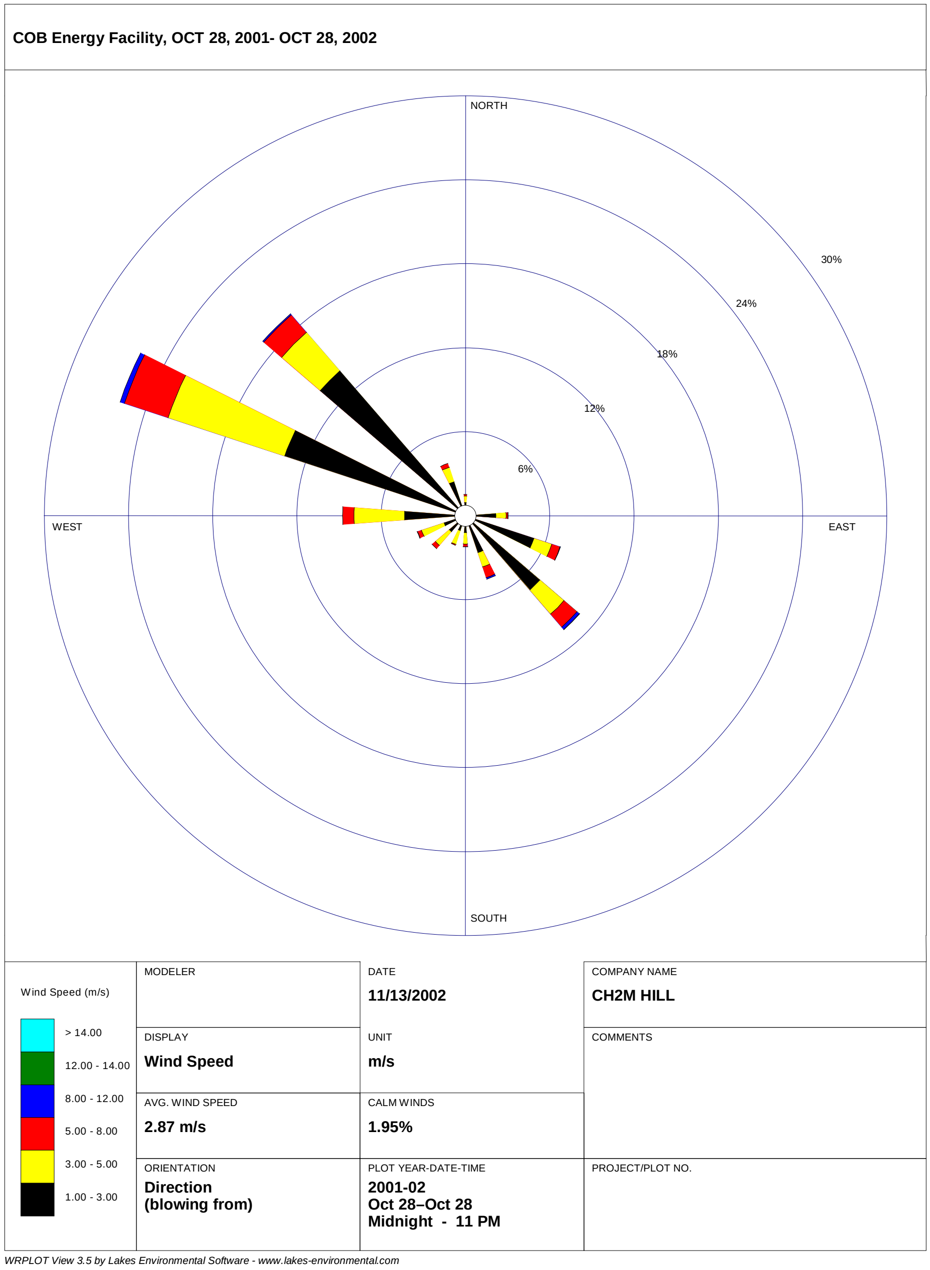


FIGURE 3.7-1
Annual Windrose of the Meteorological Data Set

3.8 Visual Quality and Aesthetics

The project area for visual quality and aesthetics covers a 30-mile radius from the Energy Facility stacks and from the southernmost tower of the electric transmission line. This is a predominantly undeveloped area where the primary land uses are forests and farming. A number of scenic and aesthetic resources, described below, surround the proposed Energy Facility. The elements of the Energy Facility that could affect the visual and aesthetic quality of the environment would be four stacks and 38 transmission towers. The stacks would be painted tan to blend in with their surroundings. The Energy Facility would use nonglare, low-impact lighting with shielded or cutoff fixtures, and the lighting would be directed downward. The proposed Energy Facility would not degrade or obstruct any scenic or aesthetic resources designated in pertinent Federal, state, and local plans.

The information presented in this section is based on the studies and analysis conducted for the SCA as amended by Amendments No. 1 and No. 2, filed with EFSC on July 25, 2003, and October 15, 2003, respectively.

3.8.1 Affected Environment

The landscape of the project area is largely undeveloped, with farms being the primary development. Within the 30-mile project area, natural resources such as national forests and existing and proposed wilderness trails, and a scenic highway surround the proposed Energy Facility. Table 3.8-1 shows the resources that have been designated as scenic or aesthetic in Federal land management, local land use, and other plans. To provide a comprehensive and conservative assessment of scenic and aesthetic values, this analysis is based on the assumption that if a location is listed as a scenic or aesthetic resource in an applicable plan, it is a significant scenic or aesthetic resource. The analysis then considers whether the proposed project would have any significant visual impact on these significant scenic areas.

The following sections describe the resources in the proposed project area.

3.8.1.1 OC&E Woods Line State Trail

The OC&E Woods Line State Trail is a state park and recreational trail near the towns of Olene and Dairy. This state park does not have a special scenic designation (Beauchmin, 2002). The Energy Facility would be located approximately 8 miles from the trail at its nearest point.

3.8.1.2 Volcanic Legacy Scenic Byway and Modoc Volcanic Scenic Byway

The Volcanic Legacy Scenic Byway and Modoc Volcanic Scenic Byway have been designated as National Scenic Byways by the U.S. Secretary of Transportation. This designation is based on a roadway's archeological, cultural, historic, natural, recreational, and scenic qualities. To receive this designation, a road must possess multiple intrinsic qualities that are nationally significant and contain one-of-a-kind features that do not exist elsewhere. Views from these two volcanic scenic byways are typically of the natural foreground features, such as volcanic formations and wildlife refuges.

3.8.1.3 State Routes 161 and 139

State Routes 161 and 139 are eligible for designation as scenic highways but have not yet been officially designated as such. Nevertheless, they are labeled as scenic highways on several road maps generally available to the public.

3.8.1.4 Miller Creek Area of Critical Environmental Concern

Miller Creek is a special area managed by BLM as an area of critical environmental concern (ACEC) with the objective of maintaining, protecting, or restoring natural ecological processes and wildlife and scenic resources. According to BLM's Klamath Falls Resource Area Resource Management Plan EIS (BLM, 1994), the Miller Creek ACEC is a scenic, natural ecosystem that is a unique feature of Gerber Plateau. Miller Creek would be managed as Visual Resources Management Class II that allows for low levels of visible change. Activities may be seen but should not attract attention from the casual observer (BLM, 1995).

3.8.1.5 Lava Beds National Monument

Although Lava Beds National Monument is not a designated scenic resource, it is a national monument with high scenic value. The purpose of the monument is to preserve and protect the significant natural and cultural resources of the area.

3.8.1.6 Lower Klamath Lake National Wildlife Refuge (NWR) and Tulelake NWR Wildlife Overlooks

These two wildlife overlooks are located approximately 15 and 11 miles from the Energy Facility site. The NWR has not designated these overlooks as scenic resources, but as wildlife viewing areas.

3.8.1.7 Bloody Point, Petroglyphs, and Battle of Scorpion Point Vista Points

Modoc County has designated these three historic sites—Bloody Point, Petroglyphs, and Battle of Scorpion Point—as vista points. They are 9, 16, and 19 miles, respectively, from the closest proposed transmission tower.

3.8.2 Environmental Consequences and Mitigation Measures

The elements of the proposed Facility that could affect the visual and aesthetic quality of the environment would be four stacks and 38 transmission towers.

The four stacks would range in height from 150 to 200 feet, and would be painted a neutral tan to blend into the horizon, making them difficult to discern from a distance.

The 38 transmission towers would range in height from 100 to 165 feet, and would be constructed south of the Energy Facility for about 7.2 miles. Most of the transmission towers would be 105 to 110 feet tall.

As described below, the Energy Facility would have no significant unavoidable adverse impacts on scenic or aesthetic resources.

Impact 3.8.1. Visual impacts to scenic and aesthetic resources would be minimal.

Assessment of Impact. Visual impacts to scenic and aesthetic resources could potentially result from the stacks and transmission towers for the electric transmission line.

Three sets of visual analyses were performed to determine visual impacts to scenic and aesthetic resources within the 30-mile project area. These analyses were based on lines of sight from the scenic and aesthetic resources to the stacks and transmission lines. Figures 3.8-1 and 3.8-2 show the lines of sight to the stacks and transmission towers, respectively.

The line-of-sight analysis determined that the stacks and transmission towers would be partially visible under clear weather conditions from the following scenic areas: OC&E Woods Line State Trail, Volcanic Legacy Scenic Byway, and BLM Miller Creek ACEC.

At least one transmission tower, but not the stacks, would be visible from the following scenic areas: Bloody Point, Petroglyphs, and Battle of Scorpion Point (historic sites with vista points); State Routes 161 and 139; Lower Klamath NWR Wildlife Overlook; and Tulelake NWR Wildlife Overlook.

From a small portion of the Modoc Volcanic Scenic Byway, at least one transmission tower would be visible, but not the stacks.

The following sections describe in more detail the potential impacts by scenic or aesthetic resource.

OC&E Woods Line State Trail. According to the line-of-sight analysis, the stacks and transmission towers would be visible from portions of the OC&E Woods Line State Trail, a state park and recreational trail, near the towns of Olene and Dairy. The landscape analysis systems established by the U.S. Forest Service and other agencies classify an object located approximately 8 miles distant (like the Energy Facility from the trail) as being in a scene's far background. These landscape assessment systems generally define a landscape scene's background zone as starting 3 to 4 miles in the distance, and characterize this zone as the area in which texture has disappeared and color has flattened, and in which landform ridgelines and horizon lines are the dominant visual characteristic (USDA Forest Service, 1995).

This conclusion is consistent with the findings of various studies of the perceived effects of electric transmission lines, which determine that for residential viewers, electric transmission lines are most likely to be noticed and perceived to have negative effects when they are relatively close to viewers' homes (no more than 2 miles away) and that transmission towers located 1 mile or less from homes are the ones most likely to be perceived in negative terms (Economics Consultants Northwest, 1987; Beauregard Conseil, 1990 and 1995; Entre les Lignes, 1993). In a study of evaluations of simulated views of transmission towers located in parkland settings in Australia, transmission towers were found to be perceived to have a negative effect on scenic quality at a distance of only up to 0.5 kilometer (about one-third of a mile) (Bishop, Hull, and Leahy, 1985). Seen from a distance of approximately 8 miles, the stacks and transmission towers would blend into the viewshed and would not substantially alter the visual character or views of the landscape.

Users of bicycle and hiking trails typically focus on their immediate surroundings unless there are established scenic viewpoints at which to stop. The OC&E Woods Line State Trail does not have a scenic designation, nor does it have any scenic viewpoints along this portion of the trail. Consequently, the Facility would not have a significant visual impact on users of the OC&E Woods Line State Trail.

Volcanic Legacy Scenic Byway and Modoc Volcanic Scenic Byway. According to the line-of-sight analysis and as shown in Figures 3.8-1 and 3.8-2, the stacks and transmission towers could be visible from the Volcanic Legacy Scenic Byway (U.S. 97 in Oregon) for a brief period of less than 1 mile while passing through Klamath Falls, and could be seen at a minimum distance of 20 miles. From the Modoc Volcanic Scenic Byway (in California), the transmission towers could be visible from a minimum of 10 miles near Tulelake. Given the location in the far background, the transmission towers would be very tiny, if visible at all, in the overall view and would blend in with the panorama; hence, they would not have an adverse effect on the character or quality of views from these roadways. For example, the Captain Jack Substation could not be seen from the Lava Beds National Monument with a high-powered spotting scope.

State Routes 161 and 139. At least one transmission tower would be visible from portions of State Routes 161 and 139, both approximately 9 miles from the closest transmission tower. From this distance, the Facility components would blend in with the distant landscape and would be difficult to discern against the surrounding hills. In addition, these views would likely be blocked by vegetation in the foreground and by Buck Butte and other hills south and west of the Facility site. Therefore, the transmission towers would not substantially alter the visual character or views of the landscape.

Miller Creek ACEC. The lower part of Miller Creek ACEC, located approximately 10 miles from the Facility, would have at least a partial line of sight to the stacks and transmission towers. Seen from a distance of 10 miles, the stacks and transmission towers would blend into the overall view and would not substantially alter the visual character or views of the landscape.

Lava Beds National Monument. The stacks would not be visible from the closest edge of the monument. It would also be unlikely that any proposed transmission towers would be visible from high points within the Monument, given that the Captain Jack Substation and the transmission towers connecting transmission lines to the substation were not visible from overlooks at varying elevations within the park during a field visit in June 2002. Even with a high-powered spotting scope, the substation and its transmission towers could not be located (Eisert, 2002). The Facility's location in the far background would mean that a transmission tower that could be within the line of sight from the monument's higher elevations would be barely detectable, if detectable at all. Because the transmission tower would be small in the overall view, these features would have little or no impact on the character or quality of views from the monument.

Lower Klamath Lake NWR and Tulelake NWR Wildlife Overlooks. Seen from a distance of 11 to 15 miles, the transmission towers would blend into the viewshed and would not substantially alter the visual character or views of the landscape. Any views would likely be blocked by vegetation in the foreground and by Buck Butte and other hills south of the Facility and north of Malin.

Bloody Point, Petroglyphs, and Battle of Scorpion Point Vista Points. The line-of-sight analysis indicates that at least one transmission tower could be visible from these vista points. The stacks would not be visible. Seen from these distances (between 9 and 19 miles), the towers would blend into the viewshed and would not substantially alter the visual character or views of the landscape. It is also likely that these views would be blocked by Buck Butte and other hills south of the Facility and north of Malin.

Recommended Mitigation Measures. No measures beyond those included in the proposed project are recommended to mitigate impacts, because impacts to designated scenic areas would not occur. Visual impacts to other areas would not be significant.

Impact 3.8.2. Impacts from Facility lighting would be minimal.

Assessment of Impact. The Energy Facility would use nonglare, low-impact lighting with shielded or cutoff fixtures. This system would minimize the lighting impact on the immediate vicinity while maintaining low to zero intensity above a horizontal axis. Outdoor lighting would be directed downward and at the Facility site and equipment, and would not be directed offsite. Lighting would be kept to the minimum required for operator safety requirements and maintenance work. Security lighting would utilize motion detection equipment rather than constant floodlights. The exhaust stacks and transmission towers would not require lighting or aircraft warning beacons.

At night, outside lighting at the Facility would be visible in the sky in the vicinity of the site. The closest recreational, scenic, or protected area to the site is the OC&E Woods Line State Trail, approximately 8 miles from the Facility. This is a day-use cycling and hiking trail; therefore, trail users would not be impacted by night lighting. Other scenic resources that would have views to the Energy Facility would be BLM’s Miller Creek ACEC and the Volcanic Legacy Scenic Byway. The Miller Creek ACEC, a day-use area, would be 10 miles away and would not be impacted. Downcast lighting at the Facility would be so far distant (21 miles away) from the scenic byway that it would be imperceptible. Therefore, no significant impacts would occur.

Recommended Mitigation Measures. No measures beyond those included in the proposed project are recommended.

3.8.3 Cumulative Impacts

The project study area was established by EFSC as a radius of 30 miles around the project site. However, for purposes of cumulative impacts, the visual resource impact area is determined by scenic locations from which the proposed Facility can be viewed. These locations are described in Section 3.8.2. The proposed Facility would not have any adverse effect on aesthetic or scenic resources. Consequently, the project would not contribute to past or current actions resulting in cumulative impacts on this element of the environment. If additional electric transmission lines were constructed in proximity to the proposed Facility’s transmission lines, they could have a cumulative negative effect on aesthetic resources by creating a cluttered appearance that detracted from the natural environment.

TABLE 3.8-1
Resources Identified as Scenic or Aesthetic

Resource	Jurisdiction	Applicable Plan Designation	Approximate Distance from Energy Facility (miles)	Approximate Distance from Southernmost Transmission Towers (miles)	Line of Sight to Stacks or Transmission Towers? (N = no, Y = yes)
Lava Beds National Monument	National Park Service	No scenic designation	22	17	N, Y
Sycan National Wild and Scenic River	USFS/Fremont and Winema NF	Wild and Scenic River	21	21	N, N
North Fork Sprague River (Wild and Scenic River)	USFS/Fremont and Winema NF	Wild and Scenic River, Scenic and Recreational Area	27	27	N, N
OC&E Woods Line State Trail	OPRD	Rails to Trails route, no scenic designation	9	8	Y, Y
Bloody Point	Modoc County	Historic Site with vista point	14	9	N, Y
Petroglyphs	Modoc County	Historic Site with vista point	22	16	N, Y
Battle of Scorpion Point	Modoc County	Historic Site with vista point	24	19	N, Y
Volcanic Legacy Scenic Byway (US 97 in Oregon)	ODOT/Klamath County	National Scenic Byway	21	20	Y, Y
US 97	Caltrans	Eligible Scenic Highway	21	20	N, N
SR 161	Caltrans	Eligible Scenic Highway	14	9	N, Y
SR139	Caltrans	Eligible Scenic Highway	14	9	N, Y
Modoc Volcanic Scenic Byway	USFS, Modoc County	National Scenic Byway	15	10	N, Y
Bear Valley National Wildlife Refuge Observation Area	USFWS	Wildlife observation, no scenic designation	28	25	N, N
Lower Klamath National Wildlife Refuge Wildlife Overlook	USFWS	Wildlife observation, no scenic designation	19	15	N, Y
Tulelake National Wildlife Refuge Wildlife Overlook	USFWS	Wildlife observation, no scenic designation	17	11	N, Y
Klamath Wildlife Refuge	ODFW	State Wildlife Refuge, no scenic designation	22	20	N, N
Miller Creek ACEC	BLM, Klamath Falls	BLM Area of Critical Environmental Concern with scenic value	10	10	Y, Y
Bumpheads Special Area	BLM, Klamath Falls	BLM Special Botanical/ Habitat Area with scenic value	15	15	N, N

BLM = Bureau of Land Management
NF = National Forest
ODFW = Oregon Department of Fish and Wildlife
ODOT = Oregon Department of Transportation
OPRD = Oregon Parks and Recreation Department
OSU = Oregon State University
USFS = U.S. Forest Service
USFWS = U.S. Fish and Wildlife Service

Figure 3.8-1
11 x 17
Color
Front

Figure 3.8-1
11 x 17
Color
Back

Figure 3.8-2
11 x 17
Color
Front

Figure 3.8-2
11 x 17
Color
Back

3.9 Cultural Resources

Cultural resources, also called heritage resources or historic properties, include resources significant in American history, architecture, archaeology, engineering, and traditional culture. Historic properties can include archaeological sites, examples of historic architecture and engineering, or resources of heritage significance to Native Americans and other cultural groups. Historic properties may be districts, sites, buildings, structures, or objects.

The significance of historic and cultural properties lies both in their heritage and their scientific value. Historic sites and historic architecture and engineering are embodiments of a technological and historical heritage. Archaeological sites are the raw material from which scientists reconstruct specific events and general trends of prehistory, and therefore have scientific value. Traditional cultural properties embody significant patterns of culture.

Cultural resource investigations have been conducted in cooperation with The Klamath Tribes. A Cultural Resources Management Plan (CRMP) would be prepared in consultation with the Tribes that describes monitoring activities during construction of the Facility and the actions to be taken if an unanticipated cultural resource site discovered during construction or operation would be managed and protected.

Three cultural sites have been identified in the area of the proposed Energy Facility, but would be avoided during construction, operation, and retirement of the Energy Facility. No impacts would occur.

The information presented in this section is based on the studies and analysis conducted for the SCA as amended by Amendments No. 1 and No. 2, filed with EFSC on July 25, 2003, and October 15, 2003, respectively, and the *Cultural Resources Technical Report* (COB Energy Facility, LLC, January 2003). The *Cultural Resources Technical Report* was prepared to discuss field survey results and describe site locations. The technical report also included an oral history and ethnographic study. Because of the sensitive nature of this report, a separate submittal would be provided to EFSC and the Oregon State Historic Preservation Office (SHPO) but would not be made available to the general public.

3.9.1 Affected Environment

3.9.1.1 Prehistoric Background

Archaeological evidence suggests that humans have occupied south-central Oregon for at least the past 11,000 years. The remains of now-extinct Pleistocene megafauna in association with cultural materials have been reported in a few locations, including lower Klamath Lake about 15 miles southwest of the Facility. Published radiocarbon dates indicate that most of the Pleistocene megafauna became extinct in North America about 11,000 years ago (Minor, et al., 1979). Additional evidence for early human occupation of the area is provided by reports of a single Clovis-type fluted point found on the surface at two locations in the Lost River area (Howe, 1979).

Currently, chronological divisions of human prehistory in Oregon are divided into two stages, Paleo-Indian (11,5000 B.P. and 10,000 B.P) and Archaic. The Archaic stage is usually divided into Early (10,000 B.P. to 6000 B.P), Middle (6000 B.P. to 2000 B.P.), and Late Archaic

(2000 B.P. to contact with Euroamericans around 1850 A.D.) periods (Beckham and Minor, 1992; Gilsen, 1989).

Paleo-Indian Stage. Not far from the Energy Facility is a site with a Western Stemmed complex component documented. The West Lost River site (35KL972) contained diagnostic projectile points and obsidian artifacts with thick hydration rinds suggesting occupation between about 10,000 and 5,500 years ago. The extremely sparse tool kit and debitage analysis suggest the occupants were highly mobile hunter-gatherers (Wilson, et al., 1996:1-19).

Archaic Stage. Excavations in the 1960s at the Nightfire Island site (CA-Sis-4) and other nearby sites located at Lower Klamath Lake produced extensive evidence of multiple pre-historic occupations as much as 6,000 years old (Sampson 1985:104-105). The site contains deep, stratified cultural deposits that represent over 6,000 years of human occupation of the Klamath Basin. Sampson (1985) suggests that from ca. 7250-4950 B.P. (5300-3000 B.C.), the site was used primarily for the procurement of waterfowl (mostly coots) from the adjacent marsh. After a drop in lake level by 4950 B.P. (3000 B.C.), the site appears to have become a winter village (at a time of greater emphasis on hunting). Between 4450 and 3950 B.P. (2500 and 2000 B.C.), lake levels returned to their former condition and the archaeological record shows increased quantities of grinding equipment, bird bones (mostly coots) and the first evidence for fishing. After an abandonment period between 3250 and 2550 B.P. (1300 and 600 B.C.), Sampson inferred an occupation of the site associated with increased emphasis on fishing. High densities of fish remains were deposited at the site by 1650 B.P. (A.D. 300) and by 650 B.P. (A.D. 1300), the site was dominated by fishing activities and apparently no longer functioned as a village.

3.9.1.2 Ethnographic Background

The region was traditionally inhabited by the Modoc Indians who, in historical times, comprised three subgroups. The Modoc territory was located south of Klamath Falls, Oregon, and extended south into California to Mount Shasta. The eastern boundary of the territory extended to an area just west of Goose Lake. The Langell Valley south of the Lost River was inhabited by the Kokiwa or “people of the far out country” group of Modoc Indians. The Modoc were similar culturally to their neighbors the Klamath Indians, who occupied the territory to the north.

The Modoc followed a subsistence round that was dependent on the availability and abundance of local resources. In the spring, the Modoc left their winter villages and moved to other locations along rivers and near lakes where fish (suckers) could be easily caught during the spring runs. As the fish runs decreased, the Modoc would move into favored root gathering grounds to collect epos, camas, arrowroot, and sego lilies. The Modoc hunted deer, antelope, and mountain sheep well into late summer. Berries were also collected in late summer when they ripened at the higher elevations. In late fall the Modoc returned to their winter villages with caches of dried fish and meat. They rebuilt their earth lodges and gathered firewood in preparation for the winter months. During the winter months the people relied on their caches of fish, meat, and vegetal foods. Ice fishing and deer hunting continued through the winter but to a lesser degree.

Modoc territory was divided into three geographic areas and the residents of each were known by a distinctive name. The *Gumbatwas ("people of the west")* were the Modoc who lived west of a line following a ridge between Lower Klamath Lake and Lost River Valley, to the northwestern corner of Tulelake, then through the lake to its southeastern corner, then southeastward to the southern tribal boundary. Modoc living east of this line, except for the lower valley of Lost River, were *Kokiwas* ("people of the far out country"), referring to their remoteness from the more concentrated population centers of the lower Lost River Valley and the Lower Klamath Lake region. Many Kokiwas villages were located on the far reaches of Lost River, east of Lost River Gap (now Olene Gap), with a heavy concentration in Langell Valley. The Modoc of Lost River Valley from the gap to Tulelake were *Paskanwas* ("river people"). These divisions were strictly geographical, not ethnic or political (Ray, 1963:202-203).

The permanent villages of the Modoc generally consisted of three to seven earth-covered lodges and associated structures. Sometimes villages might have as many as ten to fifteen lodges. More commonly, when a local population expanded a new village was established in a nearby location, as occurred again and again in Langell Valley (Ray, 1963:204). Ray (1963:204-211) provided a list of known Modoc villages occupied through the mid-1800s.

Villages in the Kokiwas area identified by Ray include #33 (*Pé owas*), a small permanent village on Lost River near the mouth of the East Branch of the Lost River, and #34 (*Ulgá na*), a permanent village on the Lost River near the present town of Langell Valley, one of many such villages lining the river both north and south of this site. A great many housepits were still visible in these locations in the early 1900s (Ray, 1963:210). In addition, Ray (1963:Map 2) depicted a ritual center as being a location somewhere on the west side of the Lost River just north of *Pé owas* and a good deal south of *Ulgá na*. This ritual center was located well to the south of the Facility area. Howe (1968:155) noted that favored places for villages seemed to be where there were riffles in the river or where a spring fed into a stream. Such conditions existed at the Hot Springs in Langell Valley.

The Modoc lived in the lower Klamath Basin until the time of historical contact. In the fall of 1872, tensions between white settlers and the Modoc mounted and the Modoc Indian War of 1872-1873 broke out. Following the war, surviving Modoc tribal members were placed on a small reservation in Oklahoma (Klamath County Historical Society, 1984).

3.9.1.3 Historical Background

In the early to mid-1800s, southern Klamath County was visited by a number of early travelers and explorers. In 1864, a Treaty was signed by the U.S. Government, the Klamath and Modoc Tribes, and the Yahooskin Paiute, resulting in the creation of the Klamath Indian Reservation north of Klamath Falls. In 1882, farmers begin irrigating in the Klamath Basin. In 1906, construction began on the A Canal using horse teams. In 1908, President Roosevelt established the Lower Klamath National Wildlife Refuge, the nation's first waterfowl refuge. In 1911, the Clear Lake National Wildlife Refuge was established and construction began on the Lost River Diversion Dam and Lost River Diversion Channel. In 1917, 175 homesteaders filed for 42 tracts of land and Klamath Falls began to grow rapidly (while other towns such as Merrill, Malin, and Midland grew more slowly or lost residents). During the 1920s, construction began on the Link River Dam at the mouth of Upper Klamath Lake, the Lower Lost River Diversion Dam (Anderson-Rose Dam), the J Canal to serve the

Tulelake area, and the Miller Diversion Dam, Gerber Dam, and North Canal in Langell Valley. Following World War I and World War II, homesteaders came to the area to farm.

3.9.1.4 Investigation Results

Previous Investigations. In early 2002, a site records and cultural resource investigation literature search was conducted by CH2M HILL at the State Historic Preservation Office in Salem. Recorded cultural resources within one-half-mile or less radius of the proposed electric transmission line include: OR-KL-7,OR-KL-122; 35-KL-817, 35-KL-818, 35-KL-1328, 35-KL-2173, 35-KL–2174, and 35-KL-2175. In addition to previous work by CH2M HILL for the proposed Lorella Pumped Storage project (Cox, 1994), two other important surveys were conducted in the immediate vicinity of the proposed electric transmission line by Ross (1995) and Mutch (2000). Recorded cultural resources within one-half-mile or less radius of the proposed Energy Facility site include: 35-KL-1330, 35-KL-1331, and 35-KL-1332. Recorded cultural resources within one-half-mile or less radius of the proposed natural gas pipeline include: 35-KL-971 and –972.

Current Investigations. The entire footprint of the Energy Facility was examined in the field for evidence of surface or buried cultural resources. When cultural materials were discovered, they were temporarily pin-flagged until observable artifacts associated with the site were identified and their spatial extent determined. The cultural features and archaeological sites were formally recorded on State of Oregon Archaeological Inventory forms. Tribal crew members contributed to the descriptions of the cultural features where they had specific knowledge that helped to interpret site function or traditional usage. While cultural features were being photographed and measured, tribal representatives working with the archaeologists were able to make pertinent observations about the condition and integrity of the features. The field survey identified 21 isolated artifacts and nine sites.

Three of the nine cultural sites identified in the analysis area are likely to be eligible for listing on the National Register of Historic Places (NRHP). (The NRHP does not list any cultural sites in the analysis area.) Direct consultations were conducted with The Klamath Tribes regarding the survey and discovered resources. The Confederated Tribes of the Siletz were contacted regarding cultural interests near the proposed Energy Facility. The Siletz Tribe indicated that the Tribe has no specific cultural concerns regarding the Facility (McClintock, 2002). Sites likely to be eligible for NRHP listing are described below.

Archaeological Site 35-KL-2175. Archaeological site 35-KL-2175 is a large, dispersed lithic scatter containing waste flakes (the by-product of stone tool manufacture), tools, and a depression feature. The site is likely to be eligible for listing on the NRHP under criterion "d" for its ability to yield information important to the understanding of American prehistory.

Archaeological Site PAS-3. Archaeological site PAS-3 is also a dispersed lithic scatter containing waste flakes and tools. This site would be eligible for listing on the NRHP under the same criterion as archaeological site 35-KL-2175. It would also qualify as an archaeological site under the Oregon statutes.

Cultural Site PAS-4. Cultural site PAS-4 is a series of four, partially buried stone features that are of cultural and religious value to The Klamath Tribes.

In addition the field surveys, an oral history and ethnographic study was conducted of the project area. Klamath tribal members were interviewed regarding their knowledge of past and present tribal uses of the project area. Although the area was generally identified as containing hunting and vision quest sites in the past, and to some degree more recently, the area is not considered likely to have Traditional Cultural Properties as defined by criteria in the National Historic Preservation Act and National Register Bulletin 38.

3.9.2 Environmental Consequences and Mitigation Measures

As described below, the proposed Energy Facility would have no significant unavoidable adverse impacts on cultural, archaeological, or historical resources.

Impact 3.9.1. None of three known cultural sites would be affected by construction and operation of the proposed Energy Facility.

Assessment of Impact. The electric transmission line and the water supply pipeline have been moved from their original locations to avoid any impacts to 35-KL-2175 and PAS-3, respectively. Cultural site PAS-4 also would not be impacted by Facility activities.

Archaeological and cultural sites would be temporarily flagged in the field and on project construction maps during construction. A CRMP would be developed in coordination with the Klamath Tribe. The CRMP would include specific protocols and procedures for protection of known cultural sites, including the presence of archaeological construction monitors during construction to prevent accidental impacts to the known cultural sites. The CRMP would also address the long-term management of the known resources.

Recommended Mitigation Measures. No measures beyond those included in the proposed project are recommended.

Impact 3.9.2. Unknown cultural resources could be adversely affected by the proposed Energy Facility.

Assessment of Impact. Based on the three sites identified during the field surveys, currently unknown properties of cultural significance to Native Americans or other cultural resources could be disturbed during construction of the proposed Energy Facility. Excavation might uncover subsurface resources or reveal resources covered by vegetation during the field surveys.

In addition to the protocols for protecting known cultural sites, the CRMP would include a section on Accidental Discovery of Cultural Resources. Specific protocols and procedures for protection of cultural sites identified during construction would include the presence of archaeological monitors to prevent accidental impacts to any resources discovered during construction.

Recommended Mitigation Measures. No measures beyond those included in the proposed project are recommended.

3.9.3 Cumulative Impacts

The proposed Facility would not have any adverse effect on cultural resources, and consequently would not contribute to cumulative impacts on this element of the environment. Past activities such as cattle grazing, agricultural pursuits, and road construction may have impacted cultural sites. However, for most of these activities no cultural resource investigations were undertaken. Consequently, the extent of potential impacts is unknown. Current farming practices in the vicinity of the project may also be impacting cultural resources, but the extent, if any, is unknown. There are no reasonably foreseeable projects in the vicinity of the proposed Energy Facility that would lead to cumulative impacts on cultural resources.

3.10 Land Use Plans and Policies

The proposed Energy Facility, including the Energy Facility site, electric transmission line, natural gas pipeline, and water supply well system and pipeline, would comply with the Klamath County Land Development Code (LDC) and the Klamath County Comprehensive Plan (KCCP). Because of its acreage needs, the Facility would require exceptions to Goals 3 and 4 of the KCCP. Development of the Facility would result in the permanent disturbance during the 30-year operating life of the Energy Facility of 108.7 acres of land from its current use. Of this total, 51.5 acres are zoned for exclusive farmland use and 52.0 for forestry; approximately 50.7 acres of the total is subject to a Significant Resource Overlay designed to protect wildlife. The proposed project has committed to restoring 91 acres of fallow field to habitat conditions and improving another 145 acres of habitat.

The information and conclusions presented in this section are based on Exhibit K (including attachments) in the SCA as amended by Amendments No. 1 and No. 2, filed with EFSC on July 25, 2003, and October 15, 2003, respectively.

3.10.1 Affected Environment

3.10.1.1 Land Use Characteristics of the Energy Facility Site and Vicinity

The Facility consists of the Energy Facility site and related or supporting facilities, including a water supply pipeline, a natural gas pipeline, access roads, an electric transmission line, and a 31-acre irrigated pasture area with irrigation pipeline. The Energy Facility is located in a rural area where elevations range from 4,000 to 8,400 feet. The majority of the lowland areas have been converted to agricultural use. The agricultural lands include cultivated crops, irrigated pasture, unimproved pasture, and fallow fields. There are a few developed areas with residential, agricultural, and industrial uses such as farm homes, dairies, the PG&E Gas Transmission Northwest (GTN) compressor station, and the Captain Jack Substation. Table 3.10-1 summarizes the current land uses for the Facility.

The project proponent has approximately 2,700 acres under option, of which approximately 200 acres are for easement purposes and approximately 2,500 acres constitute land that would be purchased in fee title for siting the Facility.

Energy Facility Site. The Energy Facility site is located 3 miles south of Bonanza, Oregon, on the east side of West Langell Valley Road No. 520 in Klamath County. Access to the site would be from Langell Valley Road No. 520 (see Figures 2-1, Site Map, and 2-2, Facility Map). The proposed Energy Facility site would occupy approximately 50.6 acres. These areas are currently used for cattle grazing and dryland farming. Due to heavy grazing, the soil is in poor condition and not suitable to raise crops.

Electric Transmission Line. The proposed Facility would include construction of an approximate 7.2-mile electric transmission line running south from the Energy Facility to an interconnection at BPA's Captain Jack Substation. Land uses along the proposed electric transmission line route include existing electric transmission lines, fallow agricultural fields used for cattle grazing, selective historical timber harvesting of ponderosa pine woodland, open rangeland/woodlands managed by Federal and private landowners, and the PG&E GTN interstate gas pipeline system.

The ponderosa pine woodland has been selectively logged in the past; old skid roads are present in the area, but there is no evidence of recent logging activity or clearcutting. The ponderosa pine woodland is isolated in a lowland area and is surrounded by rangeland areas characterized by western juniper. Jeld Wen, the owner of most of the land that contains the ponderosa pine, indicates this stand is marginal and is estimated to be ponderosa pine Site Class IV (Ditman, 2002). The scale is I to V, with I being the best. For Class IV, dominant ponderosa pine trees would grow to be 80 to 120 feet tall in 100 years (Dilworth, 1966; Woodward, 1997).

Natural Gas Pipeline. A new gas pipeline would be required to supply natural gas to the Energy Facility. It would connect to an existing PG&E GTN gas transmission system line through a 4.1-mile-long, 20-inch-diameter natural gas pipeline constructed from the Bonanza Compressor Station. The construction easement would be immediately adjacent to and along the Klamath County ROW for Harpold County Road No. 1097 and West Langell Valley Road No. 520.

Land uses along the proposed natural gas pipeline route include irrigated pasture, a dairy, industrial land (the compressor station), farming practices related to cattle feed (alfalfa hay and grain silage), rangeland/woodlands where residences are located, and dryland farming and cattle grazing on a fallow field (the last section of the natural gas pipeline before it connects with the Energy Facility). The rangeland/woodlands in this vicinity are characterized by western juniper and do not contain merchantable timber.

Water Supply Well System and Pipeline. The source of water for construction and operation of the Energy Facility would be groundwater from a deep aquifer. Water from the water supply well system would be pumped through a 2.8-mile, 6-inch-diameter water supply pipeline to the Energy Facility site. An access road required for construction of the water supply pipeline would be removed and revegetated following completion of the pipeline.

The water supply pipeline would be constructed within a 60-foot-wide temporary construction area on land under ownership options by the project proponent, except for portions of the route that cross Klamath County roads. The route of the water supply pipeline crosses two Klamath County roads: East Langell Valley Road and Teare County Road 1161. In addition, the water supply pipeline would cross an irrigation ditch operated by the Langell Valley Irrigation District in three locations.

Land uses observed along the proposed water supply pipeline route include irrigated pasture, a dairy, an alfalfa hay field, open rangeland/woodlands managed by private landowners, and dryland farming and cattle grazing on a fallow field (the last section of the water supply pipeline before it connects with the raw water storage tank on the Energy Facility site). The rangeland/woodlands are characterized by western juniper and do not contain merchantable timber.

Irrigated Pasture Beneficial Use Area. Process wastewater from the Energy Facility would be managed to provide beneficial use by irrigating 31 acres of pasture. Process wastewater would be stored in two 5-MG tanks (one 5-MG tank for each 580-MW power block) prior to pumping over to and irrigating the pasture area. The pasture area would be reduced in half if one 580-MW power block is constructed and later expanded to 31 acres if the second 580-

power block is constructed. This irrigated area would produce forage crops for cattle, deer, and antelope.

3.10.1.2 Local Comprehensive Plan Land Use Designation and Zoning

The Energy Facility would be sited solely in Klamath County. Figure 3.10-1 depicts the Facility location, and shows the KCCP designations and land use zones of the Facility and adjacent properties. Table 3.10-2 identifies the zoning designations applicable to the Energy Facility. The following provides a brief description of the zoning designations:

- **Exclusive Farm Use–Cropland ("EFU-C")**. The EFU-C designation is applied to agricultural areas characterized by row crop, hay, and livestock production in which there is no predominant parcel size.
- **EFU–Cropland/Grazing ("EFU-CG")**. The EFU-CG designation is applied to areas of existing and potential use for mixed cropland and grazing. As relevant to the Facility, the same criteria in LDC Article 54 (EFU) apply to both EFU designations.
- **Forestry ("F")**. The F zone is generally applied to lands composed of existing and potential commercial forest resources and is governed by the criteria in LDC Article 55.
- **Forestry Range ("FR") regulated as EFU ("FR-EFU")**. The FR zone is applied to lands of mixed farm and forestry uses. However, the FR zone does not contain any independent land-use criteria. Rather, the individual properties zoned FR are regulated either under the EFU standards or under the F standards, depending on the property's tax status, soil classification, and predominant use. Notwithstanding the potential applicability of local EFU standards, the Klamath County Comprehensive Plan lists and describes the FR zone as forestry land use designation under Goal 4 (Forestry), and not as an agricultural land use designation under Goal 3 (Agriculture).
- **FR regulated as F ("FR-F")**. See FR-EFU above.
- **Light Industrial ("IL")**. The IL zone is intended to establish and maintain places where manufacturing, storage, and wholesale distribution can be undertaken in close proximity to one another without encroaching upon the character of the adjacent land uses.
- **Significant Resource Overlay ("SRO")**. The criteria of the SRO zone, LDC Article 57, are relevant for portions of the Facility. The resources mapped within the SRO include high-density deer winter range and medium-density deer winter range (Figure 3.10-1). The SRO permits development in a manner that does not adversely impact identified resource values.

Energy Facility Site. The Energy Facility site would occupy approximately 50.6 acres zoned Exclusive Farm Use—Cropland (EFU-C). The vast majority of the Facility would be on non-high-value soil. Of the total acreage, approximately 3.7 acres would be high-value farmland soil. The SRO designated for Big Game Winter Range would apply to 13.9 acres of the Energy Facility site.

Electric Transmission Line. The electric transmission line would originate on the EFU-C zoned Energy Facility site; thereafter, it would cross land zoned FR and F. The 154-foot-wide easement for the electric transmission line, including the transmission towers and those portions of the access road within the easement, would occupy a total of approximately 134.0 acres. New access roads to serve the transmission line would require approximately 43.0 acres and existing access roads would cover an additional 8.8 acres outside of the 154-foot-wide easement.

Approximately 17.0 acres of the electric transmission line easement are EFU-zoned land, of which 2.4 acres are high-value-soil farmland. Operation of the transmission line would not preclude grazing activities within the 154-foot-wide easement on EFU-zoned land, and with the exception of the areas occupied by the access road and tower footings, the area would be available for continued agricultural and wildlife uses. As a result, the electric transmission line would preclude only 5.3 acres of EFU-zoned land from agricultural use.

The electric transmission line 154-foot wide easement would occupy approximately 117.0 acres of F-zoned land (87.1 acres of FR and 29.9 acres of F). For safety reasons, the vegetation-control practices within the 154-foot-wide easement would preclude potential commercial timber activities on this F- and FR-zoned land. However, the actual impact to commercial forest operations would be less. Only an approximate 24.6 acres of the 117.0 acres are considered merchantable and are managed, in part, for commercial timber values (forest range). In addition, the transmission line access roads outside of the 154-foot-wide easement would occupy and preclude 4.4 acres of F-zoned land from potential commercial forest operation.

The SRO (Big Game Winter Range) designation would apply to a 82.0-acre portion of the electric transmission line 154-foot-wide easement.

Natural Gas Pipeline. With the exception of portions of the natural gas pipeline extending from the PG&E GTN compressor station to the public right-of-way, and from the public right-of-way to the Energy Facility site, the entire natural gas pipeline would be sited along existing public rights-of-way. The natural gas pipeline would originate at the plant site on EFU-zoned land, and then would cross FR-zoned and other EFU-zoned land to reach the compressor station located on IL land. The interconnection with the natural gas compressor station and lead to the road right-of-way is located in the IL zone. All but 0.8 mile of the 4.1-mile-long pipeline would be on EFU-zoned land (or IL land).

The SRO would apply to a portion of the buried natural gas pipeline, but not to the compressor station interconnect, and high-value soil would be present on the pipeline route, but not at the compressor station interconnect. Upon full soil and vegetation restoration, no soil or agricultural practices would be permanently disturbed. The small area where the pipeline crosses FR-zoned land (and which is not currently managed for commercial timber values) may not be planted in commercial timber for pipeline safety reasons.

Water Supply Well System and Pipeline. The existing Babson well, the two additional water supply wells, and the water supply pipeline would be located on EFU-zoned land. The water supply pipeline and construction easement would temporarily impact approximately 19.4 acres of EFU-zoned land. Upon completion of restoration and revegetation, there would be no permanent impacts to agricultural lands. The SRO would apply to a 7.9-acre portion of this water pipeline alternative but would not apply to the water supply well system site.

Irrigated Pasture Area. Process wastewater would be land applied to a 31-acre site designated as EFU-zoned, fallow agricultural land, and ODFW Category 2. The wastewater would be used during the growing season to irrigate pasture for cattle grazing, but the area would also be accessible to wildlife. This acreage is not included in the overall project impacts because it consists of existing fallow fields that are not currently irrigated. Irrigating the pasture area would enhance, not impact, forage for deer and antelope and cover for game birds. Approximately 5.7 acres would be temporarily impacted by an access road and pipeline to the irrigated fields. Permanent impacts would consist of a 0.5-acre access road designated as Category 2 habitat.

Infiltration Basin. A 4.7-acre stormwater infiltration basin would be constructed adjacent to the Energy Facility. This basin would lie entirely in Category 4-designated habitat and would be included in the overall assessment of Energy Facility impacts.

3.10.1.3 Plans and Policies

No Federal land use management plan is applicable to the Facility.

Klamath County is the only local government with land use jurisdiction over the Energy Facility. The County has an acknowledged comprehensive plan and zoning code. The Energy Facility would be considered a conditional use. The Energy Facility would comply with applicable local and state land use regulations, with two exceptions—Goals 3 and 4 of the Klamath County Comprehensive Plan. These exceptions are discussed below.

- **Goal 3**: Both high-value and non-high-value soil would be located within the Facility (Figure 3.10-3). On EFU-zoned lands, the Facility would exceed Goal 3's 12-acre limitation for a power generation facility on land having high-value soil (OAR 660-033-0130(17)) and the 20-acre limitation for a power generation facility on land having non-high-value soil (OAR 660-033-0130(22)). An exception to Goal 3 would be required; justification for this exception is documented in Exhibit K of the SCA, as amended by Amendments No. 1 and No. 2, filed with EFSC on July 25, 2003, and October 15, 2003, respectively.
- **Goal 4**: On F-zoned lands, the electric transmission line and the natural gas pipeline would collectively exceed the 10-acre limitation for a power generation facility on commercial forest land (OAR 660-006-0025(4)(j)). An exception to Goal 4 would be required; justification for this exception is documented in Exhibit K of the SCA as amended by Amendments No. 1 and No. 2, filed with EFSC on July 25, 2003, and October 15, 2003, respectively.

Pursuant to the LDC and ORS 215.296, the Facility would not force a substantial change in or substantially increase the cost of accepted farm practices. The Facility also would not seriously interfere with accepted forest practices on adjacent lands devoted to forest uses, would not force a substantial change in accepted forest practices on surrounding forest land, and would generally protect the viability of the agricultural economy in the area.

3.10.1.4 Consistency with Local Comprehensive Plan Land Use Designation and Zoning

The Facility would be categorized under the Klamath County code as "commercial utility facilities for the purpose of generating power for public use by sale." As such, the Facility could be permitted as a conditional use in the EFU, FR, F, IL, and SRO zones. The Facility would meet criteria for conditional use under each zone.

3.10.1.5 Conformance with Plans and Policies

The Facility is consistent with the relevant policies of the KCCP. Further, the Facility would advance Goal 9, County Economy, because it would strengthen and diversify the economic base of the County. A description of the Facility's consistency with the applicable KCCP policies follows.

- **Goal 1, Citizen Involvement: "To encourage an effective citizen participation process that would meaningfully involve phases of the County Comprehensive Planning process."**

The Facility would be consistent with this goal. EFSC site certificate rules that apply to the proposed Energy Facility provide sufficient notice and comment periods to satisfy Goal 1. The National Environmental Policy Act also requires public participation. The Facility has complied with EFSC and NEPA public-notice requirements to date, and would continue to do so. Chapter 1 of this EIS contains information on the public involvement activities conducted for the proposed Facility.

- **Goal 2, Land Use Planning: "To establish a land use planning process for the County as a basis for all decisions and actions related to use of land and to ensure an adequate factual base for such decisions and actions."**

Neither Goal 2 nor any of its specific policies would apply to the Facility, because the project proponent is proceeding under a specific, statutorily created land-use option, ORS 469.504(1)(b)(B).

- **Goal 3, Agricultural Lands: "To encourage and allow agricultural operations consistent with the well-being of individual owners and operators, and to preserve the viability of real property ownership."**

As described in Section 3.10.1.3, an exception to this goal would be required.

- **Goal 4, Forest Lands: "To encourage conservation of forest lands in Klamath County for forest uses."**

As described in Section 3.10.1.3, an exception to this goal would be required.

- **Goal 5, Open Spaces and Scenic, Historic, and Natural Resources: "To preserve open space and protect natural and scenic resources in Klamath County."**

As described in Sections 3.4, 3.5, 3.8, and 3.9, the Facility would avoid impacts to vegetation, fish and wildlife habitat, scenic views, and cultural areas, historic sites, and archaeological resources identified in the project area. The site certification process through which the proposed Energy Facility must proceed for approval, provides an opportunity for appropriate state and Federal agency review and comment.

- **Goal 6, Air, Water, and Land Resources: "To maintain and improve the quality of the air, water and land resources of Klamath County."**

As described in Sections 3.3, 3.7, and 3.10, the Facility would not adversely affect the water, air, or land resources of the state. Furthermore, the project proponent would obtain the necessary air-quality and water-quality permits and land-use approvals from ODEQ, the Water Resources Department, and EFSC through the siting process and through ODEQ's air-quality permitting process.

- **Goal 7, Areas Subject to Natural Disasters and Hazards: "To protect life and property from natural disasters and hazards."**

This goal is intended to ensure that developments that could be damaged by natural disasters, with the potential for injury to persons or property, are approved only when appropriate safeguards are in place. The Facility would satisfy this goal.

- **Goal 8, Recreational Needs: "To recognize the recreation needs of the citizens of the County and visitors."**

The Facility would be consistent with this goal. No existing recreational resources would be located within 5 miles of the Facility site, and development would not adversely impact any existing recreation trails. BLM has proposed the Modoc Trail and Bryant Mountain trails and primitive campsites, which are within 5 miles of the proposed Facility but would not be likely to conflict with the Facility.

- **Goal 9, County Economy: "To diversify and improve the economy of Klamath County as set forth herein, intending results that nurture a productive and growing economy so as to add to the well-being of all people who participate in Klamath County. All plans, designs, processes, ordinances, and goals shall give strong consideration to this goal, to amplify the healthiest economic impacts of Klamath County."**

The Facility would diversify and strengthen the economic base of the County by adding an energy facility use to a predominantly agricultural area. The Facility would provide a substantial number of construction jobs, ranging from 147 to 543 during the construction period, with an average of 352. Operation of the Energy Facility would require 25 to 30 full-time employees. The 30 permanent jobs would provide a combined annual salary of $2.75 million that would contribute to the local economy.

For agricultural and forest producers that provide easements to the Facility, the Facility would provide an additional source of income that would help such producers weather lean economic times. The project proponent's capital investment in the Facility, estimated at over $700 million, would provide tax revenues to the County over the Facility's lifetime; indirect and direct fiscal benefits to the County are calculated to be over $575 million within 32 years following mobilization. Unlike other developments, energy facilities impose very little demand upon public services. Consequently, increased tax revenues to the County would not likely have any substantial offsetting costs for public services. Finally, the Facility would help ensure that reliable power would be available for commercial and industrial customers in the Pacific Northwest in order to maintain and expand the region's economic productivity.

- **Goal 10, Housing: "To provide for the housing needs of the County."**

No specific housing policies would apply to the Facility, and the Facility would not interfere with the County's ability to provide needed housing for its citizens. As described in

Section 3.11, the region contains adequate housing for full-time Facility employees during construction and operation. The Facility would not be located on any lands designated for future residential use.

- **Goal 11, Public Facilities and Services: "To plan and develop a timely, orderly and proven efficient arrangement of public facilities and services as a framework for urban and rural development."**

The Facility would be consistent with this goal. Existing public services in the project area would remain adequate with the addition of the Facility (Section 3.12).

- **Goal 12, Transportation: "To provide and encourage a safe, convenient and economic transportation system."**

The Energy Facility site would have direct access to West Langell Valley Road, which provides convenient access to OR 70. Highway 97 would be approximately 34 miles west of the Energy Facility site. The Facility would also be close to the Klamath Falls Municipal Airport (40 miles) for air service. The Facility would require the construction of private access roads to the Energy Facility site and along the electric transmission line easement. The Facility would not otherwise require the permanent construction of new roads or other transportation facilities, nor would it create any long-term conflicts with or burdens on such facilities in the County. As discussed in Section 3.6, the existing transportation system would be adequate, with mitigation when necessary, for construction and operation of the Facility.

- **Goal 13, Energy Conservation: "To conserve energy."**

The Facility would be a state-of-the-art power generation facility that would utilize natural gas and process steam to generate power. This process is a highly efficient and clean way to produce energy for use by existing and future development in the County and throughout the western United States.

- **Goal 14, Urbanization: "[To establish urban growth boundaries] to identify and separate urbanizable land from rural land."**

No specific policies under this goal would apply to the Facility. However, in general, the Facility would be consistent with this goal. No suitable or available urban industrial land exists for the Facility in proximity to the existing natural gas, groundwater, and electric transmission line facilities. Energy facility uses such as the use proposed are permitted on agricultural land by state statute. The site is relatively remote, and the Facility would not alter or change the character of the surrounding area from rural to urban, because energy facilities in rural areas do not attract growth.

3.10.2 Environmental Consequences and Mitigation Measures

<u>Impact 3.10.1.</u> The proposed Facility would permanently disturb a total of 108.7 acres of land during the 30-year operating life of the Energy Facility, including an approximate 45.5 acres of land within the Klamath County Big Game Winter Range SRO. However, as mitigation, 91 acres of fallow field would be restored and 145 acres of habitat would be improved.

Assessment of Impact. The SRO zone would apply to portions of the Facility, including the Energy Facility site, electric transmission line, water supply pipeline, and natural gas pipeline. Under the Klamath County Code, the Deer Winter Range SRO that overlaps with the Facility is "considered to be significant[,] and conflicting uses to the resource shall be limited in order to protect the resource from irreparable harm" (LDC § 57.020).

The Klamath County Code considers facilities such as the Energy Facility to be an "extensive impact facility" and a "conflicting use" with the Big Game Winter Range. The LDC requires a conditional use permit for construction of extensive impact facilities in the SRO.

It should be noted that Klamath County mapped the SRO at a gross scale and created winter range boundaries based on property lines rather than habitat characterizations or habitat-based delineations. Of the approximately 45.5 acres of SRO permanently impacted by the Facility, approximately 13.9 acres are located at the Energy Facility site, which consists of fallow agricultural fields and provides minimal habitat and forage value for wintering deer. If the 13.9 acres were to be rated based on biological criteria rather than inclusion on the County maps, they likely would not be included in the SRO. The remaining area of permanent disturbance to the SRO would be 31.6 acres along the electric transmission line.

The electric transmission line 154-foot-wide easement would occupy 82.0 acres of SRO land; however, approximately 50.4 acres would remain available for ongoing wildlife uses. Approximately 13.9 acres of the Energy Facility site would be SRO land that would be unavailable to wildlife uses during operation. Even though the Energy Facility site is a deer resource, that habitat provides degraded forage, as described in Section 3.4 of this EIS and Exhibit P of the SCA as amended by Amendments No. 1 and No. 2, filed with EFSC on July 25, 2003, and October 15, 2003, respectively. Exhibit P also includes an explanation of the restoration and revegetation activities the proposed project would undertake to ensure that the Facility would not destroy the significance of the deer winter range.

As mitigated, the Facility would not result in a substantial adverse impact on an identified resource value. Indeed, the project proponent is complying with ODFW's policy of allowing no net loss of habitat quantity or quality and requiring a net benefit to habitat quantity or quality. The project proponent would restore 91 acres of currently fallow agricultural land to high quality deer habitat. Further, an additional 145 acres within the Facility-owned property would be enhanced and restored to improve habitat values.

No feasible alternative location exists for the Energy Facility site. There is no nonresource site of sufficient size that would provide feasible access to the three necessary resources for the Facility: (1) the Bonanza Compressor Station, (2) deep-water aquifer/Babson well, and (3) the Captain Jack substation. The project proponent has considered alternative routes for the water supply pipeline and transmission line, and the proposed routes are the most direct routes available that cause the least amount of disruption to cultural and natural resources.

The Facility is being sited to minimize adverse impacts. The Energy Facility components are situated, where feasible, to coincide with degraded forage areas and areas with poor soil quality. Further the Facility components are sized based on technical feasibility and safety considerations. In addition, although the Energy Facility site provides winter range habitat, that habitat is generally degraded, and the Energy Facility site is configured to permit onsite and contiguous mitigation opportunities that would improve the overall quality of habitat available for deer winter range use. The project proponent would be restoring or improving approximately 236 acres for higher-quality deer winter range habitat.

The water supply pipeline would be buried and the ground rehabilitated and revegetated. The area would remain available for wildlife use.

The natural gas pipeline would be buried along existing road rights-of-way. The construction area would be rehabilitated and available for wildlife use.

The electric transmission line is the most direct route reasonably available, and, in any event, vegetation control and maintenance within the easement would not impact continued wildlife use. Further, the transmission tower footings would occupy minimal land area, and the project proponent is locating these footings in areas that would minimize impacts on forage resources. The project proponent has also sited the access roads in order to minimize disruption. Indeed, the project proponent is utilizing and improving existing access roads where possible, and their use would not be frequent enough to disrupt or pose a hazard to wildlife.

Recommended Mitigation Measures. No measures beyond those included in the proposed project are recommended.

Impact 3.10.2. Operations at the Energy Facility site would have limited impact on agricultural activities.

Assessment of Impact. There would be no permanent impacts to agricultural (crop production and cultivation) practices and crop management techniques by operation of the Facility, except for the Energy Facility site. The Energy Facility site is zoned for agriculture and attempts have been made in the past at raising crops; however, the site has been heavily grazed and soil and vegetation productivity are low.

Recommended Mitigation Measures. No mitigation measures are recommended.

Impact 3.10.3. Construction of the Energy Facility would temporarily impact agricultural activities.

Assessment of Impact. Temporary construction impacts to agricultural activities (crop production and cultivation) would occur to approximately 23.5 acres of the total 43.8 acres of temporary disturbance along the natural gas pipeline and approximately 1.4 acres of the total 19.4 acres of temporary construction disturbance along the water supply pipeline. No temporary impacts would occur to agricultural activities near the Energy Facility site, evaporation pond, or electric transmission line.

The project proponent would use BMPs to construct the Facility to avoid and minimize potential impacts to agriculture activities. The following types of impacts could occur to agricultural lands and practices during construction, although the use of BMPs would reduce the likelihood of these impacts:

- Removal of standing crops within construction areas to create a safe work area
- Mixing of topsoil with subsoil and excess rock
- Soil compaction from the operation of heavy equipment on agricultural soil

- Damage to drainage tile systems from trenching or heavy equipment
- Damage to irrigation systems from trenching, heavy equipment, and other activities
- Damage to excessively wet soil, including rutting and excessive soil compaction
- Distribution of noxious weeds to uncontaminated sites, causing new infestations
- Movement of soil-borne pathogens to previously uninfected areas
- Isolation of a field, delaying its spraying, fertilizing, tillage or harvest
- Blocked or impeded access to fields due to road closures or detours
- Soil erosion
- Creation of dust

Recommended Mitigation Measures. The project proponent prepared an Agricultural and Forestry Practices Impact Mitigation Plan, SCA Attachment K-5, submitted to EFSC for review and approval. The following measures are recommended to minimize construction impacts on agricultural practices:

- Consult with landowners and farmers to address field access, revegetation, timing, and other sensitive cropping issues.
- Consult with landowners to identify the locations of drainage and irrigation systems.
- Flag tile and irrigation lines prior to construction.
- Maintain the flow of irrigation water during construction or coordinate a temporary shutoff with affected parties.
- Coordinate with farm operators to provide access for farm equipment to fields isolated by construction activities.
- Bury the natural gas pipeline and water supply pipeline with 4 feet of topcover; the pipelines would be installed under drain tiles unless the drain tiles are located deep enough to allow the pipelines to be installed above the drain tile with at least 4 feet of topcover over the pipelines and, where feasible, a 12-inch clearance between the tile and the pipelines. Where feasible and practicable, install the pipelines with greater than 4 feet of topcover where specifically requested by the landowner to allow for certain site-specific conditions or practices. Install plastic warning ribbon approximately 12 inches above the buried pipelines to provide a greater level of safety for potential future excavation activities.
- Follow an erosion and sediment control plan as part of NPDES General Construction Permit 1200-C; control the discharge from trench dewatering to avoid damaging adjacent agricultural land, crops, or drainage systems.
- Control dust emissions generated during construction, as necessary, by the control of vehicle speed, by wetting the construction area or by other means; coordinate with farm operators to provide adequate dust control in areas where specialty crops are susceptible to damage from dust contamination.
- Identify potential noxious weed and soil-borne pathogen threats before construction and develop appropriate plans for their containment.

- Require contractors to thoroughly clean construction equipment prior to moving into a new construction area or relocating from one construction area to another.
- Consult with the appropriate agencies to determine the location of noxious weeds.
- Make reasonable efforts to obtain straw bales for erosion control and straw for mulch that are free of noxious and nuisance weed contamination.
- Use Oregon-certified seed or equivalent for revegetation.
- Construct linear facilities adjacent to public rights-of-way and along property lines, and avoid bisecting fields.
- Where possible, strip and segregate topsoil from subsoil over the trench, from the trench spoil storage area, and from areas subject to grading in agricultural lands. Store topsoil immediately adjacent to the stripped area to the extent practical and replace the segregated topsoil after the trench is backfilled and the subsoil is restored to grade.
- Take suitable precautions to minimize the potential for oversize rock to be introduced into the topsoil and to become interspersed with soil that is placed back in the trench, and remove excess surface rock from agricultural soil following construction activities.
- Locate temporary access roads used for construction purposes in coordination with the landowner and any tenants. Where feasible, identify existing farm lanes as preferred temporary access roads for construction, and design and construct temporary roads with proper drainage and to minimize soil erosion.
- Restrict the operation of vehicles and heavy equipment, take other appropriate action, on excessively wet soil on the portion of the construction work area in agricultural land where the topsoil is not stripped and segregated so that deep rutting does not result in the mixing of topsoil and subsoil.

The following measures are recommended to mitigate and minimize temporary construction impacts on agricultural practices:

- Restore and return to agricultural use the areas temporarily impacted by construction.
- Restrict deep root, invasive crops that can cause damage to the buried pipelines limited to a 10-foot-wide area (centered over the centerline) directly over the pipelines.
- Restore drainage patterns to prevent ponding of water.
- Implement additional restoration efforts if visual crop deficiencies occur on the construction area.
- Inspect the construction areas for noxious weed infestations following construction and treat any new infestations resulting from construction activities.
- Use appropriate tillage on compacted agricultural land to relieve soil compaction and follow tillage with revegetation of affected areas.
- Repair or replace damaged irrigation lines or drainage tiles.

Impact 3.10.4. Construction of the Energy Facility could have temporary impacts to dairy operation.

Assessment of Impact. Impacts to dairy management would be limited to temporary impacts associated with the construction of the proposed natural gas pipeline. These impacts would occur during a period of less than 4 months. Temporary disruption of dairy operations could be caused by the deferral of crop production, impacts to soil productivity, or the interruption of drainage, irrigation, or transportation services. These areas would be fully restored and returned to use after construction. Agreements for compensation and coordination of construction have been made with the dairy.

Recommended Mitigation Measures. The following measures are recommended to minimize impacts to the dairy operation, in addition to those recommended to minimize construction impacts on agriculture uses:

- Coordinate construction and operation of the natural gas pipeline with the dairy to address field access, revegetation, construction timing, and other sensitive dairy management issues.
- Do not allow the use of herbicides along the natural gas pipeline route near the dairy as part of the weed control and revegetation activities during and following construction, because the dairy is currently in the process of obtaining Organic Certification for its milk operation.

In addition to the mitigation measures described under Agriculture, one additional measure would be employed to mitigate construction impacts on the dairy operation: following construction, dairy operation would resume on the construction area, including the permanent easements.

Impact 3.10.5. The Energy Facility site would have permanent and temporary impacts to pasture land.

Assessment of Impact. Approximately 50.6 acres of fallow field (with some limited pasture) would be permanently impacted by the Energy Facility site. Access roads and transmission towers for the electric transmission line would permanently impact approximately 0.6 acre of pasture and approximately 1.4 acres of fallow field. The water supply well system would permanently impact approximately 0.3 acre of pasture.

BMPs would be used during construction of the Facility to minimize and mitigate potential impacts to pasture activities. Potential impacts to pasture practices include temporary disruption of livestock feeding or water areas, and removal of fences where construction easements extend into pastures. Collectively, the natural gas pipeline, water supply pipeline, and electric transmission line would temporarily impact approximately 7.7 acres of pasture, approximately 25.3 acres of agricultural field, and approximately 6.4 acres of fallow field. Also, approximately 71.0 acres of fallow field (with some limited pasture) would be used for temporary construction parking and laydown areas at the Energy Facility site.

Recommended Mitigation Measures. Landowners and tenants would be consulted to develop livestock management practices to be implemented during construction. Such practices would minimize impacts to pasture activities. The following measures would be employed to mitigate potential impacts on pasture practices:

- Provide access across the construction areas at convenient intervals to allow livestock to cross.
- Construct temporary fences and gates across the construction area, as necessary.
- Repair or replace fences damaged by construction.

Impact 3.10.6. Construction impacts would occur to rangeland/woodlands along the natural gas pipeline, water supply pipeline, and electric transmission line, and permanent impacts would occur to rangeland/woodlands along the electric transmission line.

Assessment of Impact. Temporary construction impacts to rangeland/woodlands (juniper-sage habitat and sage-steppe habitat) would occur on approximately 9.0 acres along the natural gas pipeline, approximately 10.2 acres along the water supply pipeline, and approximately 47.4 acres along the electric transmission line.

Permanent impacts to rangeland/woodlands would occur to approximately 42.0 acres (31.6 acres juniper-sage habitat and 10.4 acres sage-steppe habitat) along the electric transmission line. Western juniper woodlands exist within the permanent disturbance, and removal of this invasive juniper would benefit the rangeland/woodlands. There would be no permanent impacts on rangeland/woodlands resulting from the natural gas pipeline and water supply pipeline.

The project proponent would use BMPs to construct the Facility to avoid and minimize potential impacts to rangeland/woodlands. Potential impacts could include temporary disruption of livestock feeding or water areas and removal of fences where construction easements would extend into rangeland. The use of BMPs would reduce the likelihood that these impacts would occur.

Recommended Mitigation Measures. The following measures would be employed to minimize impacts on rangeland/woodlands:

- Consult with landowners and tenants to minimize conflicts with range operations.
- Provide access at convenient intervals to allow livestock to cross the construction area.
- Construct temporary fences and gates across the construction area as necessary to maintain livestock usage.
- Confine construction activities to permanent easement area.
- Designate equipment travel routes.
- Design and construct new access roads with proper drainage and to minimize soil erosion.
- As feasible, minimize work on excessively wet soil so that soil productivity is preserved or can be restored.
- Follow an erosion and sediment control plan as part of the NPDES General Construction Permit 1200-C.

- Control dust emissions generated during construction, as necessary, by the control of vehicle speed, by wetting the construction area, or by other means.
- Identify potential noxious weeds and incorporate measures to control their spread and establishment in the construction and revegetation plans.
- Clean construction equipment prior to relocating equipment from one area to other areas.
- Consult with agencies to determine the location of noxious weeds.
- Make reasonable efforts to obtain straw bales for erosion control and straw for mulch that are free of noxious and nuisance weed contamination.
- Use Oregon-certified seed or equivalent for revegetation.

The following measures would be employed to mitigate impacts on rangeland/woodlands:

- Revegetate temporary disturbance areas as soon as practical after construction.
- Repair damages to rangeland that result from construction and operation of the Facility.
- Disk or rip compacted soil to relieve soil compaction in temporary construction areas, and leave the areas in a condition ready for restoration.
- Treat new weed infestations resulting from construction activities.
- Repair or replace fences damaged by construction.
- Restore temporary access roads to preconstruction condition or better, unless otherwise specified in the landowner easement agreement.

<u>Impact 3.10.7. Permanent impacts would occur to forest ranges along the electric transmission line.</u>

<u>Assessment of Impact</u>. Permanent forest impacts would be limited to approximately 12.4 acres of privately and federally owned commercial timberland within the southern third of the easement for the electric transmission line. This acreage would include the permanent improvements (footings, access roads, and vehicle turnaround areas). This commercial timberland is an isolated stand of ponderosa pine surrounded by juniper woodland. As stated above, this stand is of marginal value. Construction activities would not interfere with forest operations on adjacent land because the timber value is marginal and the stand is limited is size.

The permanent impacts would occur where timber would be cleared for staging, material laydown, temporary access, elimination of hazard trees, and to create a safe work area; and where the height of vegetation would be controlled during operation of the electric transmission line. Clearing and controlling vegetation height would be required for safe and uninterrupted operation of the electric transmission line.

The project proponent would use BMPs to construct the Facility to avoid and minimize potential impacts to forest land. The following lists the types of potential impacts that might occur, although the use of BMPs would reduce the likelihood that these situations would occur:

- Precommercial and premature harvesting of timber and deferring tree growth and productivity where vegetation height would be controlled
- Increased distribution and establishment of noxious weeds along vehicle access routes and at disturbed soil areas
- Increased windthrow hazard to trees next to the permanent easement
- Increased soil erosion during construction and during the interval between construction and the reestablishment of a vegetative cover on the construction area
- Increased dust from access roads
- Increased soil compaction from roads and the operation of heavy equipment on forest soil
- Interference with livestock grazing practices on forestland
- Increased exposure to sunlight (sidelighting) along cleared easement
- Damaged trees from herbicide spray drift during vegetation maintenance in the permanent easement

<u>Recommended Mitigation Measures</u>. The following measures would be employed to minimize temporary and permanent impacts on forest practices, as follows:

- Consult with forest landowners to minimize conflicts with forest operations.
- Confine construction activities to the electric transmission line easement.
- Designate equipment travel routes and limit equipment operation outside those routes.
- Design and construct access roads with proper drainage and to minimize soil erosion.
- Take appropriate action to minimize rutting on excessively wet soil.
- Follow an erosion and sediment control plan as part of NPDES General Construction Permit 1200-C.
- Control dust emissions generated during construction, as necessary, by the control of vehicle speed, by wetting the construction area, or by other means.
- Require contractors to thoroughly clean construction equipment prior to relocating equipment from one area to other areas or before initially moving into a construction area.
- Consult with the appropriate agencies to determine the location of noxious weeds in the vicinity and take appropriate action to minimize the spread of noxious weeds.
- Make reasonable efforts to obtain straw bales for erosion control and straw for mulch that are free of noxious and nuisance weed contamination.

- When available, use Oregon-certified seed or equivalent for revegetation.
- Inspect for noxious weed infestations following construction.
- Inspect the restoration of temporarily-impacted timberlands.
- Provide access at convenient intervals to allow livestock to cross the construction area.
- Construct temporary fences and gates across the construction area as necessary to maintain livestock usage.

Potential impact mitigation measures for forest practices are listed below:

- Implement timberland restoration measures, as necessary, in cooperation with affected landowners.
- Repair damages to forestland that result from construction and operation of the electric transmission line.
- Disk or rip compacted forest soil to relieve soil compaction in temporary construction areas, and leave the areas in a condition ready for reforestation.
- Treat new weed infestations resulting from construction activities.
- Repair or replace fences damaged by construction.

3.10.3 Cumulative Impacts

During its 30-year operating life, the proposed Energy Facility would result in the permanent disturbance of 108.7 acres of land. Of this total, 56.7 acres are zoned for exclusive farmland use and 52.0 acres for forestry and forestry-range; approximately 50.7 acres of the total is subject to an SRO designed to protect wildlife. In conjunction with other development in the Klamath Basin, this conversion could contribute to increasing urbanization and intensification of land uses over time. However, because of its location, the unique attributes of energy facilities in general, and its dependency on local natural resources, the Facility is not expected to be a catalyst for such change, either in the immediate vicinity or within the region.

Cumulative impacts related to land use include the following:

- Conversion of agricultural and grazing land to industrial use
- Conversion of wildlife habitat to uses that would exclude wildlife

The resource impact area is generally the area encompassed by the land between and bordering West Langell Valley Road and East Langell Valley Road, plus the land bordering the proposed pipelines and transmission line. The proposed Energy Facility would convert agricultural land to industrial use for the operating life of the project. There are no known past, current, and potential future actions that would lead to cumulative impacts of conversion of the agricultural lands.

Impacts on wildlife habitat have occurred in the past and are likely to occur in the future from agricultural practices, grazing, and other disturbances. The construction and operation of the proposed Energy Facility would also contribute to these cumulative impacts.

However, the project proponent has committed to mitigation for impacts on wildlife habitat by converting 91 acres of fallow agricultural land to wildlife habitat and improving an additional 145 acres of degraded habitat.

TABLE 3.10-1
Current Land Use for the Energy Facility—Temporary and Permanent Disturbance

	Agriculture		Pasture		Rangeland		Fallow Field		Forested Range		Developed		Totals	
Description	**Temp.**	**Perm.**	**Temp.**	**Perm.**	**Temp.**	**Perm.**	**Temp.**	**Perm.**	**Temp.**	**Perm.**	**Temp.**	**Perm.**	**Temp.**	**Perm.**
Energy Facility site	0.0	0.0	0.0	0.0	5.4	0.0	116.2	50.6	0.0	0.0	0.0	0.0	121.6	50.6
Water supply well system	0.0	0.0	1.3	0.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.3	0.3
Natural gas pipeline	23.9	0.0	0.8	0.0	12.0	0.0	3.5	0.0	0.0	0.0	3.6	0.0	43.8	0.0
Water supply pipeline	1.4	0.0	6.3	0.0	10.9	0.0	0.8	0.0	0.0	0.0	0.0	0.0	19.4	0.0
Electric transmission line	0.0	0.0	0.0	0.0	49.8	44.1	1.1	0.8	14.0	12.4	0.0	0.0	64.9	57.3
Irrigation pipeline and access road	0.0	0.0	0.0	0.0	0.0	0.0	5.7	0.5	0.0	0.0	0.0	0.0	5.7	0.5
Total	25.3	0.0	8.4	0.3	78.1	44.1	127.3	51.9	14.0	12.4	3.6	0.0	256.7	108.7

Notes:
Developed land includes county roads.
Rangeland includes juniper-sagebrush, sage-steppe, and ruderal vegetation types.

TABLE 3.10-2
Zoning for the Energy Facility—Permanent Disturbance

	EFU Zone*		Forestry Zone*		Industrial Zone		Total	SRO	
Description	**Acres**	**%**	**Acres**	**%**	**Acres**	**%**	**Acres**	**Acres**	**%**
Energy Facility site	50.6	100	0.0	0	0.0	0	50.6	18.6	37
Water supply well system	0.3	100	0.0	0	0.0	0	0.3	0.0	0
Natural gas pipeline	0.0	0	0.0	0	0.7	0	0.7	0.0	0
Water supply pipeline	0.0	0	0.0	0	0.0	0	0.0	0.0	0
Electric transmission line	5.3	9	52.0	91	0.0	0	57.3	31.6	55
Irrigated pasture access road	0.5	100	0.0	0.0	0.0	0	0.5	0.5	100
Total	56.7	57	52.0	53	0.0	0	108.7	50.7	52

TABLE 3.10-2
Zoning for the Energy Facility—Permanent Disturbance

	EFU Zone*		Forestry Zone*		Industrial Zone		Total	SRO	
Description	Acres	%	Acres	%	Acres	%	Acres	Acres	%

* Includes lands zoned Forestry (F) and Forestry Range (FR)-F.

SRO = Significant Resource Overlay

Figure 3.10-1
11 x 17
Color
Front

Figure 3.10-1
11 x 17
Color
Back

Figure 3.10-2
11 x 17
Color
Front

Figure 3.10-2
11 x 17
Color
Back

Figure 3.10-3
11 x 17
Color
Front

Figure 3.10-3
11 x 17
Color
Back

3.11 Socioeconomics

Population has been growing in Klamath County at less than 1 percent per year over the last decade, which was approximately one-half of the state's growth rate. Communities within a 30-minute drive are Bonanza, Klamath Falls, and Malin, with populations of 415, 19,462, and 638, respectively. In early 2002, the unemployment rate in Klamath County was approximately 13 percent, primarily because of declines in the construction and mining sectors. In 2000, housing vacancy rates were around 3 percent for owner-occupied housing and 9 percent for rental housing.

Construction of the Energy Facility over a 23-month period would require an average of 352 workers and a peak of 543 workers. Operation of the Facility would require approximately 30 workers. Given the current unemployment rate, the majority of workers during construction and operation would likely be hired from the local community. If workers were needed from outside the area, sufficient housing opportunities would be available for them. There would be no significant unavoidable adverse impact.

The information presented in this section is based on the studies and analysis conducted for the SCA as amended by Amendments No. 1 and No. 2, filed with EFSC on July 25, 2003, and October 15, 2003, respectively.

3.11.1 Affected Environment

A relatively large area around the proposed Energy Facility and supporting facilities was identified as the project area to assess potential socioeconomic impacts. The project area encompasses portions of Klamath County, Modoc County, and Siskiyou County, and includes the communities of Bonanza, Klamath Falls, Merrill, Malin, Dorris, and Tulelake.

3.11.1.1 Population

In 2000, the Klamath County population was 63,755. The population of the four project area communities in Klamath County was 415 in Bonanza, 19,462 in Klamath Falls, 897 in Merrill, and 638 in Malin. The Modoc County population was 9,449 in 2000. Siskiyou County's population was 44,301 in 2000, and its two communities, Dorris and Tulelake, had populations of 886 and 1,020, respectively. The population of Klamath County is growing slowly, increasing less than 1 percent annually over the last decade.

3.11.1.2 Employment

Unemployment rates in the project area are high compared to the state and the nation, as shown in Tables 3.11-1 and 3.11-2. Klamath County had a 13.2 percent unemployment rate in February 2002, according to the Oregon Labor Market Information Service (OLMIS), affiliated with the Oregon Employment Department (OED). In 2000, there were 650 fewer nonmanufacturing jobs in the County than in 1999 (OED, 2002a). Most of the decrease in nonmanufacturing employment is attributed to layoffs in the construction and mining sectors (OED, 2002a). Table 3.11-3 shows that the average payroll per worker in Klamath and Lake counties is 25 percent lower than the state average and 32 percent lower than the national average.

3.11.1.3 Housing

According to 2002 census figures, Klamath County has 28,883 housing units, Modoc County has 4,807 units, and Siskiyou County has 21,947 units (Census, 2002a). There are no incorporated cities or towns in the portion of Modoc County that is in the project area. Dorris and Tulelake, in Siskiyou County, have 396 and 459 housing units, respectively. Table 3-11.1 shows that most of the population and housing opportunities in the project area are in Klamath County, primarily in Klamath Falls. The population of Klamath Falls, including the unincorporated communities of Lorella and Dairy, is 19,462, representing 31 percent of the County's population. There are 8,722 housing units, representing more than 30 percent of the housing in the County. This compares to Merrill, Malin, and Bonanza, which have 1.3, 0.8, and 0.5 percent of the housing units in Klamath County, respectively (Census, 2002a, 2002b).

In Klamath Falls, vacancy rates are 3.5 percent for owner-occupied housing units and 9 percent for rental units. There is some variation in vacancy rates among the cities in the project area depicted in Table 3.11-1, but the vacancy rates throughout Klamath County—3 percent for owner-occupied housing units and 8.5 percent for rental units—are similar to the rates in Klamath Falls.

Temporary housing alternatives (motels, hotels, and recreational vehicle [RV] parks) also exist in the project area. Accurate counts were not readily available for selected portions of the project area in northern Siskiyou County and Modoc County in California. At least 1,617 units are available for overnight accommodation throughout Klamath County. A total of 1,231 of those units are located in the project area. An additional 122 units plus two lodges (Crystalwood and Horseshoe Ranch) are located just beyond the 30-mile radius of the project area. RV park facilities are less common near the center of the project area, and none are listed in Klamath Falls. The 17 facilities listed as offering RV accommodation are located predominantly at the outer edge of, or beyond, the project area (Nuebert, 2002).

3.11.2 Environmental Consequences and Mitigation Measures

Construction of the Energy Facility would take place over a 23-month period, and would employ an average of 352 workers. If local labor was not available, the maximum monthly influx of laborers would be 543 (assuming construction labor comes from outside), representing a Klamath County population gain of 0.88 percent. Local residents would be hired to fill as many of the 30 permanent, full-time Facility operations positions as practicable.

As described below, the Energy Facility would have no significant unavoidable adverse impacts on population, employment, and housing.

<u>Impact 3.11.1. Project would result in a limited short-term and long-term population increase.</u>

<u>Assessment of Impact</u>. Limited in-migration is expected to occur as a result of construction of the proposed project. The decrease in nonfarm payroll in Klamath County, which has been led by loss of 650 jobs in the construction and mining sectors from 1999 to 2000 (OED, 2002b), is expected to provide an opportunity to hire local construction workers. Local hiring would decrease any potential short-term increases and any potential short-term

impacts related to temporary construction workforce demands. Nonetheless, workers would still be recruited from the regional labor pool and some would be attracted from outside the region. Construction workers that would relocate to the area for development of the proposed Energy Facility would not be likely to bring their families, because most construction workers would remain in the area for a short duration.

Local residents would be hired to fill as many of the 30 full-time, permanent operations positions as practicable. The unemployment rate in Klamath, Modoc, and Siskiyou counties (see Table 3.11-1) would make local hires possible, as would the competitive wages that would be offered for operations positions at the proposed Energy Facility. Because new employees hired to operate the Energy Facility would be, for the most part, existing residents of local communities, the project would result in minimal direct population increases.

Recommended Mitigation Measures. None are recommended.

Impact 3.11.2. Project would result in an increase in short-term and long-term employment opportunities in the area.

Assessment of Impact. As noted previously, construction of the proposed Energy Facility would result in the peak employment of 543 workers and an average employment of 352 workers. The jobs provided by construction of the proposed Energy Facility would help offset (on a temporary basis) the decrease in nonfarm payroll in Klamath County experienced within the last few years.

Operation of the proposed Energy Facility would also provide up to 30 permanent jobs. Like construction employment, many of these positions would likely be filled by local residents. Given the 8.2 percent unemployment rate reported for the region in 2000 (Table 3.11-2), the jobs provided by the Energy Facility would be beneficial to project area communities.

Recommended Mitigation Measures. None are recommended.

Impact 3.11.3. Proposed Energy Facility would have a short-term impact on housing.

Assessment of Impact. Construction labor needs would increase demand for housing. However, local hiring would decrease potential short-term impacts related to temporary construction workforce demands. The location of the Facility outside cities and communities, and at similar commuting distances to Klamath Falls, Merrill, and Malin, would also minimize potential impacts. The concentration of permanent and temporary alternate housing options in Klamath Falls would likely draw the majority of short-term residents to that city. The vacancy rates for Klamath Falls indicate that 360 rental housing units were available in 2000. In addition, Klamath County provides 1,617 units of overnight accommodation (hotel/motel rooms) plus two large lodges. At least 17 of these facilities also accommodate recreational vehicles. Most of these temporary housing alternatives are located within the project area.

Some housing opportunities might also exist in the unincorporated communities of Lorella and Dairy, where Klamath County records indicate vacancies for some homes. To the extent that residential opportunities were available, some construction laborers would probably opt to locate in one of these communities. No known temporary housing options such as hotels or recreational vehicle parks were identified in either community. Some additional rental and overnight accommodations might be available in Siskiyou and Modoc counties in northern California, but the sparse population in these areas and the distance to the Facility site make it unlikely that demand for these accommodations would be high.

Based on the above information, the influx of construction workers throughout the construction period would be noticeable, but would not create a substantial burden on available housing in the project area or in Klamath County.

Vacancy rates for rental and owner-occupied housing in the project area indicate that a sufficient number of housing units would be available for permanent employees at the Energy Facility. If local hiring was not possible, the addition of 30 jobs would create only a minimal impact in an area seeking to stabilize its population and workforce and planning to sustain existing levels of service. Any new residents relocating to the area for these positions would have a choice of communities offering various levels of service within commuting distance. Any potential impacts would be distributed across project area communities.

Recommended Mitigation Measures. None are recommended.

3.11.3 Cumulative Impacts

The proposed Energy Facility would employ 30 people, many of whom would be hired from local communities. There would be cumulative impacts. However, given the limited number of new residents to the project area, residential vacancy rates, and an unemployment rate higher than the state or national rate, cumulative impacts on housing and employment would likely be minor. The value of the property and project would add significantly to the local tax base. This increase would be partly offset by closure of past industrial facilities, but nonetheless would add to positive cumulative impacts of increasing and diversifying the local tax base. Potential impacts to public services resulting from population increase are discussed in Section 3.12.

TABLE 3.11-1
Housing Units, Unemployment Rates, and Vacancy Rates in Project Area

Jurisdiction	Average Annual Payroll	Unemployment Rate	Population	Housing Units	Rent	Own	Vacancy Rate (%)
Klamath County	**$29,548 (1998)**	**13.2% (Feb. 2002)**	**63,755**	**28,883**	**8,067**	**17,138**	**3.0 Owned 8.5 Rental**
Bonanza			415	152	41	98	3.9 Owned 2.4 Rental
Klamath Falls			19,462	8,722	4,010	3,906	3.5 Owned 9.0 Rental
Merrill			897	380	116	228	3.0 Owned 9.4 Rental
Malin			638	217	78	122	3.2 Owned 6.0 Rental
Modoc County	**$29,128 (Mean wage 2001)**	**8.3% (March 2000)**	**9,449**	**4,807**	**1,109**	**2,675**	**5.1 Owned 9.3 Rental**
Siskiyou County	**$29,128 (Mean wage 2001)**	**9.5% (March 2000)**	**44,301**	**21,947**	**6,084**	**12,472**	**3.0 Owned 9.2 Rental**
Dorris			886	396	105	237	4.0 Owned 11.0 Rental
Tulelake			1,020	459	157	201	5.6 Owned 18.2 Rental

Sources: Oregon Employment Department, 2002b; Census, 2002a; Census, 2002b, Oregon Economic and Community Development Department, 2002a; California Employment Development Department, 2002

Note: Unless otherwise noted, data are for the year 2000.

TABLE 3-11.2
Estimated Annual Average Labor Force for 2000

	Region	Oregon	U.S.
Civilian Labor Force	32,400	1,802,900	140,863,000
Employed	29,740	1,715,400	135,208,000
Unemployed	2,660	87,500	5,655,000
Unemployment Rate	8.2%	4.9%	4.0%

Source: Oregon Economic and Community Development Department, 2002a
Note: The region referred to includes Klamath and Lake counties.

TABLE 3-11.3
Average Annual Covered Payroll Per Worker, by Industry Division, 1999

Industry	Region	Oregon	U.S.
Agriculture, Forestry, and Fishing	$17,345	$19,221	$19,405
Construction and Mining	$26,252	$36,070	$36,345
Manufacturing	$29,928	$41,223	$41,917
Transportation, Communication, and Utilities	$34,311	$38,115	$41,144
Wholesale Trade	$26,880	$42,522	$44,144
Retail Trade	$15,659	$18,319	$17,592
Finance, Insurance, and Real Estate	$24,987	$37,789	$50,865
Services	$21,289	$27,275	$31,491
Total Private Sector	$22,767	$30,452	$33,220

Source: Oregon Economic and Community Development Department, 2002a
Note: The region referred to includes Klamath and Lake counties.

3.12 Public Services and Utilities

The following section discusses the provision of water, sewer, stormwater, solid waste, police, fire, health care, and school services in the project area. The Facility would use its own raw water supply well system and would manage its own wastewater through one of three alternatives:

- Beneficial use of the water for irrigated pasture
- Evaporation in an onsite, lined evaporation pond
- Temporarily storing onsite and hauling to a WWTP for offsite disposal

The raw water would be supplied from a deep aquifer zone not used by local residents or irrigation districts. No stormwater from the Energy Facility would enter a public stormwater system. The Facility would take steps to minimize the need for police and fire protection services. If needed, the Klamath County Sheriff and the Bonanza Rural Fire Protection District have indicated they would have adequate resources. The Energy Facility would not have an adverse impact on the ability of health care providers and educators to provide their services. Utilities and public service providers have adequate capacity to serve existing and new customers.

The information presented in this section is based on the studies and analysis conducted for the SCA as amended by Amendments No. 1 and No. 2, filed with EFSC on July 25, 2003, and October 15, 2003, respectively.

3.12.1 Affected Environment

The project area lies within a 30-mile radius of the Facility. It includes the southern half of Klamath County in Oregon, the northeastern corner of Siskiyou County in California, and the northwestern corner of Modoc County in California. In the project area there are four incorporated cities in Klamath County (Bonanza, Klamath Falls, Merrill, and Malin), two incorporated cities in Siskiyou County (Dorris and Tulelake), and no incorporated cities in Modoc County. Lorella and Dairy are unincorporated communities in Klamath County that are located within 12 miles of the Energy Facility.

Table 3.12-1 identifies providers of essential governmental services (listed in OAR 345-022-0110) in the project area. The following text describes, by service, the current service levels and proposed expansions or improvements in services for each community in the project area.

3.12.1.1 Utilities

3.12.1.2 Sewers and Sewage Treatment

Some of the larger communities, including Bonanza, Malin, Merrill, and Klamath Falls, have engineered wastewater collection and treatment systems. Klamath Falls has two Sanitary Districts: Klamath Falls Sanitary District and the South Suburban Sanitary District. Public services generally do not extend beyond the city limits of these incorporated jurisdictions, although some services are extended to serve developed areas within urban growth boundaries. Domestic sewage from ranches and residences outside of urban growth areas and in rural parts of the project area is discharged into individual, privately owned septic tank and drainfield systems.

Klamath County confirmed that sewer systems generally do not extend beyond city limits or urban growth boundaries. Residents of Klamath County, including the unincorporated communities of Lorella and Dairy, are served by private septic systems. There are no known areas of substandard septic suitability (Nelson, 2002). Jurisdictions confirmed having remaining capacity. Neither Bonanza nor Malin anticipate any sizeable increase in demand. Merrill, the Klamath Falls Sanitary District, and the South Suburban Sanitary District are planning changes or expansions to their systems. Merrill plans to replace its system. Both sewer districts in Klamath Falls anticipate increased demand as a result of industrial, residential, and commercial development, and are developing capital facilities plans to address anticipated demands (Brakeman, 2002; Meek, 2002; Matthews, 2002; Hapalla, 2002; Colahan, 2002; Newmeyer, 2002).

For the alternative of storing and hauling to a WWTP for offsite disposal, the project proponent has contacted the two municipal WWTPs in Klamath Falls—the South Suburban Sanitary District and the City of Klamath Falls Sanitary District. According to managers at both facilities, each would be required to evaluate whether they can meet the EPA categorical standard to accept industrial waste or whether local ordinance provide for acceptance of truck-hauled wastewater. Over the life of the Energy Facility, other WWTPs may be constructed or considered for management of wastewater generated at the Energy Facility. The project proponent would arrange with a trucking company to routinely haul the wastewater stored in the wastewater storage tanks at the Energy Facility to the WWTP.

There are no engineered wastewater collection and treatment systems in the Modoc County portion of the project area. No impacts are anticipated in Dorris or Tulelake in Siskiyou County because of the commuting distance from the site, limited populations, and limited housing opportunities.

3.12.1.3 Water Supply

Farms and residences in unincorporated areas of the project area obtain water from individual, privately owned wells. There are a few community potable water systems in the project area, and irrigation districts offer nonpotable water service for irrigation.

Service providers of potable water for the cities of Bonanza, Klamath Falls, Merrill, Malin, and Klamath County were contacted. Bonanza provides no public water service; its residents are served by private wells completed in a shallow zone aquifer. The other cities have adequate capacities to meet service needs. Klamath Falls has an existing capital improvement plan for its water system that includes funds to upgrade and maintain storage, distribution, and production facilities. Merrill plans to add storage and complete line replacement in the next 5 to 8 years (Brakeman, 2002; Meek, 2002; Steiner, 2002; Newmeyer, 2002). Klamath County confirmed that public water systems typically do not extend beyond city limits or urban growth boundaries. Residents of unincorporated areas, including Lorella and Dairy, are served primarily by private wells (Nelson, 2002).

Two irrigation districts, Horsefly and Langell Valley, provide irrigation water to land around the Facility. Horsefly provides irrigation water for about 7,700 acres (CH2M HILL , 1998). Langell Valley provides full service to 14,400 acres, and supplemental and variable service to additional land beyond that (U.S. Bureau of Reclamation, 1966). Irrigation district water is made available through surface water rights. Both irrigation districts draw from Gerber Reservoir through Lost River. Langell Valley also draws from Clear Lake through Miller Creek.

3.12.1.4 Stormwater

Stormwater facilities in the project area are limited because the area receives little precipitation, soil is quite permeable, and the communities are not large or dense urban areas. In rural areas, runoff drains to ditches, farm ponds, creeks, and local rivers. Most stormwater control measures are designed on a site-specific basis. There are no centralized public stormwater systems other than the system in Klamath Falls, which is administered jointly by the city and Klamath County and is reported to be in poor condition (Steiner, 2002; Newmeyer, 2002; Brakeman, 2002; Meek, 2002).

3.12.1.5 Solid Waste

Landfills. Solid waste generated in the project area is collected and hauled to one of the area's two landfills—Klamath Falls Landfill and Chemult Landfill.

Klamath Disposal (formerly USA Waste) has the hauling franchise for Klamath County, and parts of Lake, Modoc, and Siskiyou counties, including the Energy Facility site (Quifenberry, 2002). Most of the solid waste collected by Klamath Disposal is taken to the Klamath Falls Landfill, which is about 25 miles from the Energy Facility. The landfill is an unlined facility that accepts about 200 tons of solid waste per day. No hazardous waste is accepted. The Klamath Falls Landfill would cease to accept household waste in mid-2003. Construction and demolition waste would continue to be accepted for another 20 years.

The Chemult Landfill, at the north end of the Klamath County, is 70 miles from the Klamath Falls Landfill. The Chemult Landfill is an unlined facility capable of handling less than 20 tons of solid waste per day. It operates under a special ODEQ permit with an anticipated 20-year life span and only accepts waste from the north end of the County. No solid waste would be transported to the Chemult Landfill when the Klamath Falls Landfill ceases to accept household waste. There are no plans to expand either landfill (Henry, 2002).

3.12.1.6 Transfer Station Siting

The siting of a new transfer station is underway. The transfer station would collect waste to be taken by rail to Roosevelt Regional Landfill in Klickitat County, Washington. Tipping fees would almost double after the Klamath Falls Landfill is closed to household waste and that waste needs to be transported to the Roosevelt Regional Landfill. Fees would increase from the current $27 per ton to an anticipated $50 per ton (Henry, 2002).

Rabanco Regional Disposal Company, owner of Roosevelt Regional Landfill, is currently working with Klamath County to establish a transfer station. Roosevelt is permitted to accept up to 5 million tons per year of solid waste. At the current disposal rate of 2 million tons per year, it has an approximate 100-year capacity. It can accept solid waste from private haulers or through the proposed transfer station, depending on how the franchises work in a specific area. The new transfer station would be an intermodal facility and is expected to have the capability to provide rail containers to a project site to load sludge or other large quantities of waste directly into a rail container. This method of direct loading eliminates the need to tip wastes through the transfer station. Containerized wastes can be placed from delivery trucks directly into rail cars.

3.12.1.7 Police and Fire Protection

Local police and fire departments serve the communities in the project area. Outside the incorporated areas, the Oregon State Police (OSP) and Klamath County Sheriff's Department provide police protection. Table 3.12-2 lists current staffing levels for police and fire service providers in Klamath County. Mutual aid agreements exist among most service providers, and emergency response is coordinated centrally through the Klamath County Emergency Communications District covering Klamath County except Crater Lake (Thompson, 2002). Descriptions of the services offered by the service providers follow.

Police protection is provided by Klamath County Sheriff's Department in the rural unincorporated areas of Klamath County. The department serves a population of 71,000 and an area of 7,000 square miles. The main station is in Klamath Falls. One resident deputy is assigned to the Bonanza area and resides there. The resident deputy would be the primary responder to any call. Response time for first responder can be within minutes. Backup response would be provided by another deputy from the Klamath County Sheriff's Department from Klamath Falls or Chiloquin, or an officer from Malin or Merrill, depending on availability and proximity (Dailey, 2002). The Merrill Police Department, Malin Police Department, and Klamath Falls Police Department have mutual aid agreements with the sheriff's department and OSP. Each of these departments serves primarily within its city limits or urban growth boundaries (Ruddock, Broussard, and Redner, 2002).

Rural fire protection around Bonanza and Klamath Falls is provided by Klamath County Fire District #1, Fire District #4, Fire District #5, and the Bonanza Rural Fire Protection District (RFPD). Bonanza RFPD, which serves 2,000 residents and covers a 120-square-mile service area, would be the primary responder for the Energy Facility site. The Bonanza RFPD extends south to Malin (RFPD) and north to Klamath County Fire District #5. The nearest station is 3 miles from the Energy Facility site, and response time is estimated at 10 minutes (Lee, 2002).

The secondary responder to the Energy Facility site would be Klamath County Fire District #5, which has a service area of 70 square miles, covering the area around Highway 140, north of Bonanza (Longoria, 2002). Fire District #5's closest station is 10 miles from the Energy Facility.

Klamath County Fire District #1 has a mutual aid agreement with Bonanza RFPD. It has the only state-certified HazMat response team and would respond to any hazardous material spill. Fire District #1 has a 300-square-mile area of primary response, serving a population of 4,500. Four of the district's six stations are operated 24 hours a day. Station #2, the closest to the Energy Facility site, is 15 miles away, with a response time of approximately 20 minutes (Romsby, 2002).

Klamath County Fire District #4 serves a limited population consisting of the southwest portion of Klamath Falls known as Stewart Lennox. The service area is only 10 square miles and 3,000 to 4,000 residents are served. Fire District #4 has a mutual aid agreement with Bonanza RFPD, but is not a likely responder (Whisenhunt, 2002).

Keno RFPD, Bly RFPD, Malin RFPD, and the Merrill Fire Department have mutual aid agreements with Bonanza RFPD. Table 3.12-2 shows staffing levels for these service providers. Each of these service providers serves primarily within or immediately around its community. Keno and Bly are each more than 20 miles from the Energy Facility site.

3.12.1.8 Health Care

Merle West Medical Center in Klamath Falls is 35 miles from the Energy Facility site and serves the portion of the project area located in Klamath County. Merle West has remaining capacity, but does not have a trauma center. The closest trauma center is located in Bend. Bonanza Medical Clinic is 3 miles from the Energy Facility site. Lake District Hospital in Lakeview, Oregon, is about 65 miles from the site and Modoc Medical Center in Alturas, California, is about 75 miles from the site. Life Flight of Oregon is located in Bend and Medford, and provides helicopter and fixed wing transport 24 hours a day. By helicopter it is approximately 45 minutes from Bend or 35 minutes from Medford to Merle West Medical Center. When Life Flight is required, the patient is stabilized at Merle West, then sent to Bend, Medford, or Portland for treatment.

3.12.1.9 Schools

Four school districts serve the project area. Two of the four districts, the Klamath County School District and Klamath Falls City Schools, serve most of the project area. Table 3.12-3 summarizes capacity data for the public schools in the area.

All four school districts report declining enrollment. None of the districts has any immediate plans to put a bond on the ballot. Klamath Falls City Schools is considering the need for a bond to support capital improvements and maintenance, but additional capacity is not anticipated. Klamath County School District enrollment is at 86 percent capacity. Thirteen of 20 schools in the district have an enrollment of 70 to 88 percent capacity. Klamath Falls City Schools have a similar but lower enrollment-to-capacity ratio. The city’s overall enrollment is at 78 percent capacity, and enrollment in five of its nine schools ranges from 53 to 79 percent capacity. The school districts in northern California have even greater remaining capacity (Coltrane, Davis, Hamilton, and Scott 2002).

Nonpublic elementary and secondary schools also provide services in Klamath County. According to the Oregon Department of Education’s Web site, three schools offer preschool to grade 12, one school offers elementary grades only, three schools offer middle and high school grades, and two schools offer high school grades only.

3.12.2 Environmental Consequences and Mitigation Measures

The Energy Facility would not have any adverse effects on public services or utilities during its construction or operation. During construction and operation, the Energy Facility would be self-sufficient, providing its own sewage, water, and stormwater systems. The capacity of the Roosevelt Regional Landfill would be adequate to accommodate the increased demand. The local utilities would have adequate capacity to serve the residential demands of facility workers during construction and operation.

As described below, the Energy Facility would have no significant unavoidable adverse impacts on utilities or public services.

Impact 3.12.1. Energy Facility would have limited, if any, effects on the capacity of local utilities during construction, and no effects during operations.

Sewers and Sewage Treatment

The Energy Facility would generate little sanitary sewage during its anticipated 30-year operational period. Conservatively assuming that about 1 gpm or 1,500 gallons per day of sanitary sewage would be generated and discharged into a septic tank and drainfield, there would be no connection to or reliance on any public sewer system. Many of the 30 jobs created to operate the Energy Facility would likely be filled by local residents. Some employees would relocate to the area. Given the slow growth and current vacancy rates in the project area, employees that are new residents to the area are not expected to generate substantial demand for new housing units or sewer hookups from any sewer service providers. Therefore, operation of the Facility would have no adverse impact on sewer systems in the project area.

During the construction phase, a contractor would provide onsite chemical toilet service. Construction laborers not hired locally are expected to reside in existing houses or other temporary housing options that are already receiving sewer service on systems designed to accommodate the existing dwelling units or overnight accommodations. Accordingly, no substantial adverse impacts to local sewer systems would result from construction of the Facility.

Water

The sole source of water for construction and operation of the Energy Facility would be groundwater from a deep aquifer system. The deep aquifer system would be isolated from the shallow aquifer system and surface water. Under annual average conditions with supplemental duct firing, the Energy Facility would need 72 gpm from the Babson well. Under maximum consumption conditions with supplemental duct firing, that rate would increase to 210 gpm.

Nearby residents of Bonanza have expressed concern that water use at the Energy Facility would affect their available well water and the surface water available to irrigation districts. The residents obtain their water from private wells, many of which are shallow. As described below, tests conducted have shown that these residents' water source would not be affected by use of the Babson Well.

The Babson well is located approximately 2 to 3 miles east of the Energy Facility. The well is reported to have been originally drilled to depths exceeding 5,000 feet for oil and gas exploration in the 1920s, and currently has partial obstructions at depths of 1,870 and 2,050 feet. Previous borehole geophysics and aquifer testing at the Babson well (CH2M HILL , 1994) indicated the presence of two separate aquifer systems within the upper 2,050 feet of the borehole. The Energy Facility would use the deep water-bearing zones that are present below a depth of 1,580 feet to supply its water.

The shallow aquifer system (above approximately 500 feet) is a heavily appropriated basalt aquifer that is in varying degrees of hydraulic connection with the Lost River. The shallow aquifer system is used for irrigation and domestic water supply. The Energy Facility would not use any water from the shallow aquifer system. An intensive 30-day aquifer test in 1993 at the Babson well (CH2M HILL , 1994) demonstrated that the deep groundwater-bearing zones below 1,580 feet are hydraulically isolated from the shallow aquifer system and surface water in the vicinity of the Energy Facility. No other Langell Valley area wells or water rights in the deep aquifer system are known to exist.

The project proponent conducted an additional long-term aquifer test at the Babson well during 2002 at an average rate of 6,800 gpm for approximately 30 days. An expanded observation well network of 31 different locations was used that included both shallow wells and deeper irrigation wells in Langell Valley, Yonna Valley, Swan Lake Valley, Malin, and Klamath Falls. There was no hydraulic response in the observation well network to pumping the Babson well that indicated a geologic connection between the two systems. This lack of response indicates that deep aquifer system withdrawals from a reconstructed Babson well would not affect shallow aquifer system water levels or supplies. Deep aquifer response suggests extremely high aquifer transmissivity; at the end of the 30-day pumping period, water levels had recovered to the pretest static level within 5 minutes. These observations show that the roughly 294 million gallons withdrawn for this test was an insignificant quantity relative to the rate and volume of water available to the Babson well.

During construction, bottled water would be provided at the construction site for potable use. Water for construction activities would be provided by the water supply well system and purchased as necessary during well reconstruction and construction of the water supply pipeline to the Energy Facility site. Water usage during construction would be intermittent, with no more than 100 gpm required at any time. Once the water supply well system was functioning and providing water to the site, construction-related water needs would be met by the onsite system.

The Energy Facility would use water from its own water supply well system to supply the demineralized water, potable water, service water, and sanitary systems along with continued dust abatement during the testing and commissioning phase.

There would be no reliance and therefore no impact, on any public or community water system.

Stormwater

Stormwater would be managed through three systems—the plant drains system, stormwater sewer system, and offsite stormwater diversion system.

For the industrial, developed part of the site, a plant drains system would route stormwater through an o/w separator and then into a collection basin where it would be routed back into the Facility water supply system for reuse. For rooftops, parking lots, and landscaped areas, stormwater would be routed to a stormwater pond. From the stormwater pond there would be two options:

- The preferred option is to discharge the water into a 4.7-acre infiltration basin where the water would be allowed to infiltrate into the ground. This option would not impact existing public systems.

- The second option would be to discharge the stormwater from the pond into the West Langell Valley Road side ditch. The stormwater, commingled with water runoff from the road and adjacent fields, would flow approximately 8,000 feet before discharging into an irrigation canal. This option would impact the West Langell Valley Road side ditch that is owned and operated by Klamath County.

Stormwater that would run onto the site from adjacent undeveloped areas would be routed around the proposed Facility in a network of swales and drainage ditches. This stormwater would be routed to existing natural drainages that currently carry this water or to the West Langell Valley Road side ditch.

During construction, stormwater would be managed in accordance with the Facility's NPDES General Construction Permit 1200-C and an erosion and sediment control plan. Because the Facility would not rely on offsite stormwater systems, there would be no impact on the ability of service providers in the area to provide stormwater services.

Additional information on these stormwater options is provided in Section 3.3.2.

Solid Waste

The Energy Facility would produce an estimated 50 tons of conventional solid waste (such as trash) per year. Recyclables would be separated and recycled. Other waste would be stored in onsite bins to be collected periodically and hauled to a licensed disposal facility.

Under the process wastewater management alternative involving an evaporation pond, the wastewater from hydrostatic testing and flushing and the wastewater from Energy Facility operations would be treated in a lined, onsite evaporation pond. Evaporation would leave a solid waste that would occasionally be removed for disposal in a licensed landfill. This solid waste would be a nonhazardous solid waste composed of water-treatment chemicals and constituents concentrated from the raw water supply.

As described above, the Klamath County Landfill currently accepts solid waste in the project area. Eventually the solid waste from the project area would be transported by rail to the Roosevelt Regional Landfill in southern Washington. The Klamath County Landfill and the regional landfill would accommodate solid waste generated as a result of the operation of the Energy Facility. Recognizing the size and capacity of the regional landfill, there would be no adverse impacts on service providers managing solid waste in the project area

A variety of nonhazardous, inert construction wastes would be generated by the Energy Facility. As much waste as feasible would be recycled, and any nonrecyclable construction wastes would be collected and transported to Klamath Falls Landfill. The Klamath Falls Landfill has adequate capacity to accommodate anticipated quantities of construction wastes so there would be no adverse impact on service providers managing solid waste in the project area. Closure of the Klamath Falls landfill to all but construction waste in mid-2003 would require wastes from Facility operations to be sent to a regional landfill.

<u>Recommended Mitigation Measures</u>. No measures beyond those included in the proposed project are recommended.

Impact 3.12.2. Energy Facility would not affect the level of service provided by local public services.

Assessment of Impact. The proposed Energy Facility would employ approximately 30 full-time staff who would be hired as much as possible from the local area. As a result, there would be little measurable population increase attributable to the project; therefore, the proposed Energy Facility would not place additional demand on local police and fire protection services.

Short-term increases in demand for local services by the in-migration of construction workers would not cause substantial impacts on the level of service because services possess capacity adequate to accommodate the increased demand.

Police

During operations, the Energy Facility site would be fenced and access controlled. Personnel would be on duty at the Energy Facility site at all times (24 hours a day) and available to respond to concerns at other portions of the Facility. These onsite security features would minimize opportunities for theft and vandalism. Police protection as currently provided by OSP and the Klamath County Sheriff's Office is adequate to serve current demand, and could serve the demand of the Facility (Dailey, 2002). The Klamath County Sheriff's Office has provided a letter stating the office's willingness and ability to serve the Energy Facility site (Dailey, 2002).

During construction, onsite security would be provided by the construction contractor, who would provide fencing and security services.

Fire

Fire risks would be addressed during operation of the Energy Facility. The Energy Facility would have its own fire prevention, protection, and fire detection system, including a dedicated water storage system, hose stations, and fire pumps. Water storage dedicated to fire protection use would be provided onsite in accordance with or exceeding code requirements.

Facility staff would receive basic fire suppression training, which would cover only small fires that can be controlled and/or extinguished with rack hoses and fire extinguishers. If a fire exceeds the resources available, assistance from the Fire District would be requested.

Fire risks during construction would be addressed in three ways: (1) work crews would suppress any small fires that can be controlled with extinguishers; (2) if a larger fire occurs, the fire protection district and 911 would be notified immediately; and (3) during mobilization, the contractor would coordinate with the local fire marshal and fire district regarding activities at the construction site.

Bonanza Rural Fire Protection District has stated that the fire district has the capacity to serve the Facility without adversely affecting its ability to serve the surrounding community (Lee, 2002). The Energy Facility was not mentioned as a concern by the Bonanza Rural Fire Protection District. The fire chief has provided a letter stating the district's willingness and ability to serve the Energy Facility site (Lee, 2002).

Accordingly, the Facility would not have an adverse impact on the ability of local departments to provide police or fire services.

Health Care

Merle West Medical center in Klamath Falls is located 35 miles from the Energy Facility site and Bonanza Medical Clinic is 3 miles from the site. Lake District Hospital in Lakeview, Oregon, is about 65 miles from the site and Modoc Medical Center in Alturas, California, is about 75 miles from the site. Life Flight of Oregon, located in Bend, provides helicopter and fixed-wing transport. By helicopter it is approximately 45 minutes from Bend to the Energy Facility site and Life Flight patients typically are taken to Merle West to be stabilized, then sent to Portland, Bend, or Medford for treatment. According to emergency medical service (EMS) personnel at Bonanza Medical Clinic, local medical facilities and transport services (described under Section 3.13.1.1 have adequate capacity to accommodate the Energy Facility during construction and operations (O'Keefe, 2002). The Bonanza Ambulance Service provided a letter documenting its capacity to respond to calls for service (O'Keefe, 2002).

Accordingly, the proposed Energy Facility would not have an adverse impact on the ability of local service providers to provide health care services.

Schools

The Energy Facility is anticipated to require 30 full-time employees. Most of these employees are expected to be hired from the local area. There would not be a substantial increase in student enrollment resulting from families relocating to the area for the new jobs created by the Energy Facility. Any increase in enrollment could be accommodated readily based on available capacity in the public school system and the availability of private school options. Enrollment is in a general decline in Klamath County and Klamath Falls City Schools. Capacity remains in almost all schools and both districts are seeking stability in enrollment, if not growth. Private school alternatives also exist. The scenario is similar in Modoc and Siskiyou counties (see Table 3.12-3).

The Energy Facility would be constructed using local labor to the extent possible. Nonlocal construction workers are not expected to bring their families into the area because of the short duration of construction work at the Energy Facility site. Without their families, nonlocal construction workers are not expected to affect school enrollment in public or private schools. However, even if some portion of the nonlocal workforce were to bring school-aged children into the area, local schools could readily accommodate the new students.

Several factors suggest that construction of the Energy Facility would not adversely affect schools. These factors include the likelihood of local hiring of construction workers; the improbability of a temporary, nonlocal workforce bringing families to the area; dropping enrollment; and remaining capacity.

<u>Recommended Mitigation Measures</u>. No measures beyond those included in the proposed project are recommended.

3.12.3 Cumulative Impacts

The Energy Facility would be largely self-sufficient, providing it own utilities and security services; therefore, it would not affect the capacity of services provided to the local community in the future. If process wastewater is managed by storing and hauling to a WWTP, agreements would be put in place to ensure the WWTP has the capacity to manage the Energy Facility's volume of process wastewater. The Energy Facility would employ 30 people, many of whom would be hired from local communities. Given the limited number of new residents to the project area, the low growth rate, and the existing capacity of public services and utilities, cumulative impacts to utilities and other public services would not be significant.

TABLE 3.12-1
Service Providers in Facility Area

Jurisdiction	Sewage Collection and Treatment	Water Supply	Stormwater Drainage	Solid Waste	Police/Fire	Health Care/EMS	Education
Klamath County	Private septic	Private wells	NA	Klamath County—landfill; Klamath Disposal—hauler	Klamath County Sheriff; Oregon State Police/Klamath County Fire District #1, #4; #5 volunteer RFPDs	Merle West Medical Center/Klamath County Fire District #1 and #4; volunteer ambulance providers	Klamath County School District
Klamath Falls	City of Klamath Falls, South Suburban Sanitary District	City of Klamath Falls	City of Klamath Falls and Klamath County	Klamath County—landfill; Klamath Disposal—hauler	City of Klamath Falls/Klamath County Fire District #1 and #4	Merle West Medical Center/Klamath County Fire District #1 and #4	Klamath Falls City Schools
Bonanza	City of Bonanza	Private wells	None	Klamath County—landfill; Klamath Disposal—hauler	Klamath County Sheriff/Bonanza RFPD	Bonanza Clinic; Merle West Medical Center/Bonanza Quick Response	Klamath County School District
Malin	City of Malin	City of Malin	None	Klamath County—landfill; Klamath Disposal—hauler	Malin Police Department/Malin RFPD	Merle West Medical Center/Basin Volunteer Ambulance	Klamath County School District
Merrill	City of Merrill	City of Merrill	None	Klamath County—landfill; Klamath Disposal—hauler	Merrill Police Department/Merrill Fire Department	Merrill Clinic; Merle West Medical Center/Basin Volunteer Ambulance	Klamath County School District
Lake County	Private septic	Private wells	NA	Klamath County—landfill; Klamath Disposal—hauler	Lake County Sheriff/Lakeview Fire Department	Lake District Hospital/Basin Volunteer Ambulance	Lake Education Service District
Siskiyou County	Private septic	Private wells	NA	Klamath County—landfill; Klamath Disposal—hauler	Siskiyou County Sheriff/California Department of Forestry and Fire Protection	Tulelake Health Center; Butte Valley Health Center/Basin Volunteer Ambulance	Butte Valley Unified School District; Tulelake Basin Joint Unified School District
Tulelake	City of Tulelake	City of Tulelake	None anticipated	Klamath County—landfill; Klamath Disposal—hauler	Tulelake Police Department/ Tulelake Fire Department	Tulelake Health Center; Modoc Medical Center/Basin Volunteer Ambulance	Tulelake Basin Joint Unified School District
Dorris	City of Dorris	City of Dorris	None anticipated	Klamath County—landfill; Klamath Disposal—hauler	Dorris Police Department /Dorris Volunteer Fire Department	Butte Valley Health Center/Basin Volunteer Ambulance	Butte Valley Unified School District
Modoc County	Private septic	Private wells	NA	Klamath County—landfill; Klamath Disposal—hauler	Modoc County Sheriff/California Department of Forestry and Fire Protection	Tulelake Health Center; Modoc Medical Center/Basin Volunteer Ambulance	Tulelake Basin Joint Unified School District

Sources:

Sewer and water: Steiner, 2002; Colahan, 2002; Hapalla, 2002; Nelson, 2002; Parks, 2002; Newmeyer, 2002; Grounds, 2002; Brakeman, 2002; Matthews, 2002; Meek, 2002; King, 2002, Clark, 2002

Solid waste: Henry, 2002; Quifenberry, 2002

Police/Fire: Dailey, 2002; Ruddock, 2002; Broussard, 2002; Redner, 2002; Romsby, 2002; Ketchum, 2002; Lawrence, 2002; Lee, 2002; Stratton, 2002; King, 2002, Clark, 2002; Oregon State Fire Marshal, 2002

Health Care/EMS: O'Keefe, 2002; Romsby, 2002;Vickerman, 2002; Ongman, 2002; Thompson, 2002; Ketchum, 2002; Tulelake Chamber of Commerce, 2002; Butte Valley Chamber of Commerce, 2002

Education: Davis, 2002; Hamilton, 2002; Stratton, 2002

Notes:

NA = Not applicable. Public stormwater systems typically are not found outside city limits or urban growth boundaries.
None = No centralized stormwater system is administered by the city or any special district.
RFPD = Rural Fire Protection District

TABLE 3.12-2
Police, Fire, and Emergency Medical Service Summary

Jurisdiction	Police			Fire			EMS		
	Agency	**Staffing**	**Services**	**Agency**	**Staffing**	**Services**	**Agency**	**Ambulances**	**Services**
Klamath County	Klamath County Sheriff	1 sheriff 27 patrol officers plus jail and support staff	Primary response (other than highway incidents)	Klamath County Fire District #1	1 chief, 1 operations chief, 1 training chief, 1 fire marshal, 3 battalion chiefs, 3 fire prevention officers, 12 captains, 57 fire fighters, 3 office staff	Primary response for HazMat/Mutual aid	Klamath County Fire District #1 Klamath County Fire District #4	6 2	Secondary response Mutual aid
	Oregon State Police	Not available	Primary response to emergency calls for service on Oregon's State and Interstate Highways	Klamath County Fire District #4 Klamath County Fire District #5	1 chief, 20 volunteer firefighters	Mutual aid Secondary response			
Bonanza	Klamath County Sheriff	See Klamath County	See Klamath County	Bonanza RFPD	1 chief, 1 assistant chief, 20 volunteer firefighters	Primary response (except for HazMat, see Klamath Co. F.D. #1)	Bonanza Quick Response	1	Primary response
Klamath Falls	Klamath Falls Police	1 chief, 1 captain, 1 code enforcement officer, 1 code enforcement tech, 1 captain, 1 lieutenant, 8 detectives, 36 patrol officers, 1 evidence tech, 3 clerical	Mutual aid*	Klamath County Fire Districts #1, #4, #5	See Klamath County	See Klamath County	Klamath County Fire District #1 and #4	See Klamath County	See Klamath County
Malin	Malin Police	1 chief, 2 part-time officers, 2 reserves (unpaid)	Secondary response/mutual aid*	Malin RFPD	Not available	Mutual aid	Basin Ambulance	4	Mutual aid
Merrill	Merrill Police	1 chief, 3 reserve officers, 1 clerk	Secondary response/mutual aid*	Merrill Fire Department	Not available	Mutual aid	Basin Ambulance	See Malin	See Malin
Bly	Klamath County Sheriff	See Klamath County	See Klamath County	Bly RFPD	1 chief, 25 volunteer firefighters	NA	Bly Ambulance	1	NA
Keno	Klamath County Sheriff	See Klamath County	See Klamath County	Keno RFPD	1 chief, 25 volunteer firefighters, 2 office staff	Mutual aid	Keno RFPD Ambulance	2	Mutual aid

Sources:

Police: Dailey, 2002; Ruddock, 2002; Broussard, 2002; Redner, 2002; Oregon State Police, 2002

Fire: Romsby, 2002; Ketchum, 2002; Lawrence, 2002; Lee, 2002; Whisenhunt, 2002; Oregon State Fire Marshal, 2002

EMS: O'Keefe, 2002; Romsby, 2002; Vickerman, 2002; Ongman, 2002; Oregon Public Health Services, 2002

Notes:

NA = Not applicable. Provider's driving distance to COB Energy Facility precludes it from providing any services.
RFPD = Rural Fire Protection District

* The Klamath County Sheriff has a written mutual aid agreement with Oregon State Police only. Informal agreements exist with local police agencies.

TABLE 3.12-3
Summary of School District Service Level in the Facility Area

Schools by District	City/Town Served	Enrollment	Capacity	Enrollment as % of Capacity
Klamath County				
Klamath County School District				
Bonanza Schoo1—K-12	Bonanza	439	600	73%
Gearhart Elementary School	Bly	85	125	68%
Chiloquin Elementary School	Chiloquin	300	350 w/portables	86%
Chiloquin High School	Chiloquin	270	325 w/portables	83%
Gilchrist School—K-12	Gilchrist	371	470	79%
Keno Elementary School	Keno	243	275	88%
Falcon Heights Academy—K-12 Alternative School	Klamath Falls	75	100	75%
Altamont Elementary School	Klamath Falls	284	350	81%
Fairhaven Elementary School	Klamath Falls	240	250 w/portables	96%
Ferguson Elementary School	Klamath Falls	523	550 w/portables	95%
Henley Elementary School	Klamath Falls	390	400 w/portables	98%
Peterson Elementary School	Klamath Falls	503	550 w/portables	91%
Shasta Elementary School	Klamath Falls	506	506	100%
Stearns Elementary School	Klamath Falls	343	400	86%
Brixner Jr. High School	Klamath Falls	470	535	88%
Henley Middle School	Klamath Falls	420	500	84%
Henley High School	Klamath Falls	645	720	90%
Malin Elementary School	Malin	157	180	87%
Merrill Elementary School	Merrill	165	180 w/portables	92%
Lost River High School	Merrill	278	350	79%
Klamath Falls City Schools				
Fairview Elementary School	Klamath Falls	250	350	71%
Joseph Conger Elementary School	Klamath Falls	226	250	90%
Mills Elementary School	Klamath Falls	461	500	92%
Pelican Elementary School	Klamath Falls	166	250	66%
Riverside Elementary School	Klamath Falls	116	220	53%
Roosevelt Elementary School	Klamath Falls	346	375	92%
Ponderosa Junior High School	Klamath Falls	475	525	90%
Klamath Union High School	Klamath Falls	985	1,250	79%
Mazama High School	Klamath Falls	783	1,100	71%
Siskiyou County				
Butte Valley Unified School District				
Butte Valley Elementary School	Dorris	150	250	60%
Butte Valley Middle School	Macdoel	54	100	54%

TABLE 3.12-3
Summary of School District Service Level in the Facility Area

Schools by District	City/Town Served	Enrollment	Capacity	Enrollment as % of Capacity
Butte Valley High School	Dorris	84	100	84%
Cascade High School (Continuation)	Dorris	12	20	60%
Picard Community Day School (Alternative)	Dorris	3	NA	
Mahogany Community Day High School (Alternative)	Dorris	3	NA	
Modoc and Siskiyou Counties				
Tulelake Basin Joint Unified School District				
Newell Elementary School—K-2	Tulelake and Newell	179	300	60%
Tulelake Basin Elementary School—3-6	Tulelake	181	300	60%
Tulelake High School	Tulelake	240	400	60%
Tulelake Continuation High School	Tulelake	10	20	50%

Sources: Davis, 2002; Hamilton, 2002; Coltrane, 2002; Scott, 2002

Note:

NA = Not applicable. District must accommodate all students who need services.

3.13 Health and Safety

A power plant could potentially increase risk to health and safety as a result of using hazardous materials and transmitting natural gas in an underground pipeline. However, the Energy Facility would be designed with attention to the reduction of potential hazards associated with its operation and meets or exceeds state and Federal safety standards in its components. Its design includes safety and emergency systems that would be included during construction to ensure safe and reliable operation of the proposed Energy Facility. Through continuous monitoring of process variables and a thorough maintenance program, safety and reliability would be further increased. Both electric and magnetic fields (EMFs) and noise would increase but would be within allowable limits.

This section discusses health and safety matters, including occupational health and safety; fuel management; use, handling, and storage of hazardous non-fuel substances; fire protection; electric shock hazard; EMFs; and noise. The affected environment is not described in this section because there are no activities currently ongoing at the site to which these issues apply. Rather, aspects of the proposed operations at the Facility are described, followed by a discussion of their potential impacts and mitigating measures.

The information presented in this section is based on the studies and analysis conducted for the SCA as amended by Amendments No. 1 and No. 2, filed with EFSC on July 25, 2003, and October 15, 2003, respectively.

3.13.1 Construction and Operation of Proposed Energy Facility

3.13.1.1 Occupational Health and Safety

A comprehensive occupational health and safety program would be implemented to protect workers during construction and operation of the proposed Facility. The health and safety program would meet Federal, state, and local health requirements.

If an accident occurred, Merle West Medical Center, located 35 miles from the Energy Facility site, and Bonanza Medical Clinic, located 3 miles from the site, could provide medical services. Life Flight of Oregon, located in Bend, provides helicopter and fixed-wing transport. By helicopter it is approximately 45 minutes from Bend to the Energy Facility site and Life Flight patients typically are taken to Merle West to be stabilized, then sent to Portland, Bend, or Medford for treatment. According to emergency medical service (EMS) personnel at Bonanza Medical Clinic, these facilities have adequate capacity to accommodate the proposed Facility during construction and operation (O'Keefe, 2002). The Bonanza Ambulance Service provides local response to calls for service. Klamath County Fire District #1 has the only state-certified HazMat response team and would respond to any hazardous material spill.

Health and Safety During Construction. During construction, a health and safety program would be implemented by the construction contractors, based on industry standards for accident prevention. At a minimum, the construction health and safety program would comply with Federal, state, and local health and safety regulations. Contractors involved with the proposed Facility would be required by contract to comply with the construction health and safety program. Key elements of the plan would include:

- Responsibilities of construction team and subcontractors
- Job site rules and regulations
- Emergency response procedures
- Safety inspections and audits
- Medical services and first aid
- Safety meetings, employee training, and communications, including the hazard communications program and a review of procedures when performing high risk tasks
- Personal protective equipment
- Standard construction procedures
- Accident investigation and reporting

Health and Safety During Operation. An employee health and safety program would be implemented for operations personnel. It would include regular employee education and training in safe working practices; communication of hazards in accordance with Federal, state, and local standards; accident incident evaluations; administrative health and safety procedures; emergency response; fire protection and fire response; and reporting and recordkeeping of safety performance data. Operations personnel would be provided with written safety guidance similar to that used at other project proponent facilities. A first aid station containing basic first aid equipment would be established at several locations around the Facility. First aid training would be required for operations personnel.

3.13.1.2 Fuel Management

Fuels used during construction would likely include diesel fuel and gasoline. These fuels would be stored in aboveground storage tanks located within secondary containment. The chemicals would be stored in drums and containers located inside construction storage trailers.

During operations, natural gas would be delivered from the existing PG&E GTN pipeline system through a 4.1-mile natural gas pipeline constructed from the Bonanza Compressor Station to the Energy Facility along the right-of-way of existing Klamath County roads. Natural gas would not be stored onsite.

Diesel fuel would be stored onsite for the diesel-fired fire water pump. The pump would be equipped with a diesel fuel tank of approximately 100 gallons that would be used for diesel fuel storage. The diesel-fired pump and fuel tank would be located inside a concrete spill containment berm sized to contain 110 percent of the fuel tank volume.

Diesel fuel also would be used for the backup generators at the water supply well system and would be stored in skid-mounted, double-walled, diesel fuel tanks. An interior tank would be located inside a rupture containment basin. The tanks would be located inside a concrete spill containment berm sized to contain 110 percent of the fuel tank volume. Each tank would hold approximately 2,150 gallons of diesel fuel. The diesel fuel storage tanks at the water supply wells would provide sufficient diesel fuel to accommodate operation of the water supply wells for up to approximately 37 hours on diesel fuel if necessary.

3.13.1.3 Hazardous Nonfuel Substances

Several hazardous materials would be used at the Energy Facility. The following list summarizes typical chemicals currently planned for use at the proposed Energy Facility:

- Lubricants: medium and heavy weight oil, light lubrication oil, generator lube oil, and combustion turbine lube oil
- Aqueous ammonia
- Water treatment chemicals: sulfuric acid, sodium hydroxide, EDTA, hydrazine, ammonia hydroxide, sodium hypochlorite, sodium bisulfite, sodium metabisulfite, sodium nitrite, organic phosphate, sodium phosphate, lime, soda ash, magnesium chloride, polymers, filter acid, and iron chloride.
- Cleaning fluids and detergents: solvents, Pen-7 surfactant, sodium hypochlorite, and nitrogen
- Hydrogen
- Carbon dioxide

3.13.1.4 Fire Protection

During construction and operations, facility workers would receive basic fire suppression training to address small fires that could be controlled and/or extinguished with rack hoses and fire extinguishers. If a fire exceeds the resources available, assistance from the Bonanza Rural Fire Protection District (RFPD) would be requested.

3.13.1.5 Electrical Shock Hazard

Power lines can cause serious electric shocks if they are not constructed to minimize the shock hazard. Also, high-voltage transmission lines can cause nearby ungrounded metal objects to become charged, such as wire fencing mounted on wooden fence posts that prevent the energy from discharging into the ground. Providing grounding for the charged objects solves this problem.

3.13.1.6 Electric and Magnetic Fields

Transmission lines constructed to connect the Energy Facility to the regional power grid would emit electric and magnetic fields. Background on EMF fields is provided in this section.

Background. Oscillating EMFs are invisible lines of force surrounding devices that carry or use electricity. These fields are present wherever electricity is used or distributed, not just from overhead power lines but from indoor wiring, household appliances such as television sets, toasters, hair dryers, and computers. All electrical devices generate EMFs. The earth itself has a naturally occurring steady-state EMF.

The strength of EMFs falls off rapidly (exponentially) with distance. People are much more likely to be exposed to relatively high levels from appliances in their homes than from power lines, especially since most power lines are built on dedicated rights-of-way that are, by their nature, unoccupied.

Electric fields are related to voltage and are measured in units of volts per meter (V/m). When a conductor is energized, an electric field exists around the conductor that is proportional to the energized voltage. The closer to the conductor, the higher the electric field. Magnetic fields are generated by the electric current flowing through the wire. When alternating current flows through a conductor, an alternating magnetic field is created around the conductor. Magnetic fields are measured in milligauss (mG). In the United States, most AC has a frequency of 60 Hertz (Hz); the EMFs created by AC are referred to as 60-Hz fields.

Throughout the home, the electric field strength from wiring and appliances is typically less than 10 V/m; however, fields of 10 V/m and higher can be found very close to electrical appliances. Average magnetic field strength in most homes (away from electrical appliances and home wiring, etc.) is typically less than 2 mG. Very close to appliances carrying high current, fields of tens to hundreds of mG are present.

Studies of Health Risk Associated with Electric and Magnetic Fields. Both electric and magnetic AC fields induce currents in conducting objects, including people and animals. These currents, even from the largest power lines, are too weak to be felt. Despite this, some scientists believe that these currents might be potentially harmful and that long-term exposure should be minimized. Hundreds of studies on EMFs have been conducted in the United States and other countries. Studies of laboratory animals generally show that these fields have no obvious harmful effects (COB Energy Facility, LLC, 2002).

Concern about health effects arose in 1979 when researchers looked at wired code classifications for residences and the incidence of leukemia (COB Energy Facility, LLC, 2002). The study resulted in a weak statistical link between proximity to power lines and childhood leukemia. Since the release of this study there has been a lot of effort to determine if this statistical link is reproducible and if there are any other human health effects from exposure to EMFs. The National Academy of Sciences reviewed more than 500 studies from a period of 17 years and issued a report in October 1996 which says that there is no conclusive evidence that EMFs play a role in the development of cancer, reproductive and developmental abnormalities, or learning and behavioral problems (NRC, 1996). An additional report issued May 4, 1999, by the National Institute of Environmental Health Science (NIEHS) came to the conclusion that the data showing the link between EMFs and cancer showed only marginal scientific support and concluded that aggressive regulation was not warranted. The report did recommend that attempts be made to minimize the exposure of the public to EMFs (NIEHS, 1999).

3.13.1.7 Noise

The Energy Facility site consists primarily of scrub brush with limited cattle grazing. There are no continuous noise sources in the project area. Intermittent noise includes traffic on local roads, agricultural activities, and distant overhead aircraft. Measurements reveal most noise occurs during the daytime; nighttime noise levels are low.

Noise Measurement and Terminology. To understand how the significance of noise impacts is determined, it is useful to understand how noise is defined and measured.

Airborne sound is a rapid fluctuation of air pressure above and below atmospheric pressure. There are several ways to measure noise, depending on the source of the noise, the receiver, and the reason for the noise measurement. Chapter 8, Glossary of Terms and Acronyms, defines the acoustical terms used in this discussion of noise.

In this discussion, some statistical noise levels are stated in terms of decibels on the A-weighted scale (dBA). Noise levels stated in terms of dBA reflect the response of the human ear by filtering out some of the noise in the low- and high-frequency ranges that the ear does not detect well. The A-weighted scale is used in most ordinances and standards, including the ODEQ standard. The equivalent sound pressure level (L_{eq}) is defined as the average noise level, on an energy basis, for a stated period of time (such as hourly).

In practice, the level of a sound source is conveniently measured using a sound-level meter that includes an electrical filter corresponding to the A-weighted curve. The sound-level meter also performs the calculations required to determine the L_{eq} for the measurement period. The following measurements relate to the noise-level distribution during the measurement period. The L_{90} is a measurement that represents the noise level exceeded during 90 percent of the measurement period. Similarly, the L_{10} represents the noise level exceeded for 10 percent of the measurement period.

Table 3.13-1 shows the relative A-weighted noise levels of common sounds measured in the environment and in industry for various sound levels.

Noise Regulations. OAR Chapter 340, Division 35, establishes statewide maximum permissible environmental noise levels for new commercial and industrial uses. The noise regulations apply at "appropriate measurement points" on "noise-sensitive property." The "appropriate measurement point" is defined as whichever of the following is farther from the noise source:

- Twenty-five feet toward the noise source from that point on the noise-sensitive building nearest the noise source; or
- That point on the noise-sensitive property line nearest the noise source.

"Noise-sensitive property" is defined as "real property normally used for sleeping, or normally used as schools, churches, hospitals or public libraries."

Residences are the only noise-sensitive property identified in the project area. Table 3.13-2 summarizes the applicable Oregon regulations.

The proposed Energy Facility may operate 24 hours per day and would generally represent a constant noise source.

Exemptions. Exemptions to the noise regulations (per OAR 340-035-0035(5)) are as follows:

- Sounds created by the tires or motor used to propel any road vehicle complying with the noise standards for road vehicles
- Sounds that originate on construction sites

- Sounds created in construction or maintenance of capital equipment
- Impulse noise regulated in OAR 340-035-0035(1)(d). However, gas turbines do not generate impulse noise.

Noise Emissions. Construction of the proposed Energy Facility is expected to be typical of other energy facilities in terms of schedule, equipment used, and other types of activities. The noise level would vary, depending on the construction phase. Construction of energy facilities generally can be divided into five phases in which different types of construction equipment are used: site preparation and excavation, concrete pouring, steel erection, mechanical, and cleanup. The specific equipment that would be used at the site is not known at this time. Based on similar construction projects, noise would be produced by a range of construction equipment, including light and heavy trucks, backhoes, bulldozers, graders, cranes, air compressors, welding machines, and power hand tools.

The primary operational noise sources anticipated with this Energy Facility are the CTG packages, the HRSG packages, the STG packages, and the air-cooled condensers. Secondary noise sources are anticipated to include the generator step-up transformers (GSUT), the HVAC systems, the boiler feed pumps (BFP), and the circulating water pumps (CWP).

Sensitive Receptors. The only noise-sensitive receptors in the vicinity are residences. The closest residences are on land controlled by the project proponent and would be kept vacant or razed if necessary to comply with ODEQ noise standards. Accordingly, the noise analysis focuses on the two closest residential receptors not controlled by the Facility. One receptor (R1), located about 6,700 feet to the southeast, has a direct line of sight to the Energy Facility. The other receptor (R3), with no line of sight, is located over the bluff about 5,700 feet away to the northwest. Noise-level measurements were conducted at these receptors—R1 and R3. These receptors are also referred to as monitoring locations M1 and M2, respectively. The receptors and the two monitoring locations are shown in Figure 3.13-1.

Ambient Noise Measurements. Representative nighttime L_{50} levels of 20.5 dBA were calculated for M1 by averaging L_{50} levels between 10:00 p.m. and 4:00 a.m. the nights of May 10, 11, and 12, 2002. Similarly, a representative nighttime L_{50} of 20 dBA was calculated for M2 by averaging L_{50} levels between 10:00 p.m. and 4:00 a.m. the night of May 16, 2002. The average L_{10} levels at M1 and M2 during those same periods were calculated to be 29 and 26, respectively. At M1, the L_{10} was between 3 and 20 dBA higher than the L_{50} during those same periods. The wide variation between the L_{10} and L_{50} is likely the result of residents dogs barking, and it was thought to be inappropriate to include such activity in the average L_{10} calculation[14].

To limit the effect of "outliers" on the L_{10}, the median difference between the L_{10} and L_{50} was used rather than the average. The median difference between the L_{10} and L_{50} during the averaging period is 7 dBA at M1, resulting in an L_{10} of 27 dBA. At M2, the median difference between the L_{10} and L_{50} is 4 dBA during the averaging period resulting in an L_{10} of 24 dBA. It should be noted that the L_{50} is the more restrictive noise criterion. The hours between 10:00 p.m. and 4:00 a.m. were the quietest hours of the night on an L_{50} basis. Averaging the L_{50} during the quietest hours results in data that do not emphasize either the noise peaks or

[14] Based on conversation between Mark Bastasch/CH2M HILL and Kerrie Standlee/Daly Standlee Associates.

unusual quiet, as required by Section 4.5.6 of the ODEQ publication titled NPCS-1: Sound Measurement Procedures Manual (1983).

3.13.2 Environmental Consequences and Mitigation Measures

Construction and operation of the proposed Energy Facility would not have a substantial adverse effect on health and safety. Various features would be built into the proposed Energy Facility, and operational practices adopted, to ensure that the Energy Facility would meet or exceed state and Federal safety standards in its components.

Impact 3.13.1. A natural gas leak could occur, posing a risk of fire.

Assessment of Impact. Natural gas could leak, posing a risk of fire. The proposed Energy Facility would include design features to reduce the chance of a natural gas leak, as well as prescribe measures to be taken in the event of a gas leak. The natural gas pipeline would be constructed in accordance with the requirements of the U.S. Department of Transportation as set forth in 49 CFR and OAR 345-24-060.

The natural gas pipeline would have a shutoff system to quickly shut down natural gas flow in the event of fire. In addition, PG&E GTN would have remote shutdown capability from its 24-hour operated gas control center in the event of excess flow conditions or other incidents.

Recommended Mitigation Measures. No measures beyond those included in the proposed Energy Facility are recommended.

Impact 3.13.2. Diesel fuel could leak from a storage container, posing a fire risk or possible contamination of soil.

Assessment of Impact. Diesel fuel storage of approximately 100 gallons for the diesel-fired fire water pump and approximately 4,300 gallons for the backup generators at the water supply well system would be provided. Diesel fuel could leak from the storage container, posing a fire risk and possible contamination of soil.

The proposed Energy Facility would include measures to reduce the risk of fire and to contain any spill to prevent contamination. Systems for fire prevention, detection, and control would be installed throughout the Facility's buildings and yard areas as required by the National Fire Protection Association (NFPA) and insurance requirements. Diesel fuel would be stored in areas designed to contain spills through berms, curbs, and other secondary containment features during construction and operation of the Facility. A spill prevention control plan would be in effect from the beginning of construction and continue throughout the life of the Facility.

Recommended Mitigation Measures. No measures beyond those included in the proposed project are recommended.

Impact 3.13.3. Aqueous ammonia spill could spill and/or ammonia vapor could be released to the atmosphere, posing a health risk.

Assessment of Impact. Aqueous ammonia solution would be stored in a 30,000-gallon aboveground storage tank. The design of the aqueous ammonia storage and handling subsystem would be done with careful attention to the goal of eliminating hazards associated with the use of ammonia. Nonetheless, ammonia could spill or ammonia vapor could be released to the atmosphere, posing a health risk.

The tank would be contained within a bermed area, and would be designed in accordance with applicable industry specifications. The tank would be equipped with a level gauge and would be monitored from the control room. The area for delivery of aqueous ammonia to the storage tank also would be bermed.

The spill prevention control plan, mentioned previously, would address the potential for an aqueous ammonia spill.

A material safety data sheet (MSDS) for aqueous ammonia would be available at the Facility. The MSDS would identify the appropriate procedures for handling the aqueous ammonia, which would be maintained and enforced by the Energy Facility manager or the manager's delegated safety coordinator.

Recommended Mitigation Measures. Hazardous materials would be stored in structures that meet the requirements of the Uniform Fire Code, Article 80. In addition, a Hazardous Materials Inventory Statement and a Hazardous Materials Management Plan would be written and filed with the Bonanza RFPD and Klamath County Fire District #1, which has a mutual aid agreement with the Bonanza RFD and has the only state-certified HazMat response team within the area.

Impact 3.13.4. Spills of other hazardous, nonfuel substances could occur, with the potential to harm people at the Energy Facility and in the surrounding area.

Assessment of Impact. Hazardous nonfuel substances could spill, with the potential to harm people in the Energy Facility and in the surrounding area.

The following measures would be taken to prevent and minimize the impacts of a spill of any hazardous, nonfuel substance:

- Management of hazardous substances would be conducted in accordance with applicable Federal, state, and local regulatory standards for public and occupational safety and health protection.
- Training would be provided to appropriate workers in materials handling and disposal.
- The storage and conveyance systems for liquid hazardous chemicals would be designed to prevent and contain spills through pumping and storage controls and secondary containment tanks.

Recommended Mitigation Measures. The recommended mitigation measures are the same as those proposed for aqueous ammonia.

Impact 3.13.5. A fire could occur at the Energy Facility, posing a threat to workers and nearby people and structures.

Assessment of Impact. A fire could occur at the Energy Facility, posing a threat to workers and nearby people and structures. To reduce the risk and consequences of fire, systems for fire prevention, detection, and control would be installed at the Energy Facility. These systems would meet local, state, and NFPA standards.

The main fire protection system would include a dedicated water storage system, hose stations, and fire water pumps. A portion of the raw water aboveground storage tank would be dedicated to the fire protection system. NFPA requires providing a 2-hour supply for the largest fire system demand plus a minimum 500-gpm rate.

The fire detection system would continuously monitor the Energy Facility, provide an indication of the location of fires, warn Energy Facility personnel, and activate the fire protection system. The combustion turbine enclosures would include carbon dioxide fire-extinguishing systems. Smoke detectors, heat detectors, manual alarm stations, and indicating devices would be installed throughout the Energy Facility. Portable fire extinguishers would be placed at key locations. Flammable materials would be stored in appropriate containers and cabinets.

Recommended Mitigation Measures. No measures beyond those included in the proposed project are recommended.

Impact 3.13.6. The high-voltage electric transmission line could cause electrical shocks directly and from induced charges.

Assessment of Impact. The high-voltage electric transmission line could cause electrical shocks directly and from induced charges. The electric transmission line would be designed so that induced currents resulting from the transmission line and related facilities would be as low as reasonably achievable. The project proponent would agree to a program that would provide reasonable assurances that fences, gates, cattle guards, trailers, or other permanent objects or structures that could become inadvertently charged with electricity would be grounded through the life of the line.

Recommended Mitigation Measures. No measures beyond those included in the proposed project are recommended.

Impact 3.13.7. Electric and magnetic fields would increase but would be well within allowable limits.

Assessment of Impact. EMF estimates were calculated for the proposed Energy Facility's 7.2-mile electric transmission line to obtain the maximum possible EMF strengths that would be produced. The maximum operating voltage is expected to be 550 kV. The nominal operating voltage would be 500 kV, and the normal operating voltage would be 540 kV. These estimates are computed at a height of 1 meter (3.3 feet) aboveground at midspan. The estimates also consider the maximum current per phase of 1,260 amps. There would be one three-phase circuit on the easement. The circuit configuration would be delta, which minimizes EMFs.

Figures 3.13-2 and 3.13-3 present the EMF estimates. Because the proposed electric transmission lines would be symmetrical (Figure 2-3), the EMF profiles on both sides of the line would be identical. The maximum magnetic field would be at the center of the easement and the maximum electric field would occur at 24 feet from centerline for the 138M tower and 20 feet from centerline for the 238M tower.

The allowable limit for electric field intensities for the state of Oregon is 9 kV/m at the peak. The maximum electric field for a line using the 138M tower is slightly above the peak, whereas the maximum electric field for a line using the 238M tower is below the peak.

Figure 3.13-4 shows that, based on the calculations, the electric fields would be 1.92 and 1.48 kV/m at the edge of the 154-foot easement for the 138M and 238M towers, respectively, for a minimum clearance at midspan of 33 feet.

Figure 3.13-5 shows that the maximum magnetic field for 1,260 amps flowing in each phase would be approximately 214 mG and 188 mG for the lines using the 138M and 238M structures, respectively. The maximum values would occur directly under the center phase. At 77 feet from the center of the line (or the edge of the planned easement), the magnetic fields would decrease to 45.9 mG and 36.7 mG for the lines using the 138M and 238M structures, respectively.

Based on the estimates, the EMFs would be well within allowable limits.

Recommended Mitigation Measures. No measures beyond those included in the proposed project are recommended.

Impact 3.13.8. Operation of the proposed Energy Facility could affect noise levels but would be within limits allowed by state statute.

Assessment of Impact. The modeling used to predict the Energy Facility's noise emissions during operation assumed a "worst case" scenario, with the Energy Facility operating under steady-state conditions at full capacity and with the combustion and steam turbines at base load and the air-cooled fans operating. After Energy Facility noise emissions were determined, modeling was performed to predict sound levels at the closest noise sensitive receptors—monitoring locations M1 and M2. This modeling also conservatively assumed environmental conditions that facilitate sound transmission.

Energy Facility

The Energy Facility sound level, with mitigation incorporated, would be 30.5 dBA or less at residences, as shown in Figure 3.13-1. This level would be the maximum sound level audible at the nearest residences during ideal sound propagation weather conditions. During most weather conditions and at the most times, the Facility sound level would be well less than 30 dBA and would not be audible at the residences.

Actual mitigation measures would be determined by the equipment manufacturers and suppliers. A barrier wall would be reserved as a contingency mitigation measure that would be installed in the event a noise exceedance is detected during Facility performance testing.

A sound level of 30 dBA is quite low; for comparison, a typical cooling fan on a desktop computer is 40 to 45 dBA at the operator's ears, and rustling leaves in a light breeze are generally louder than 30 dBA. Power plant noise is typically very steady in nature, with no extraordinary tones or impact type noises. The noise is similar to an idling car or a neighbor's air conditioning unit. The Energy Facility noise would tend to be a steady faint background noise source in the everyday noise environment to which people are exposed.

Electric Transmission Line

The corona discharge from high-voltage electric transmission lines is known to generate audible noise (often described as crackling or sizzling) under certain conditions. Noise from AC electric transmission lines would be at a maximum during periods of precipitation. Formulas have been developed by BPA and others to estimate maximum electric transmission line noise based on operational parameters and distance from the line. The general equation for AC electric transmission lines developed by BPA was used to estimate L_{50} noise levels under maximum conditions.

The estimated L_{50} electric transmission line noise under worst case conditions is presented for several distances in Table 3.13-3. The maximum L_{50} estimated at the closest residence would be 27 dBA. This would be much less than the L_{50} nighttime absolute limit of 50 dBA. The increase in noise over the existing nighttime average L_{50} of 20 dBA (as estimated at M2) would be less than 10 dBA. The electric transmission line noise level would be lower most of the time.

Water Supply Well System

Pumphouses would be designed to mitigate noise levels to less than 27 dBA at the nearest residence, which would be R8 (located approximately 3,500 feet away). The major noise generating equipment would be located in a fully enclosed and acoustically designed structure. In addition, submersible pumps would be used. Currently, acoustically designed enclosures capable of achieving 20 dBA at 3,000 feet are available.

An emergency generator would be located at the pumphouse site. It is likely that this generator would only run continuously if power was lost for a minimum of 7 days. The generator would probably also be run once monthly for 15 minutes during the day for maintenance and reliability. The emergency operation of the generator would be exempted from ODEQ's noise regulations because it is "emergency equipment not operated on a regular or scheduled basis." Scheduled operation of the emergency generator would be 15 minutes per month for maintenance and reliability. Operation would be limited to between the hours of 8:00 a.m. and 6:00 p.m. During these hours, the ambient noise levels are elevated from agricultural, transportation, or other activities and the generator noise level should not be a concern at the nearest residence 3,500 feet away. Scheduled operation would likely qualify for an exemption from ODEQ's noise restrictions as an "infrequent event" or exempted as "sounds created in construction or maintenance of capital equipment."

Recommended Mitigation Measures. Noise emissions from major equipment at the Energy Facility would be specified at an appropriate level to ensure the overall Energy Facility sound levels satisfy the noise criteria. Final selection of mitigation measures would be determined by the project proponent's engineer, equipment manufacturers, and suppliers prior to procurement. Noise mitigation is not recommended for the electric transmission line or the natural gas pipeline because noise from these facilities would not exceed any applicable ODEQ noise standard. A barrier wall would be reserved as a contingency mitigation measure that would be installed in the event a noise exceedance is detected during Facility performance testing.

Impact 3.13.9. Construction of the proposed Energy Facility could affect noise levels.

Assessment of Impact.

Energy Facility

Table 3.13-4 shows the loudest equipment types generally operating at a power plant site during each phase of construction.[15] The composite average or equivalent site noise level, representing noise from equipment, is also presented in Table 3.13-4 for each phase.

The Wright residence, the receptor closest to the site with a direct line of sight, would be more than 1 mile (6,700 feet) away (receptor position R1 in Figure 3.13-1). Table 3.13-5 shows the average or equivalent construction noise levels projected to the nearest residences from the Energy Facility site. These results are conservative because topography and other potentially attenuating factors are not included.[16] Average noise levels during construction activities would be between 35 and 46 dBA at R1 and between 37 and 48 dBA at R2.

Table 3.13-6 shows the maximum noise levels from construction equipment projected to the residences nearest to the Energy Facility site.

Noise generated during the testing and commissioning phase of the proposed Facility would not be substantially different from noise produced during normal, full-load operations. Starts and abrupt stops would be more frequent during this period, but on the whole they would usually be short-lived. The steam releases associated with these starts and stops should not be problematic because they would be vented through permanent vent silencers.

Electric Transmission Line

Noise from electric transmission line construction is represented by the site clearing and excavation, concrete pouring, and steel erection phases shown in Table 3.13-5. The closest receptor would be 3,000 feet from the electric transmission line. As with the Energy Facility construction noise, these estimates are conservative because divergence is the only attenuating mechanism taken into account. Depending on the construction activity, the noise level would range between 42 and 53 dBA. Table 3.13-6 shows the maximum noise levels from construction equipment projected to the nearest residences from the electric transmission line, which would range between 37 and 52 dBA.

Water Supply Well System and Water Supply Pipeline

Noise levels from construction equipment associated with the water wells, pumphouses, and water pipeline are anticipated to be similar to the levels presented in Table 3.13-6. The closest receptor would be located 0.7 mile away (Receptor R8).

---

[15] Because specific data regarding the types, quantities, and operating schedules of construction equipment that would be used for the proposed Facility are not currently available, the DEIS analysis relies on research conducted by the EPA Office of Noise Abatement and Control and the Empire State Electric Energy Research Company, which have extensively studied noise from individual pieces of construction equipment as well as from construction sites of power plants and other types of facilities similar to the proposed Energy Facility. The use of these data, which are 21 to 26 years old, is conservative because the evolution of construction equipment has been toward quieter designs as the nation becomes more urbanized and the population becomes more aware of the adverse effects of noise.

[16] Topographic attenuation is expected to be significant at R2, which is over a bluff from the Energy Facility site. Because this factor is not accounted for in the analysis of construction noise in this exhibit, predicted construction sound levels at R2 and other receptors where the line of sight is blocked by terrain are likely overstated. Similarly, given the large distance to R1 (over 1 mile), atmospheric attenuation is expected to be significant. As with R2, because this factor is not accounted for in the analysis of construction noise in this exhibit, predicted construction sound levels at R1 and other distant receptors are likely overstated.

Natural Gas Pipeline

Noise levels from construction of the natural gas pipeline are anticipated to be similar to levels presented in Table 3.13-6.

Recommended Mitigation Measures. No mitigation measures are recommended because construction noise is exempt from state of Oregon noise regulations.

3.13.3 Cumulative Impacts

There are no other existing or proposed facilities in the vicinity of the proposed project that would produce typical industrial or urban sounds. The proposed Energy Facility would not lead to cumulative impacts to the health and safety of workers or the community.

3.13.3.1 Hazardous Materials

Some elements of the proposed Energy Facility could potentially increase risk to public health and safety. This includes the transmission of natural gas in an underground pipeline and use and storage of hazardous chemicals. Although safety features would be built into the proposed Energy Facility to reduce hazards to public health and safety, the risk of accidents could not be completely eliminated. However, the proposed Energy Facility is unlikely to contribute to a cumulative increase to risks to public health and safety because uses in the vicinity of the Energy Facility are limited to farming and forest use.

3.13.3.2 Electric and Magnetic Fields

The proposed Energy Facility would not create EMFs over the allowable state limit, so the project would not lead to a cumulative impact.

3.13.3.3 Noise

The proposed Energy Facility would be a new source of noise, but it would comply with Oregon's noise regulations. Land uses around the Energy Facility are devoted to farming and forest use, so it is unlikely that future development would occur that would cumulatively add to noise generation within the vicinity of the Energy Facility.

TABLE 3.13-1
Typical Sound Levels Measured in the Environment and Industry

Noise Source at a Given Distance	A-Weighted Sound Level in Decibels	Noise Environment	Subjective Impression
Civil defense siren (100 feet)	130		
Jet takeoff (200 feet)	120		Pain threshold
	110	Rock music concert	
Pile driver (50 feet)	100		Very loud
Ambulance siren (100 feet)	90	Boiler room	
Freight cars (50 feet)	—	Printing press plant	
Pneumatic drill (50 feet)	80	In kitchen with garbage disposal running	
Freeway (100 feet)	70		Moderately loud
Vacuum cleaner (10 feet)	60	Data processing center	
Department store	—		
Light traffic (100 feet)	50	Private business office	
Large transformer (200 feet)	40		Quiet
Soft whisper (5 feet)	30	Quiet bedroom	
	20	Recording studio	
	10		Hearing threshold

Source: Peterson and Gross, 1974

TABLE 3.13-2
State of Oregon Noise Regulations

Statistical Descriptor	Maximum Permissible Environmental Noise Levels (dBA)	
	Daytime (7 a.m. to 10 p.m.)	**Nighttime (10 p.m. to 7 a.m.)**
L_{50}	55 or Ambient + 10 dBA	50 or Ambient + 10 dBA
L_{10}	60 or Ambient + 10 dBA	55 or Ambient + 10 dBA
L_1	75	60

dBA = decibel (A-weighted scale)
Note: Based on Table 8 of OAR 340-035: New Industrial and Commercial Noise Source Standards and OAR 340-035-0035(1)(b)(B)(i).

TABLE 3-13.3
Maximum L_{50} Noise Levels from Electric Transmission Line Operation

Description	Distance from Centerline of Electric Transmission Line (feet)	Estimated Sound Pressure Level (dBA)
Edge of Right-of-Way	125	43
Edge of Corridor	750	34
Closest Residence	3,000	27

Source: CH2M HILL calculations based on equations developed by Bonneville Power Administration.

TABLE 3-13.4
Construction Equipment and Composite Onsite Noise Levels

Construction Phase	Loudest Construction Equipment	Equipment Noise Level at 50 feet (dBA)	Composite Onsite Noise Level at 50 feet (dBA)
Site clearing and excavation	Dump truck Backhoe	91 85	89
Concrete pouring	Truck Concrete mixer	91 85	78
Steel erection	Derrick crane	88	87
Mechanical	Derrick crane Pneumatic tools	88 86	87
Cleanup	Rock drill Truck	98 91	89

Source: EPA, 1971; Barnes et al., 1976

TABLE 3-13.5
Average Construction Noise Levels at the Nearest Residential Receptor

Construction Phase	Expected Sound Pressure Level at 3,000 Feet (dBA)	Expected Sound Pressure Level at 5,700 Feet (dBA)	Expected Sound Pressure Level at 6,700 Feet (dBA)
Site clearing and excavation	53	48	46
Concrete pouring	42	37	35
Steel erection	51	46	44
Mechanical	51	46	44
Cleanup	53	48	46

Source: EPA, 1971; Barnes et al., 1976

TABLE 3.13-6
Maximum Noise Levels from Common Construction Equipment and Resultant Receptor Noise Levels

Construction Equipment	Typical Sound Pressure Level at 50 feet (dBA)	Expected Sound Pressure Level at 3,000 Feet (dBA)	Expected Sound Pressure Level at 5,700 Feet (dBA)	Expected Sound Pressure Level at 6,700 Feet (dBA)
Bulldozer (250 to 700 horsepower)	88	52	47	45
Front-end loader (6 to 15 cubic yards)	88	52	47	45
Truck (200 to 400 horsepower)	86	50	45	43
Grader (13- to 16-foot blade)	85	49	44	42
Shovel (2 to 5 cubic yards)	84	48	43	41
Portable generators (50 to 200 kilowatts)	84	48	43	41
Derrick crane (11 to 20 tons)	83	47	42	40
Mobile crane (11 to 20 tons)	83	47	42	40
Concrete pumps (30 to 150 cubic yards)	81	45	40	38
Tractor (3/4 to 2 cubic yards)	80	44	39	37
Unquieted paving breaker	80	44	39	37
Quieted paving breaker	73	37	32	30

Source: Barnes, et al., 1977

Figure 3.13-1
noise levels
11 x 17
Color
Front

Figure 3.13-1
noise levels
11 x 17
Back

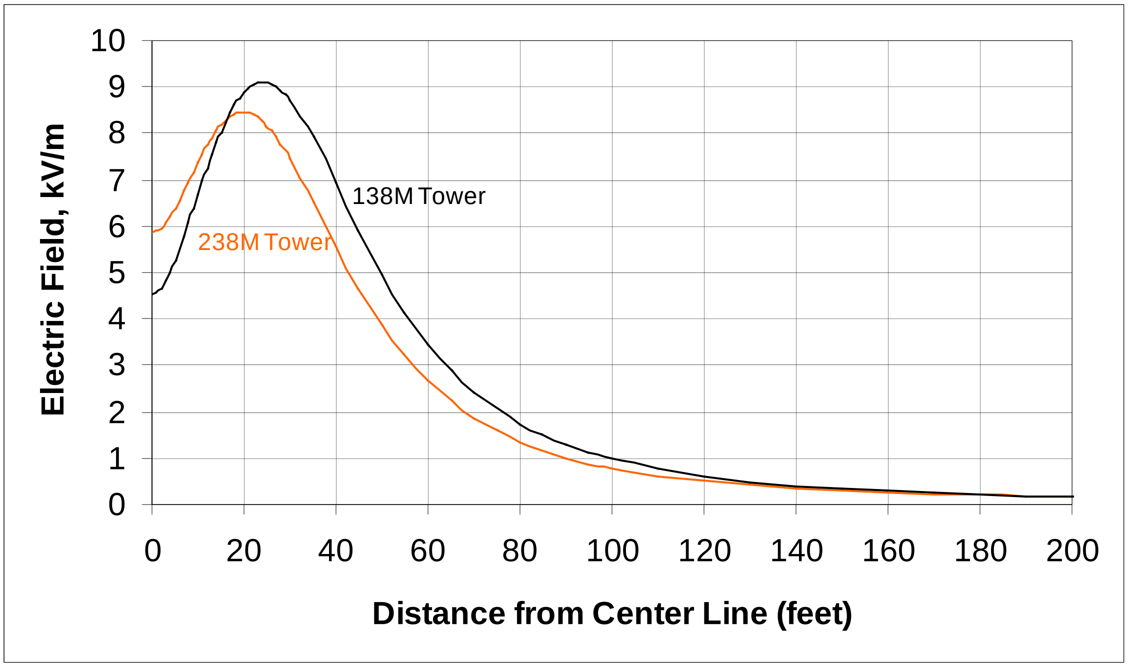


FIGURE 3.13-2

Predicted Electric Field Profiles for two Delta-Configured Lines Under Consideration Based on Maximum Three-Phase Voltage of 550 Kilovolts

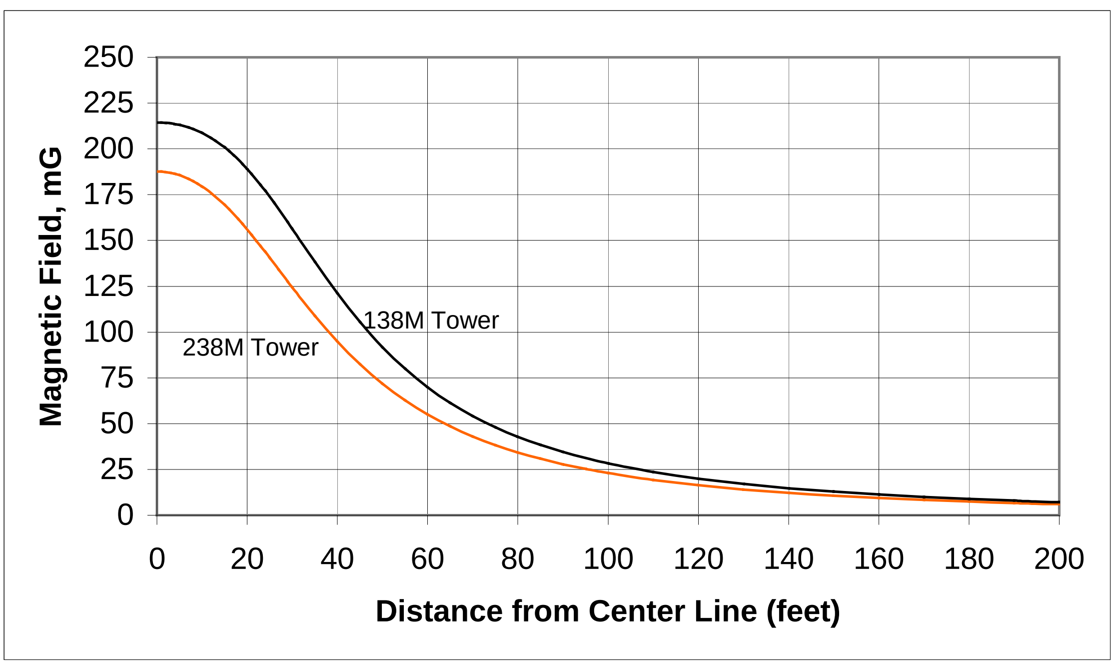


FIGURE 3.13-3

Predicted Magnetic Field Profiles for two Delta-Configured Lines Under Consideration Based on Maximum Current Per Phase of 1,260 Amps

Figure 3.13-4
Noise Monitoring - M1 (Wright Residence)

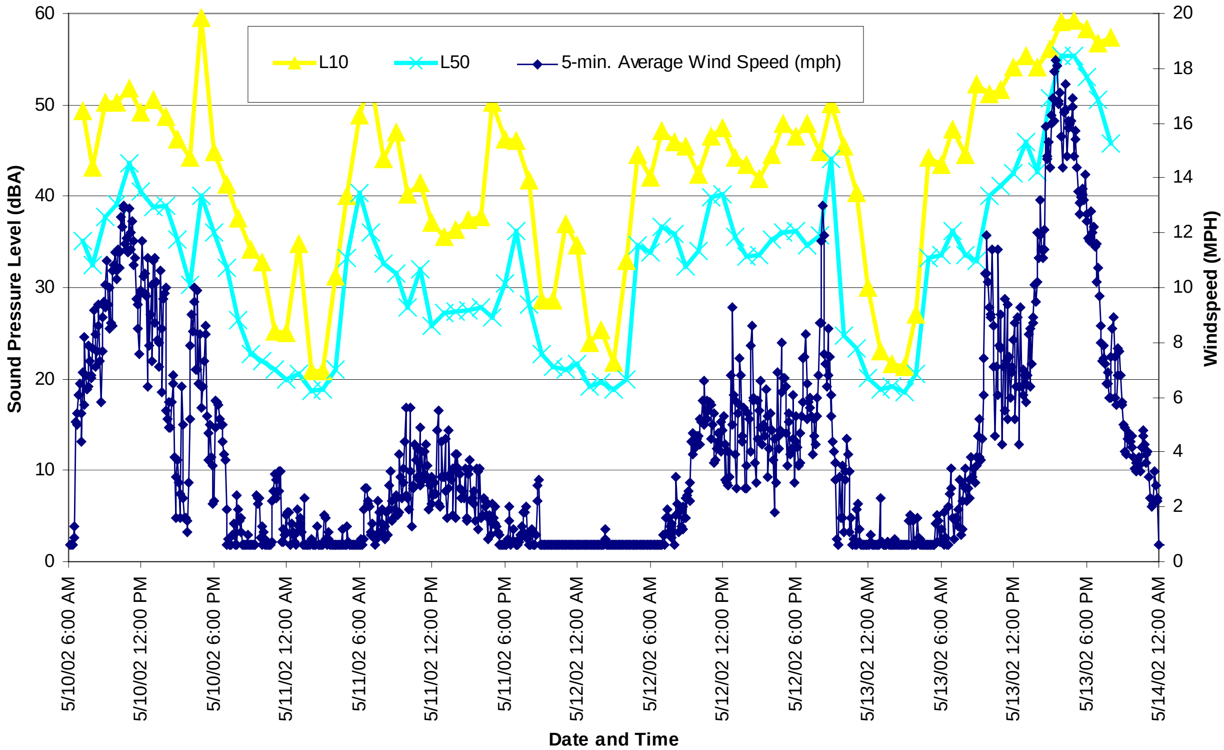
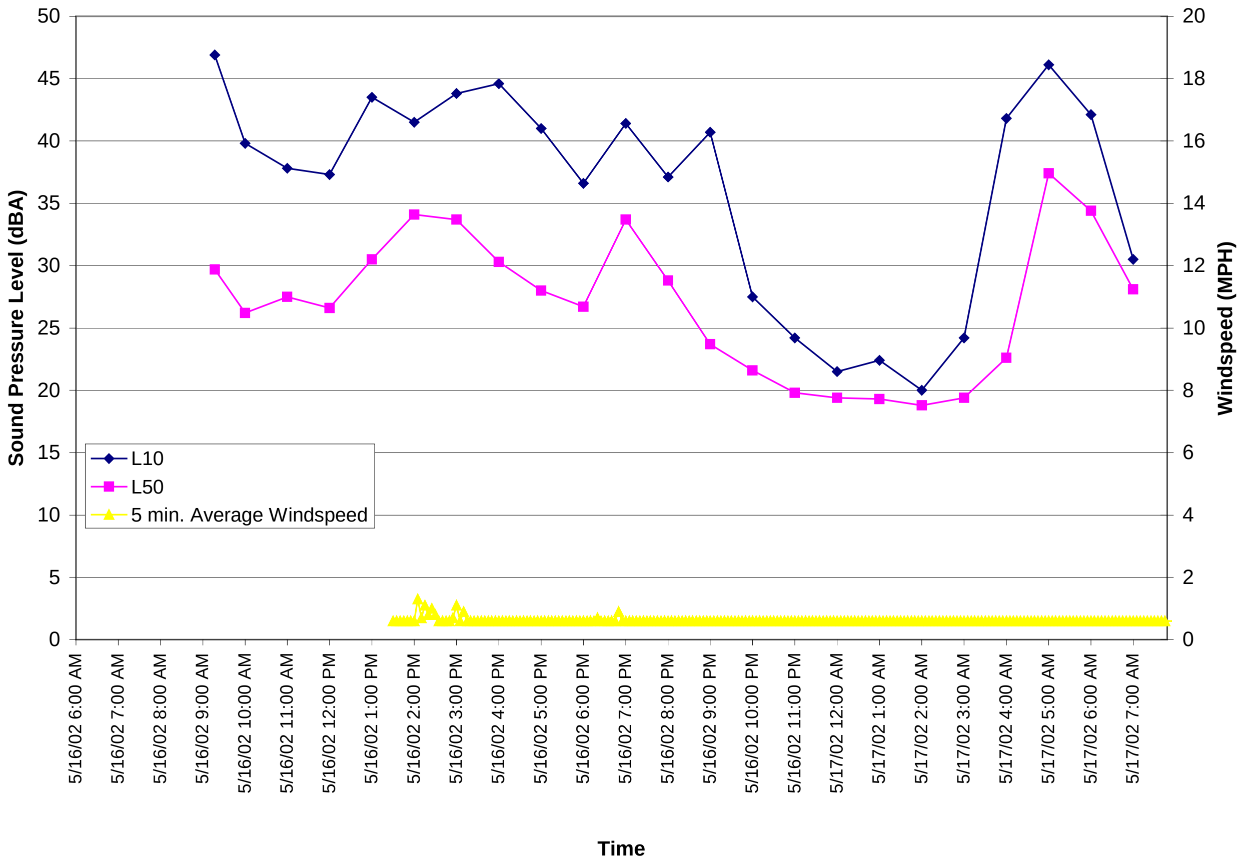
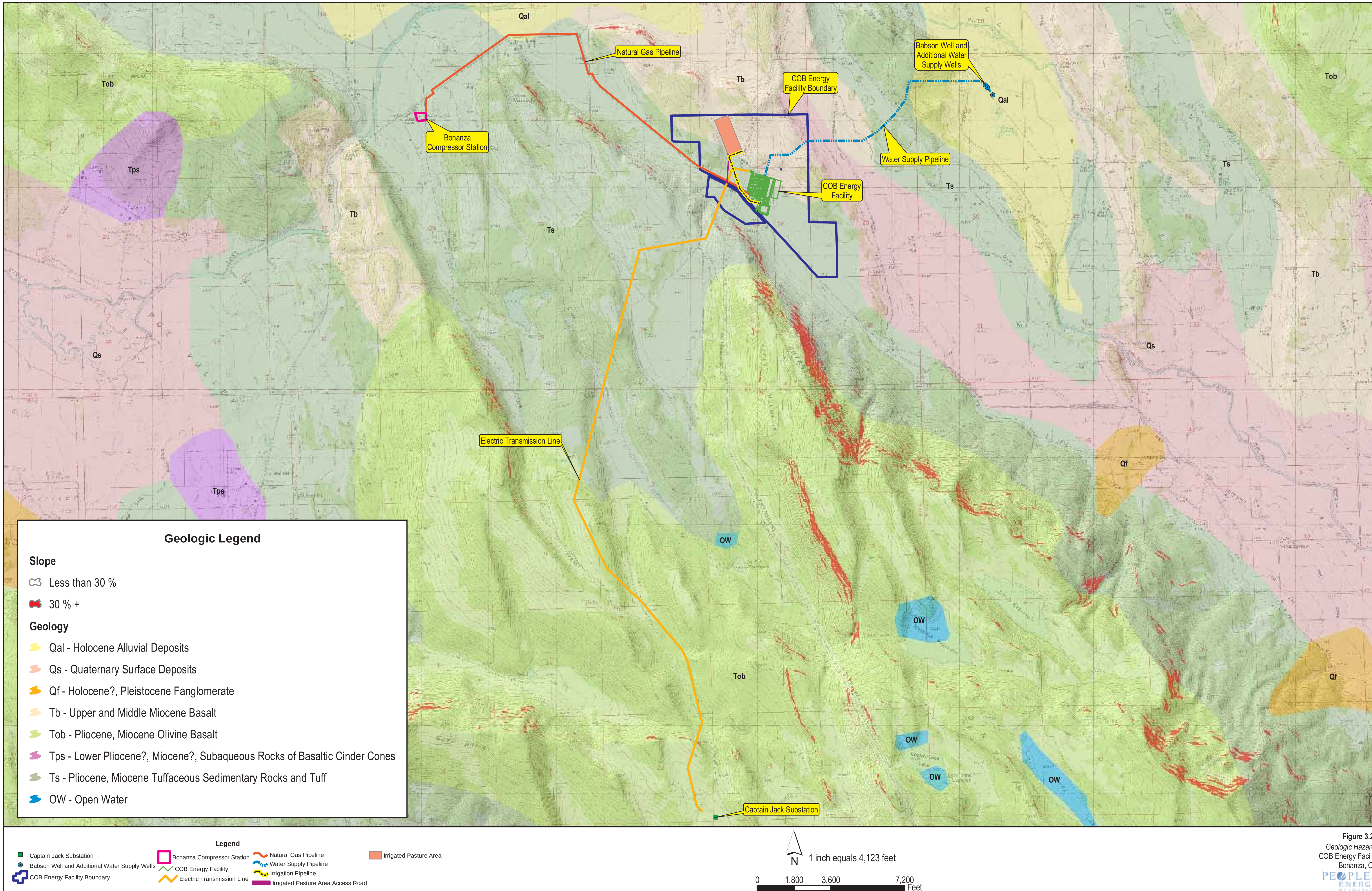
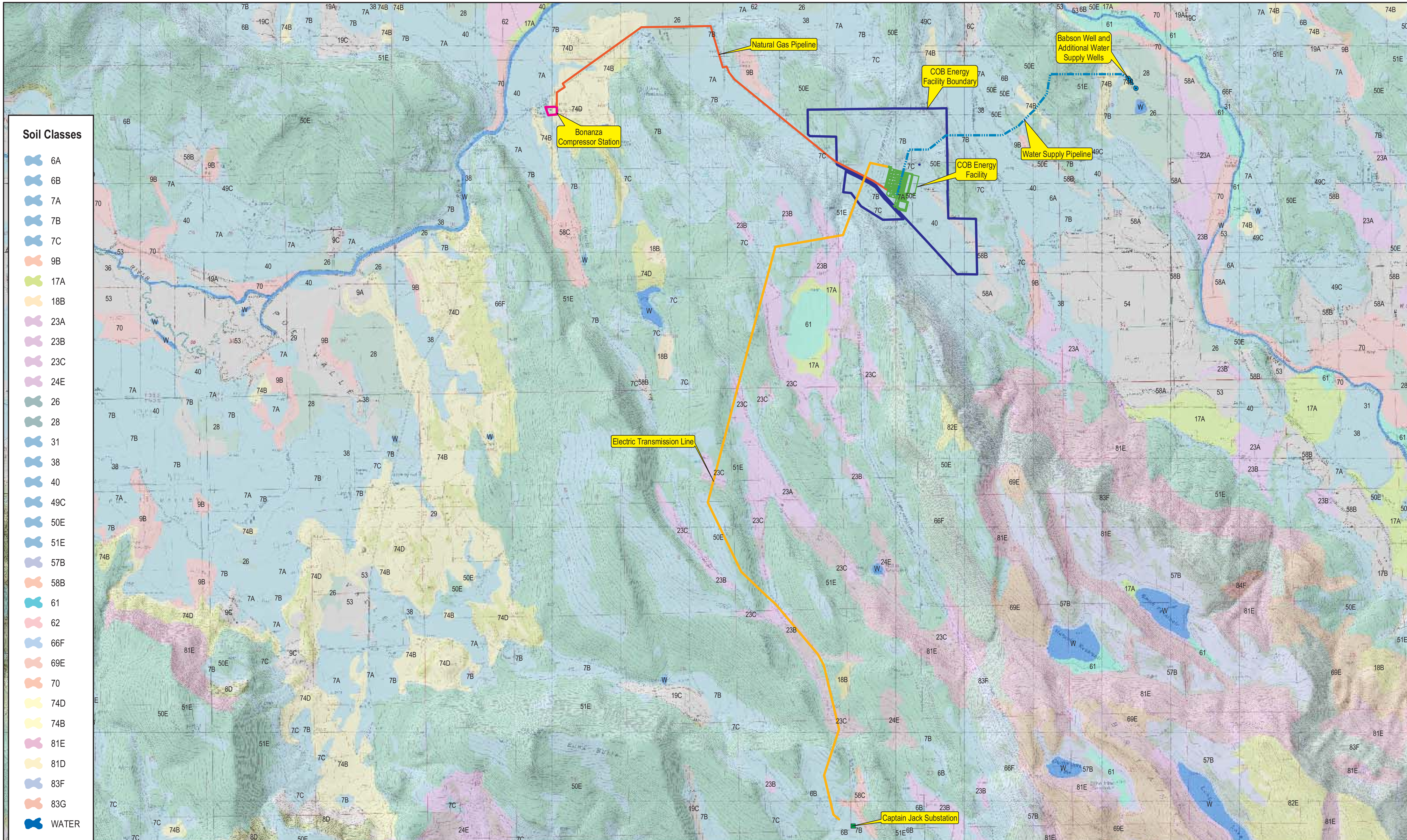


Figure 3.13-5
Noise Monitoring - M2





File Path: \\Rosa\Proj\PERC\167426\Gis\EIS\mxds\EIS_October_03\3.2-1_geologic-hazards.mxd, Date: October 27, 2003 4:27:05 PM



Legend

- Captain Jack Substation
- Babson Well and Additional Water Supply Wells
- COB Energy Facility Boundary
- Bonanza Compressor Station
- COB Energy Facility
- Electric Transmission Line
- Natural Gas Pipeline
- Water Supply Pipeline
- Infiltration Basin

N

1 inch equals 4,210 feet

0 1,100 2,200 4,400 Feet

Figure 3.2-2
Soil Map
COB Energy Facility
Bonanza, OR

PEOPLES ENERGY RESOURCES

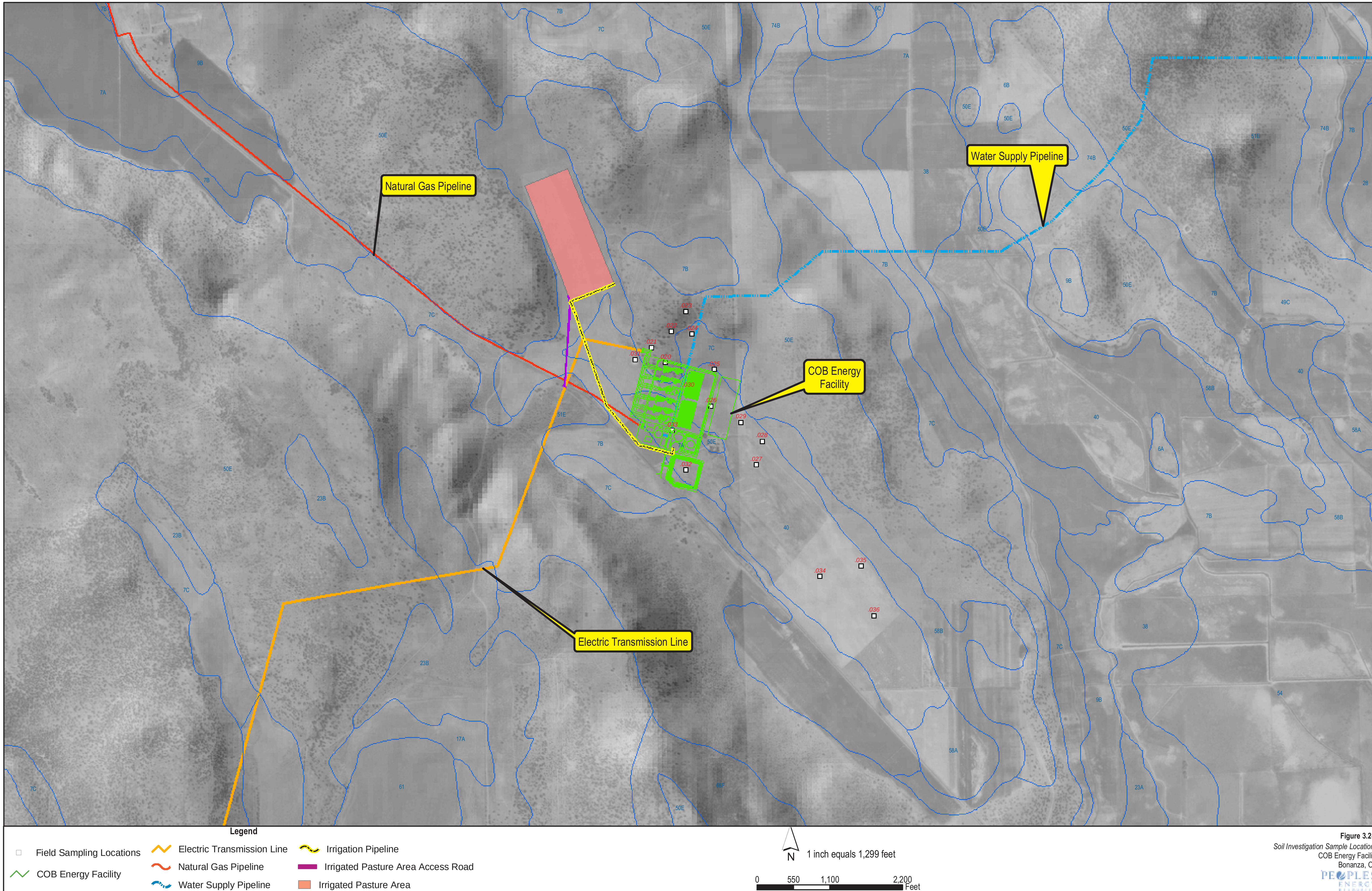
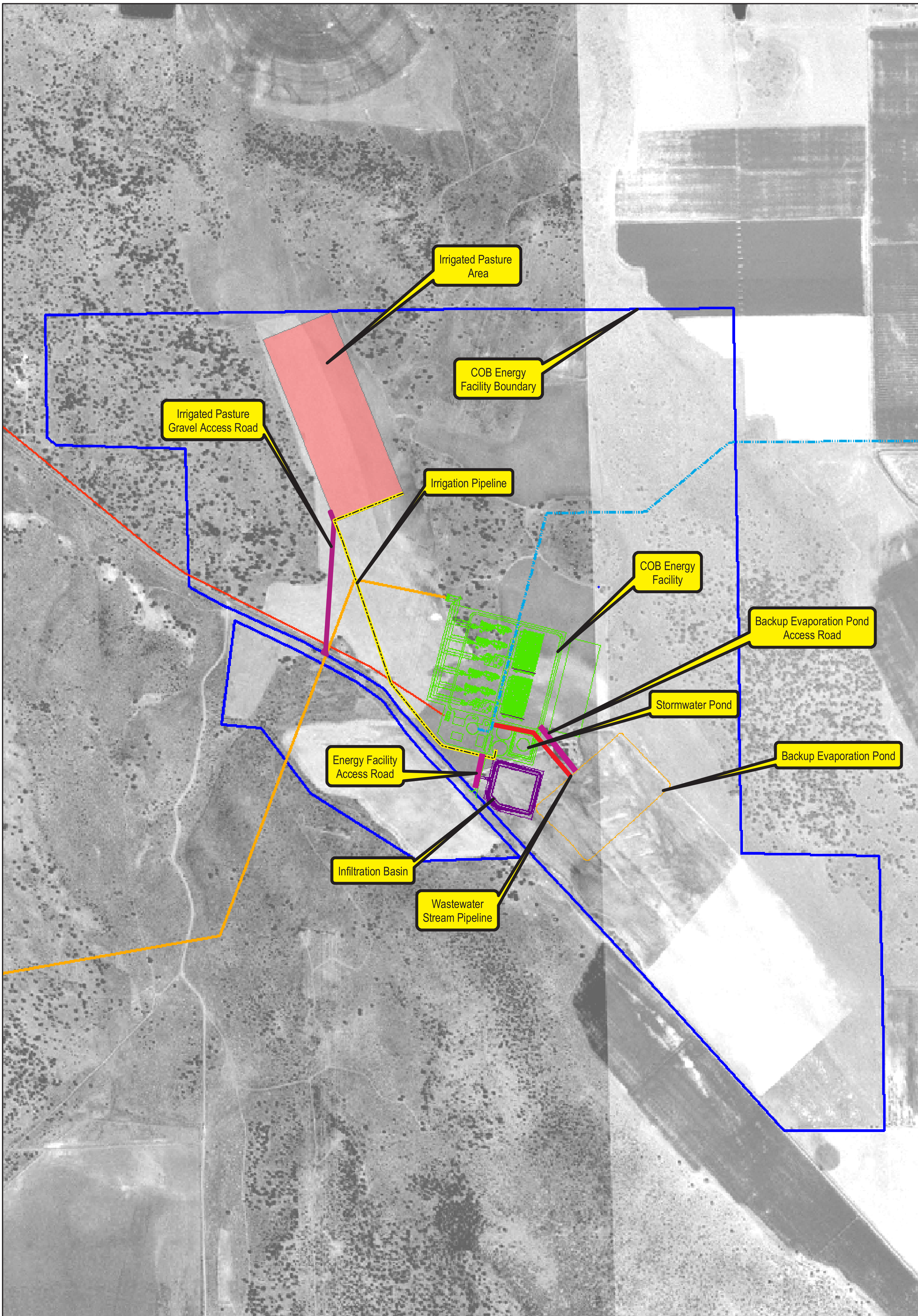


Figure 3.2-3
Soil Investigation Sample Locations
COB Energy Facility
Bonanza, OR

PEOPLES ENERGY RESOURCES

File Path: \\Rosa\Proj\PERC\167426\Gis\EIS\mxds\EIS_October_03\3.2-1_soil-investigation.mxd, Date: October 27, 2003 4:32:53 PM



Legend

- COB Energy Facility
- Natural Gas Pipeline
- Water Supply Pipeline
- Wastewater Stream Pipeline
- Irrigation Pipeline
- Backup Evaporation Pond
- Infiltration Basin
- Access Roads
- Electric Transmission Line
- COB Energy Facility Boundary
- Irrigated Pasture Area

N

1 inch equals 850 feet

0 250 500 1,000 1,500 Feet

Figure 3.2-4

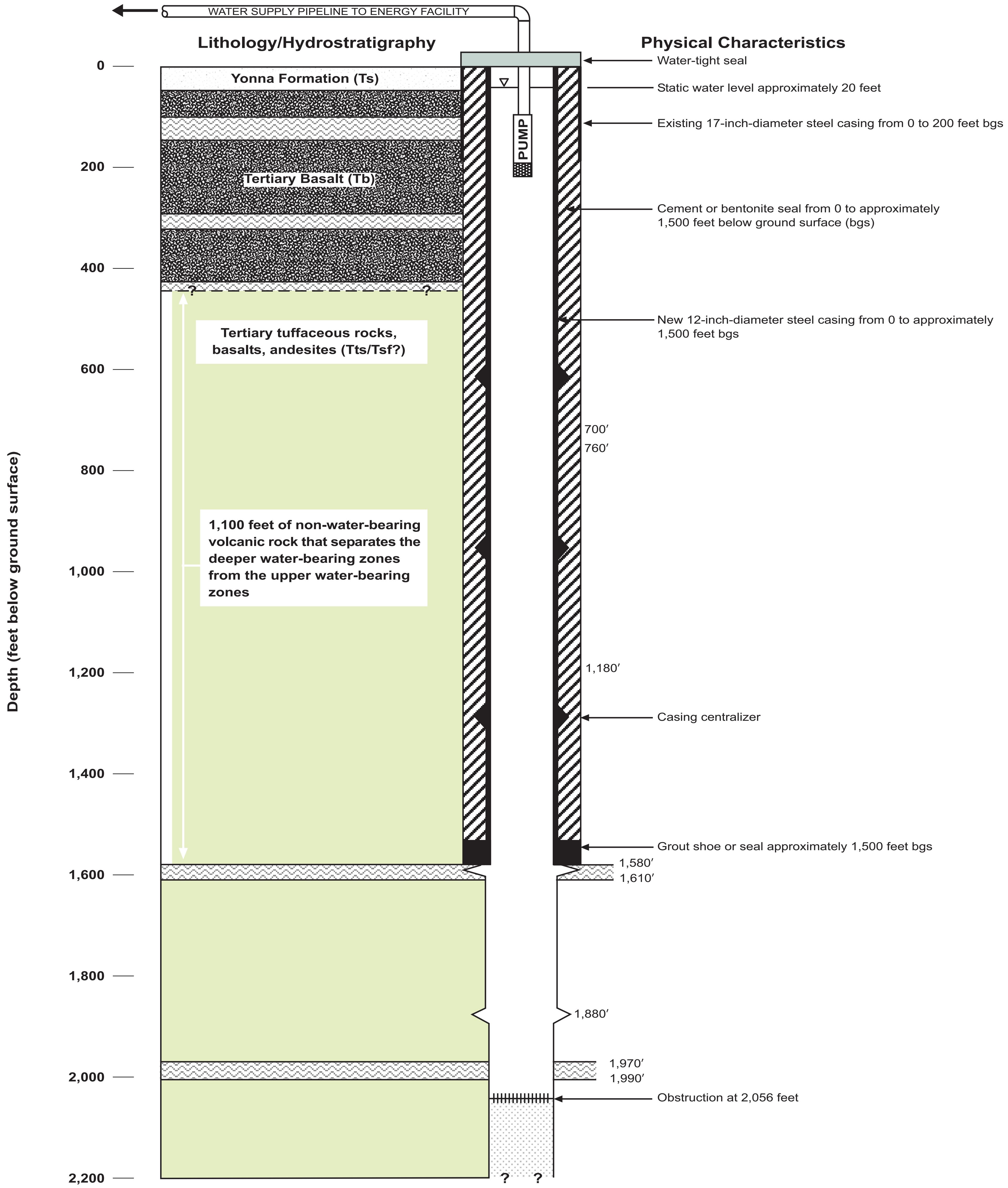
Energy Facility Site Layout

COB Energy Facility
Bonanza, OR

PEOPLES ENERGY RESOURCES

File Path: P:\PERC\167426\Gis\EIS\mxds\EIS_October_03\3.2-4_Facility_Layout.mxd, Date: October 27, 2003 4:46:43 PM

Proposed Babson Well Reconstruction Diagram—Air Cooled



LEGEND

Ts Tuffaceous sedimentary rocks and tuff (Piocene and Miocene), AKA Yonna Formation—Semiconsolidated to well-consolidated mostly lacustrine tuffaceous sandstone, siltstone, mudstone, concretionary claystone, pumicite, diatomite, air-fall and water-deposited vitric ash, palagonite tuff and tuff breccia, and fluvial sandstone and conglomerate. Palagonite tuff and breccia grade laterally into altered and unaltered basalt flows of unit Tob.

Tb Basalt (Upper and Middle Miocene)—Basalt flow, flow breccia, basaltic peperite, minor andesite flows, and some interbeds of tuff and tuffaceous sedimentary rocks.

Tts/ tsf This unit represents rocks that are indicated to occur beneath Tb in the project area but could not be differentiated here. Tts: Moderately well-indurated lacustrine tuff, palagonitic tuff, pumice, lesser siltstone, and sandstone and conglomerate. Tsf: Rhyolitic to dacitic bedded tuff, lapilli tuff, welded and nonwelded ash-flow tuff, and interbedded basalt and andesite flows.

Groundwater production zone.

1,080′ Large void or fracture zone and corresponding depth in feet

Lithologic contact

Hydrostratigraphic contact

Notes

Borehole diameters will decrease as follows to 2,056 feet (diameters are approximations only):
20" = 200-380 feet
18" = 380-1,010 feet
17" = 1,010-1,090 feet
16" = 1,090-1,700 feet
14" = 1,700-Total Depth

Lithologic and hydrostratigraphic relationships are interpreted from borehole geophysics conducted by CH2M HILL in April 1993 and the stratigraphic descriptions provided in the Geologic Map of Oregon (Walker and MacLeod, 1991).

Figure 3.3-1
Proposed Babson Well Reconstruction Diagram—Air Cooled
COB Energy Facility
Bonanza, Oregon

PEOPLES ENERGY Resources

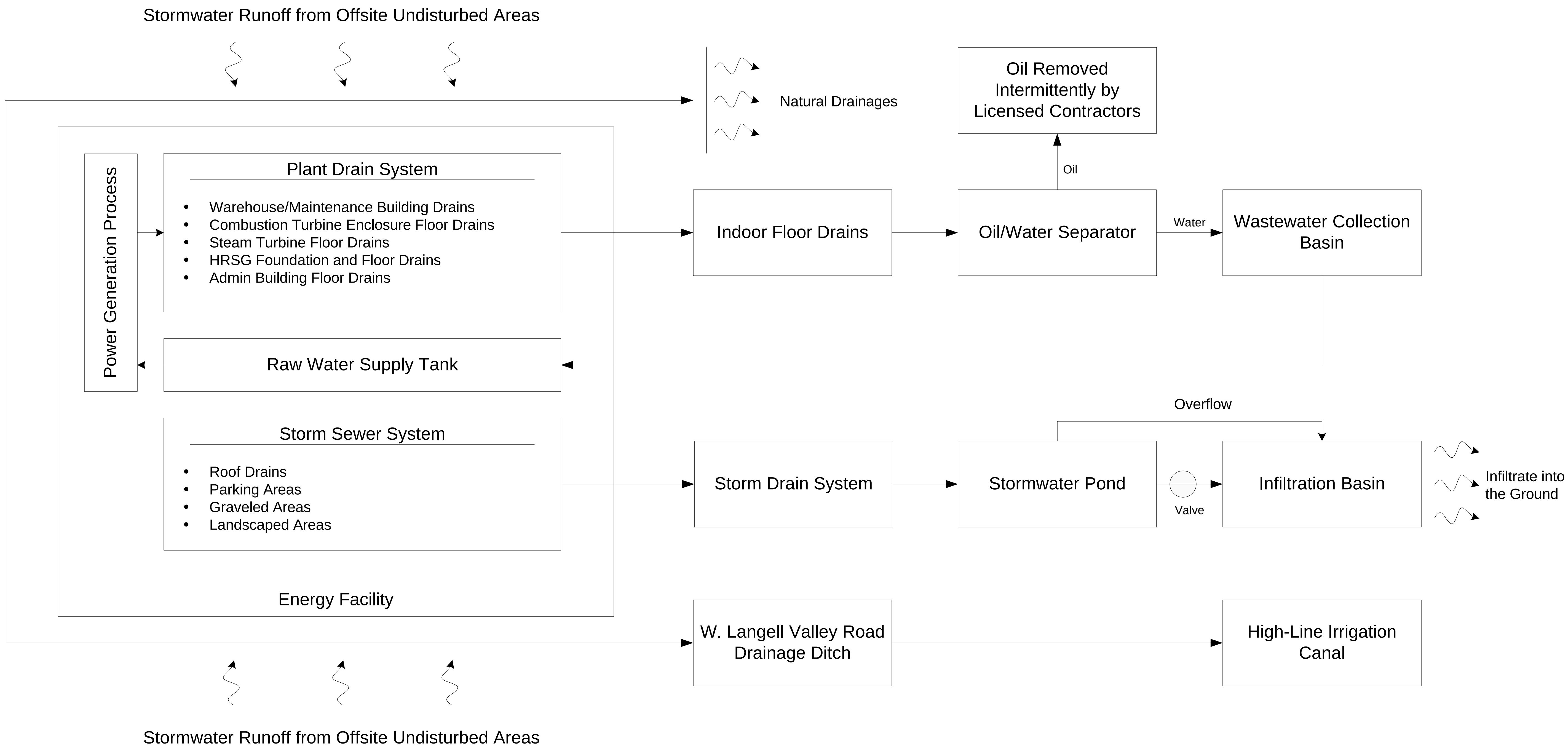
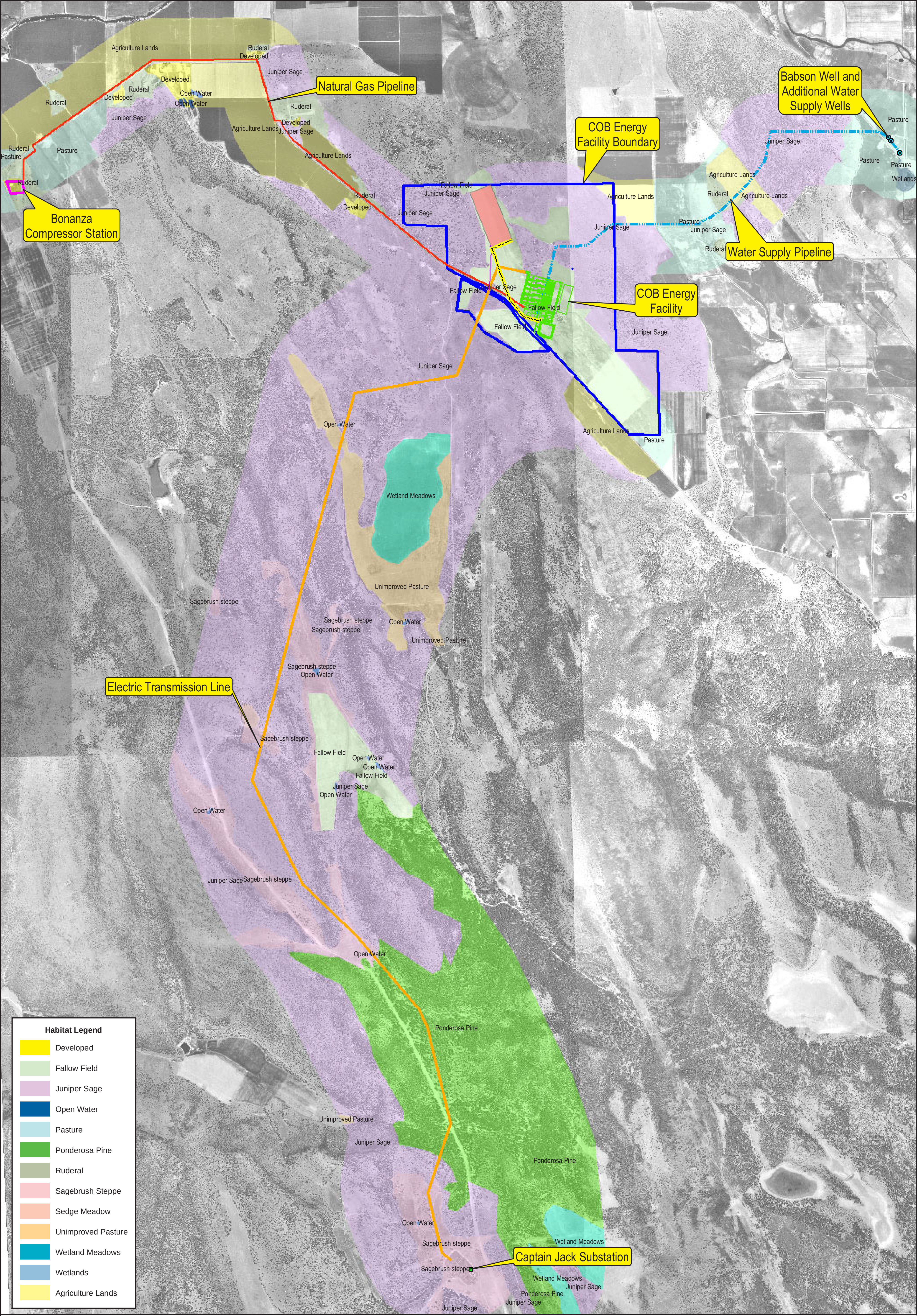


FIGURE 3.3-2
Stormwater Drainage Flow Schematic
COB Energy Facility
Bonanza, OR

PEOPLES ENERGY Resources

PDX/032950009.VSD



Legend

Captain Jack Substation

Babson Well and Additional Water Supply Wells

Bonanza Compressor Station

COB Energy Facility

Electric Transmission Line

Natural Gas Pipeline

Water Supply Pipeline

Irrigation Pipeline

Irrigated Pasture Area Access Road

Irrigated Pasture Area

N 1 inch equals 2,762 feet

0 1,050 2,100 4,200 Feet

Figure 3.4-1
Habitat Types
COB Energy Facility
Bonanza, OR

PEOPLES ENERGY RESOURCES

File Path: \\Rosa\Proj\PERC\167426\Gis\EIS\mxds\EIS_October_03\3.4-1_habitat-types.mxd, Date: October 27, 2003 4:49:52 PM

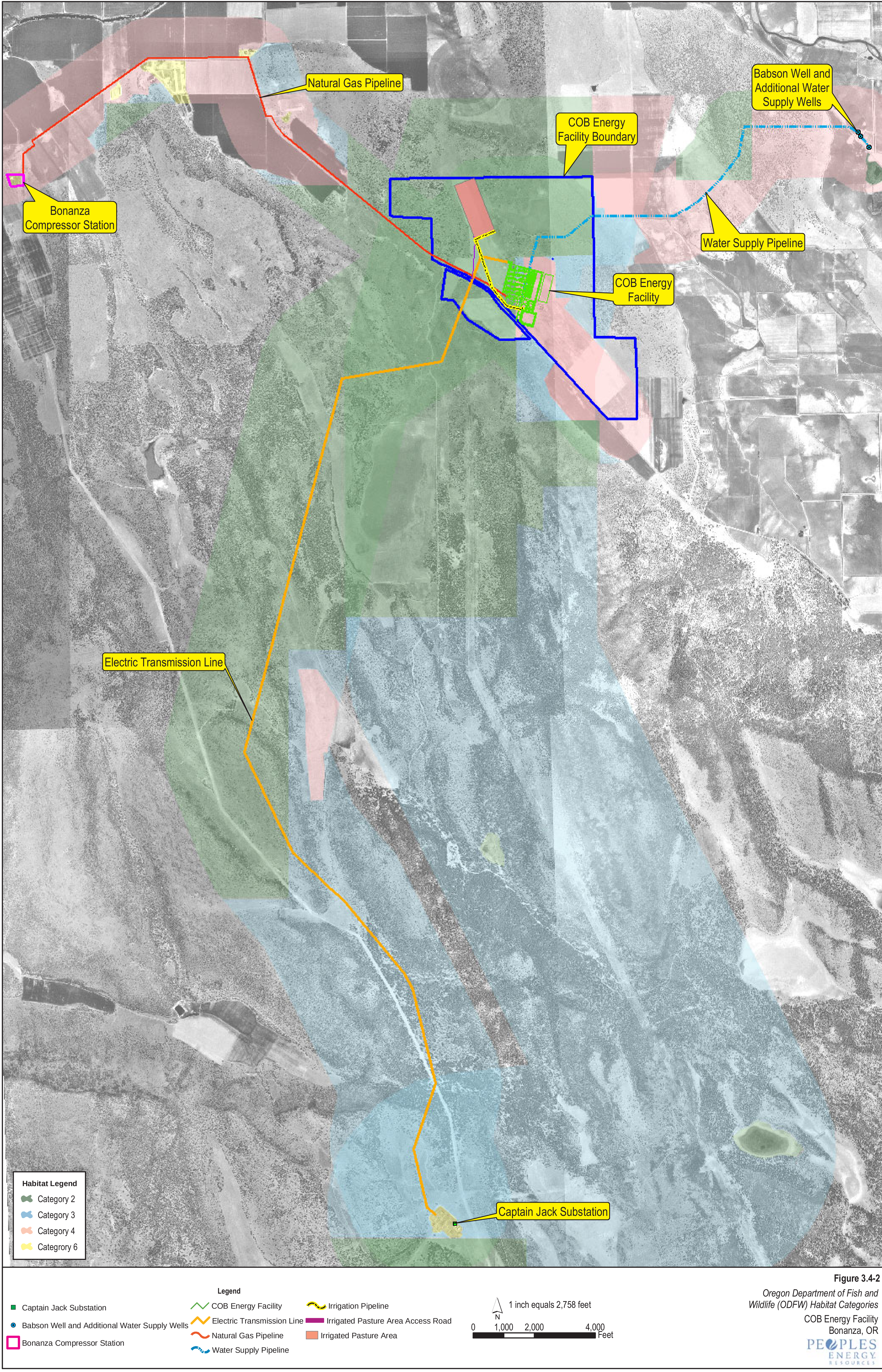


Figure 3.4-2

Oregon Department of Fish and Wildlife (ODFW) Habitat Categories

COB Energy Facility
Bonanza, OR

PEOPLES ENERGY RESOURCES

File Path: \\Rosa\Proj\PERC\167426\Gis\EIS\mxds\EIS_October_03\3.4-2_odfw.mxd, Date: October 27, 2003 4:52:56 PM

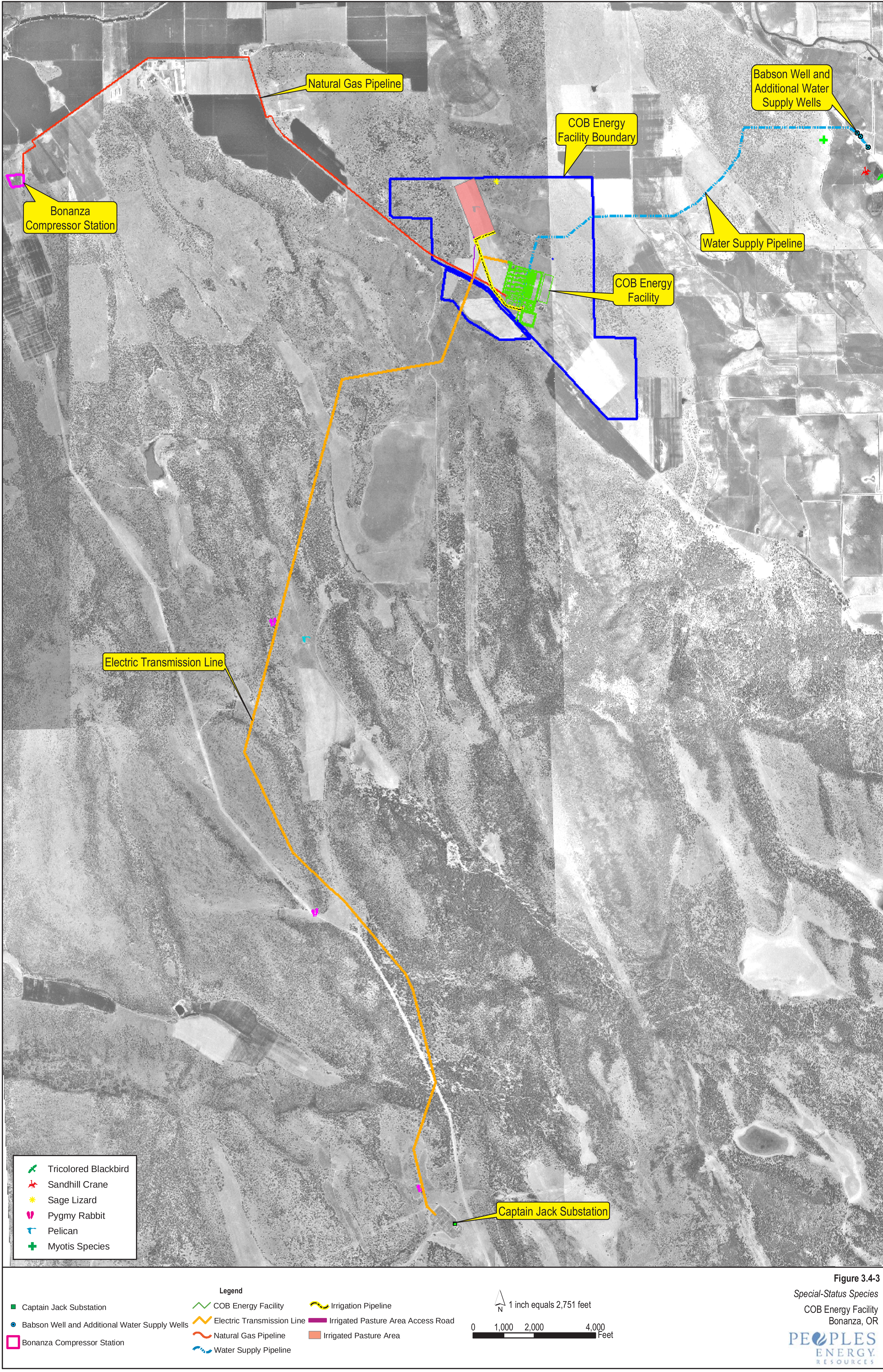


Figure 3.4-3

Special-Status Species

COB Energy Facility
Bonanza, OR

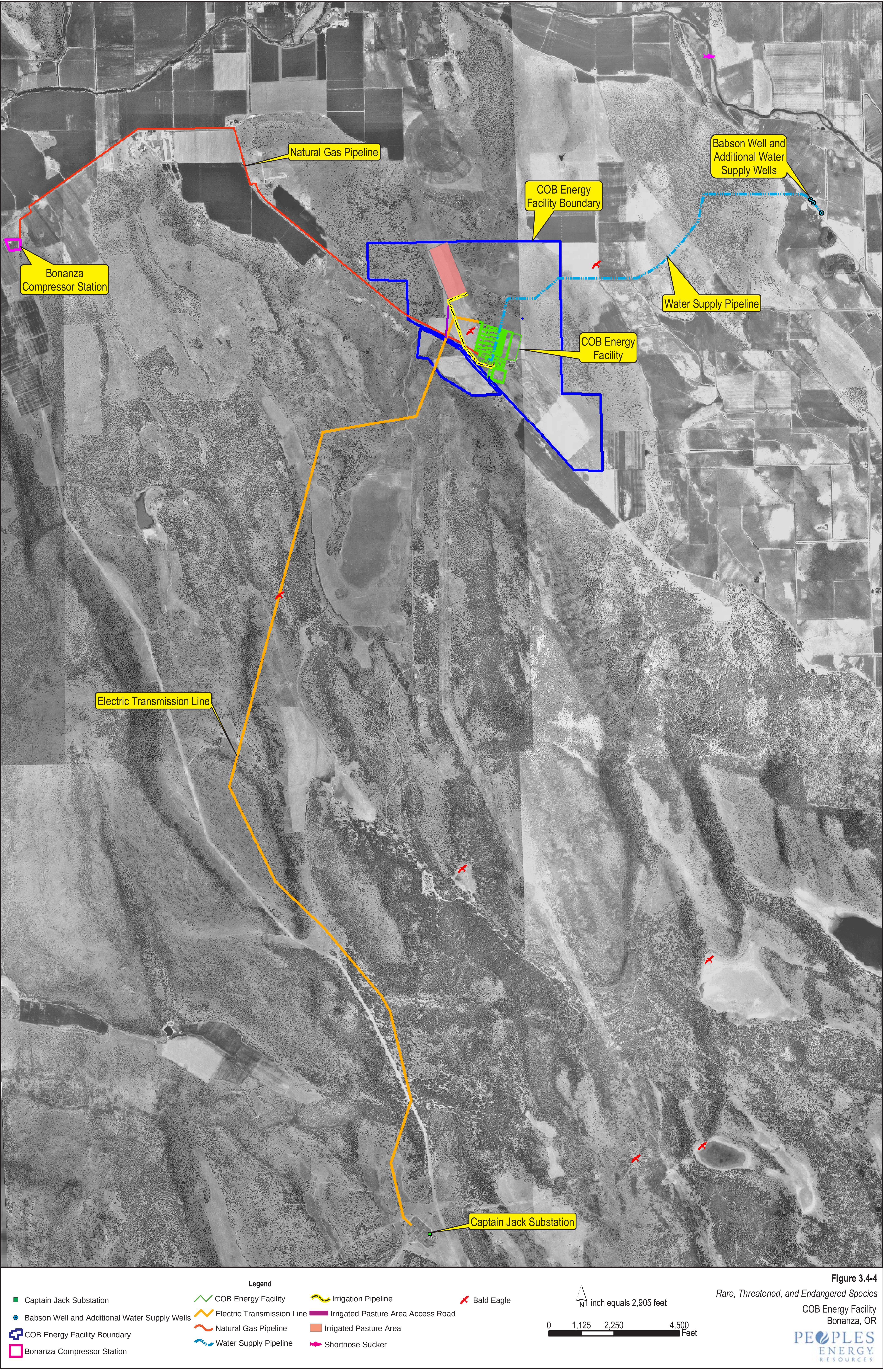


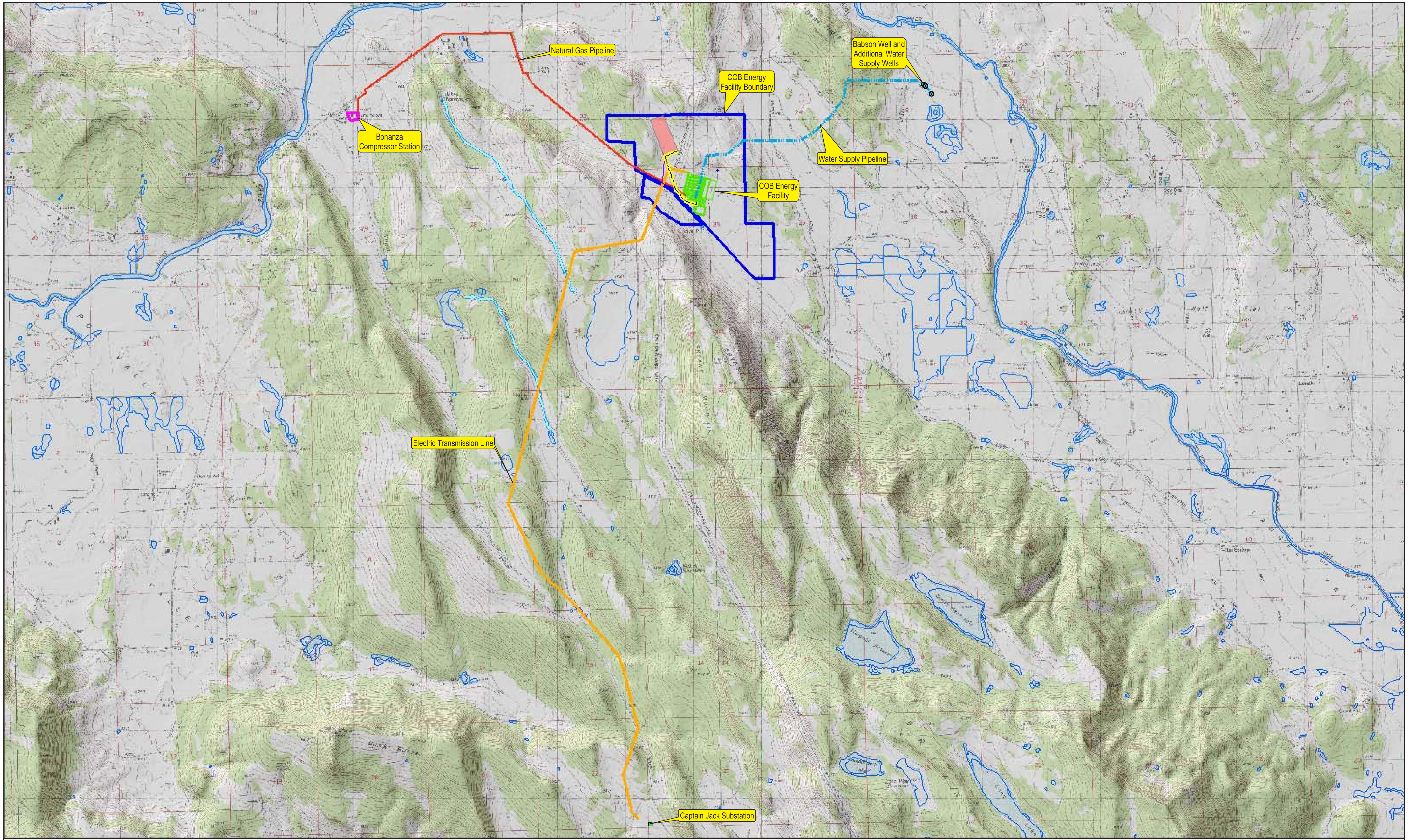
Figure 3.4-4

Rare, Threatened, and Endangered Species

COB Energy Facility
Bonanza, OR

PEOPLES ENERGY RESOURCES

File Path: \\Rosa\Proj\PERC\167426\Gis\EIS\mxds\EIS_October_03\3.4-4_rte.mxd, Date: October 27, 2003 4:55:32 PM



Legend

- Captain Jack Substation
- Babson Well and Additional Water Supply Wells
- Water Supply Pipeline
- Natural Gas Pipeline
- Irrigation Pipeline
- Irrigated Pasture Area Access Road
- Irrigated Pasture Area
- Field-Observed Wetlands
- Electric Transmission Line
- COB Energy Facility
- Bonanza Compressor Station
- COB Energy Facility Boundary
- National Wetlands Inventory (NWI) Wetlands

Source: National Wetlands Inventory (NWI). Malin, Bonanza, Bryant Mountain and Lorella 1:24,000 Scale Quadrangle Series. Digitized from aerial photo interpretation.

N

1 inch equals 4,211 feet

0 2,000 4,000 8,000 Feet

Figure 3.4-5
Wetlands
COB Energy Facility
Bonanza, OR

PEOPLES ENERGY RESOURCES

File Path: \\Rosa\Proj\PERC\167426\Gis\EIS\mxds\EIS_October_03\3.4-5_wetlands.mxd, Date: October 27, 2003 4:58:23 PM

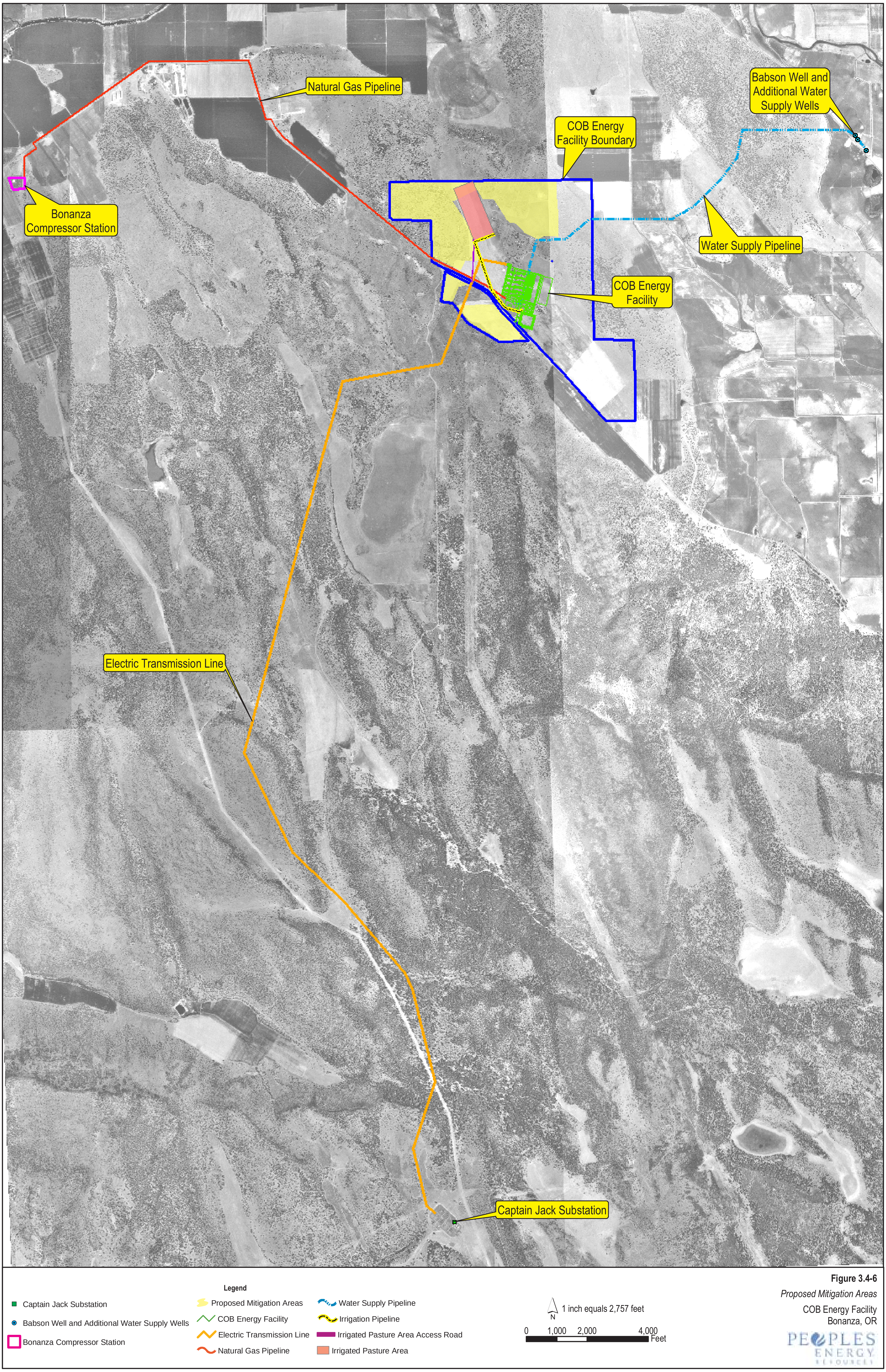


Figure 3.4-6

Proposed Mitigation Areas

COB Energy Facility
Bonanza, OR

PEOPLES ENERGY RESOURCES

File Path: \\Rosa\Proj\PERC\167426\Gis\EIS\mxds\EIS_October_03\3.4-6_habitat-mitigation.mxd, Date: October 27, 2003 4:59:36 PM

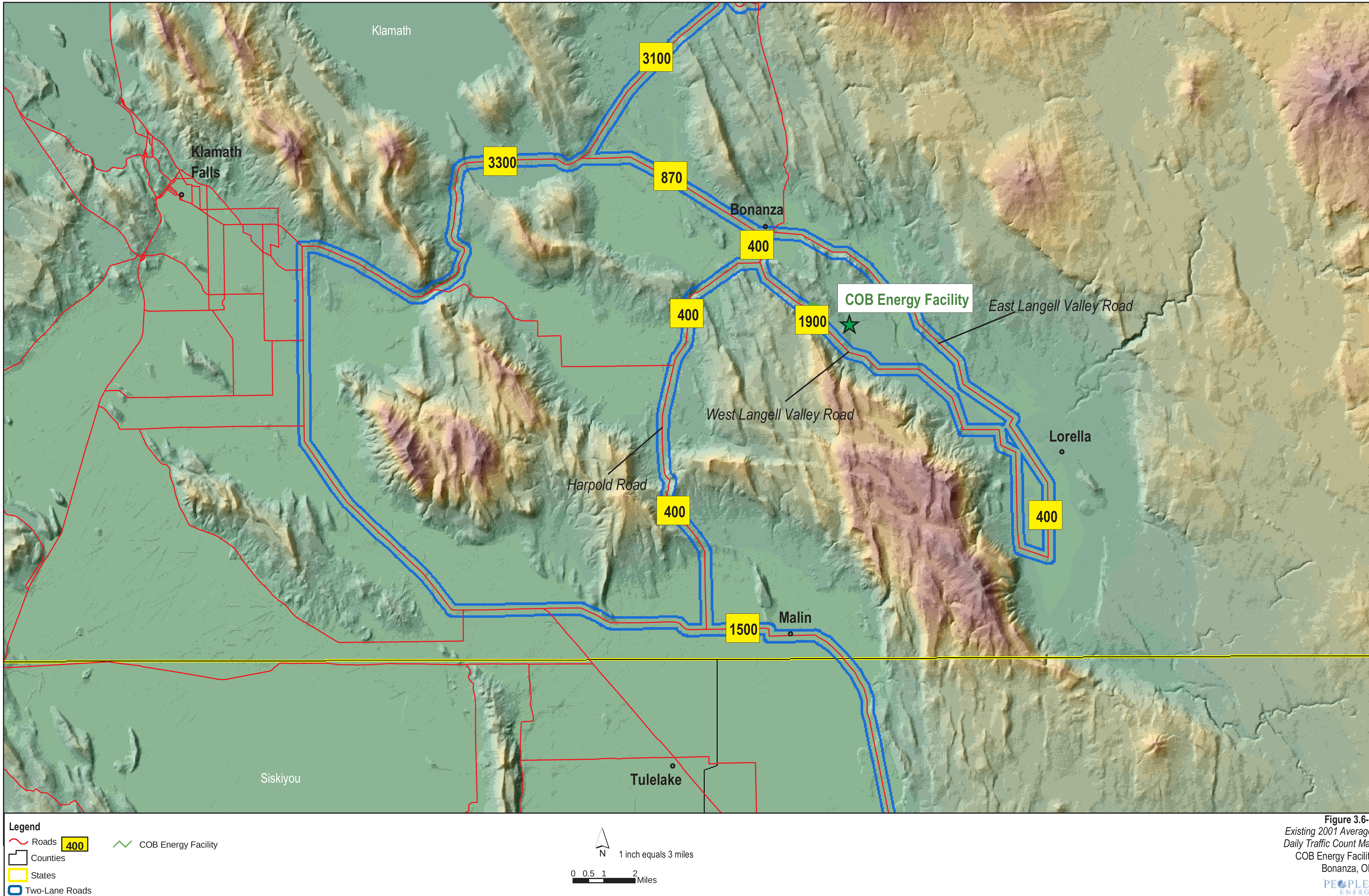


Figure 3.6-1
Existing 2001 Average
Daily Traffic Count Map
COB Energy Facility
Bonanza, OR

File Path: \\Rosa\Proj\PERC\167426\Gis\EIS\mxds\EIS_October_03\3.6-1_traffic-counts.mxd, Date: October 27, 2003 5:01:54 PM

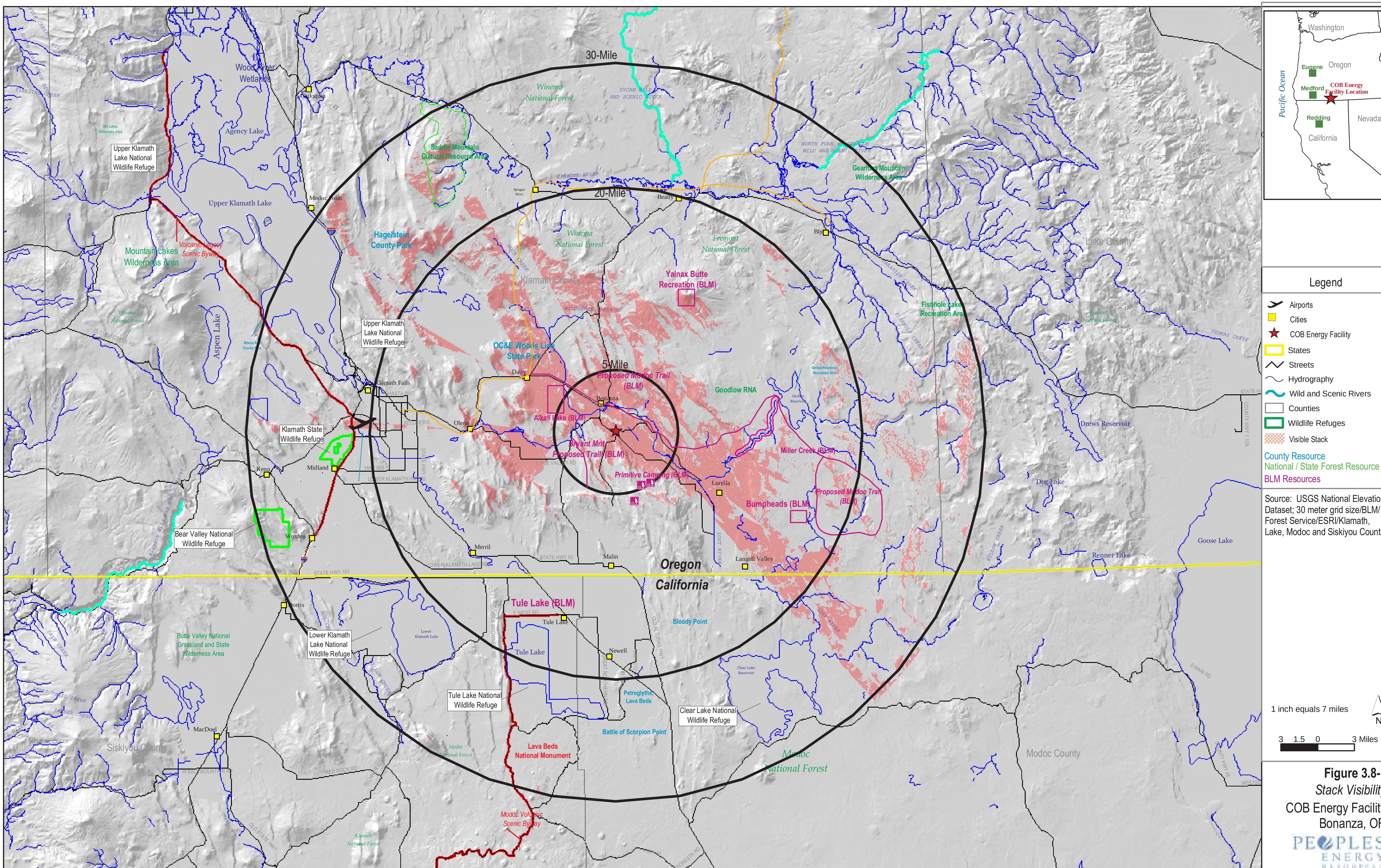


Figure 3.8-1
Stack Visibility
COB Energy Facility
Bonanza, OR

PEOPLES ENERGY RESOURCES

File Path: P:\PERC\167426\Gis\EIS\mxds\EIS_8-7-03\3.8-2_tower_Visibility.mxd, Date: 08 15, 2003 10:29:17 AM

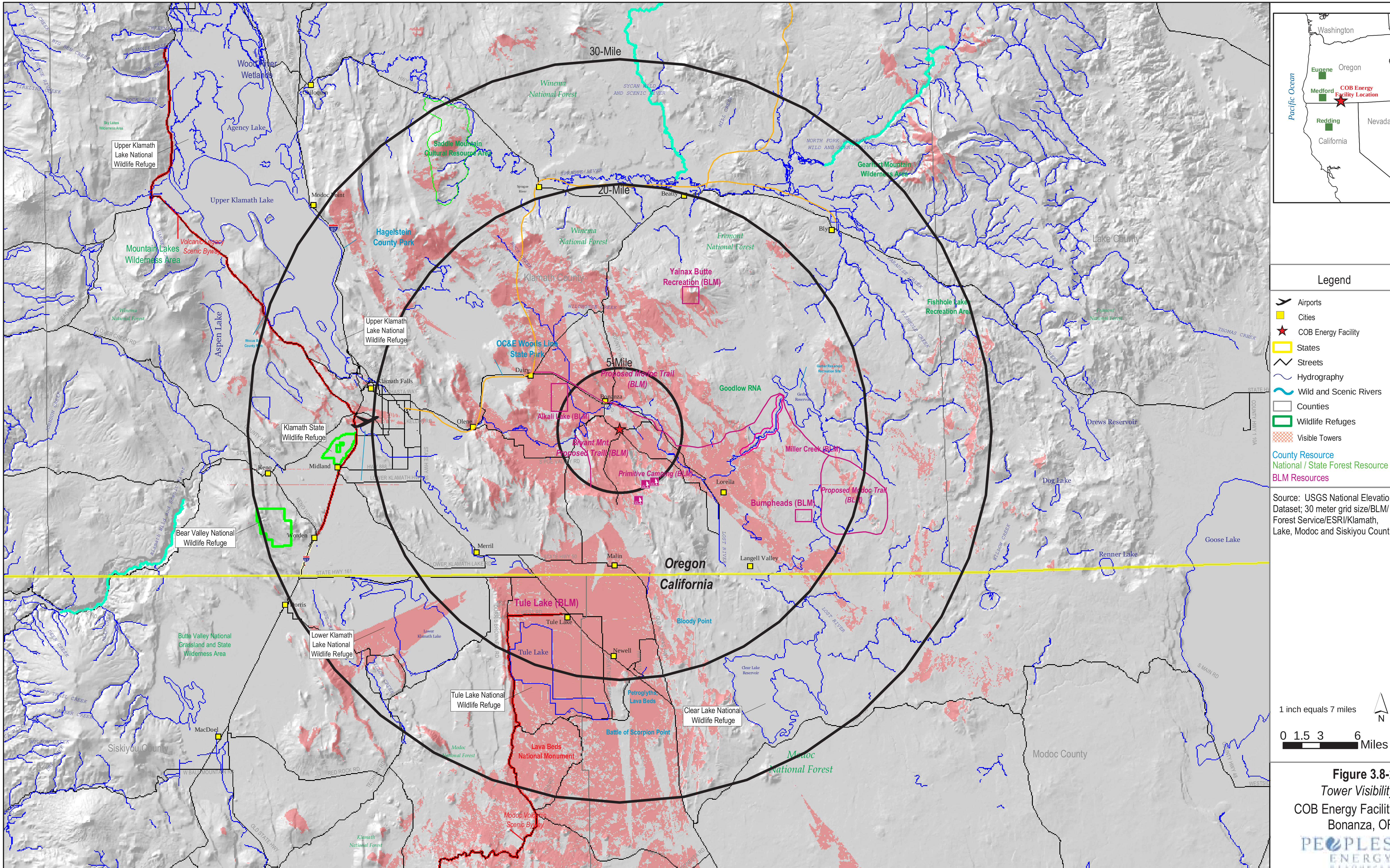


Figure 3.8-2
Tower Visibility
COB Energy Facility
Bonanza, OR

File Path: P:\PERC\167426\Gis\EIS\mxds\EIS_8-7-03\3.8-2_tower_Visibility.mxd, Date: 08 15, 2003 10:29:17 AM

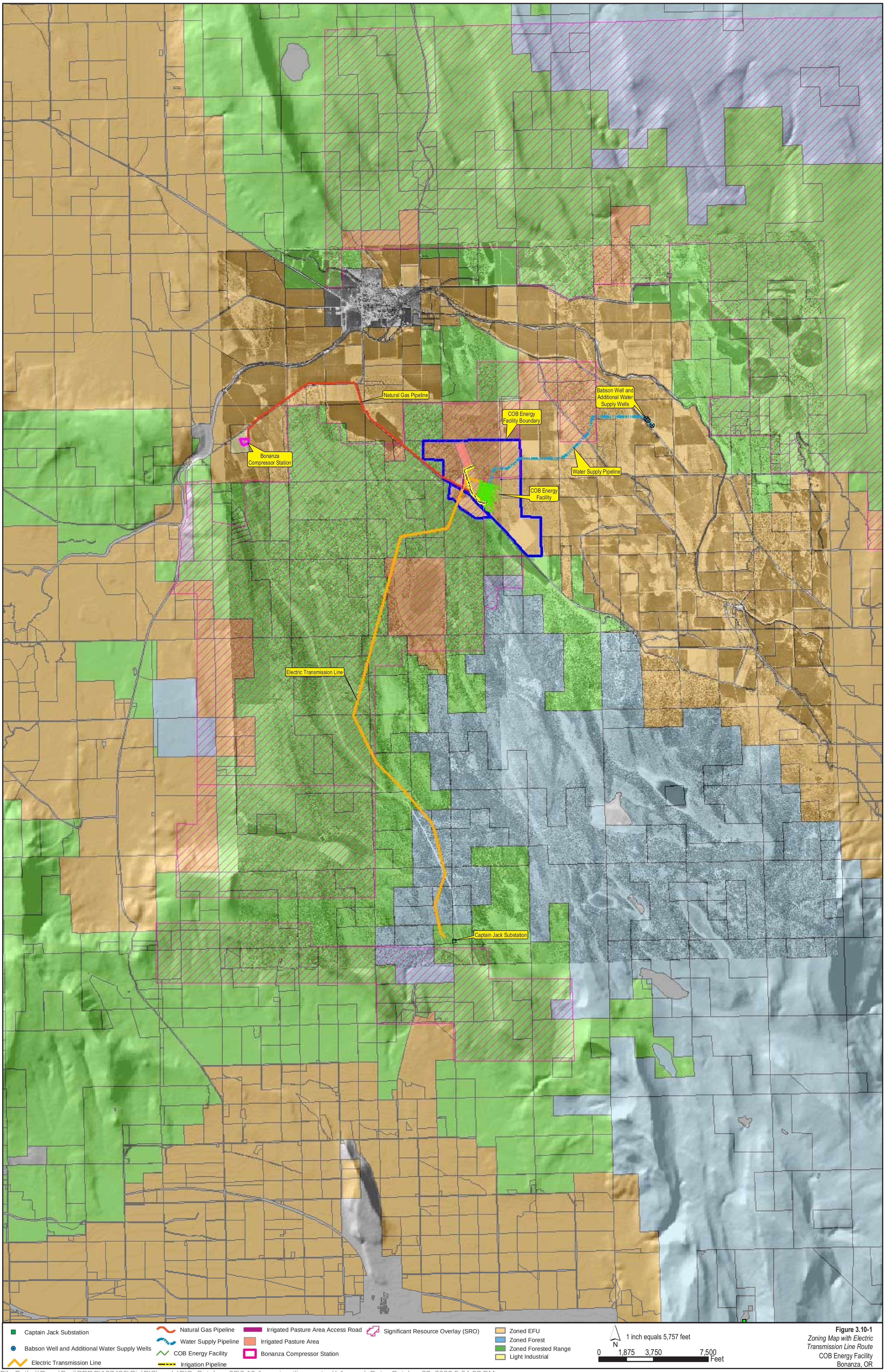


Figure 3.10-1
Zoning Map with Electric Transmission Line Route
COB Energy Facility
Bonanza, OR

File Path: \\Rosa\Proj\PERC\167426\Gis\EIS\mxds\EIS_October_03\3.10-1_zoning-tline-route_K-1a.mxd, Date: October 27, 2003 5:04:37 PM

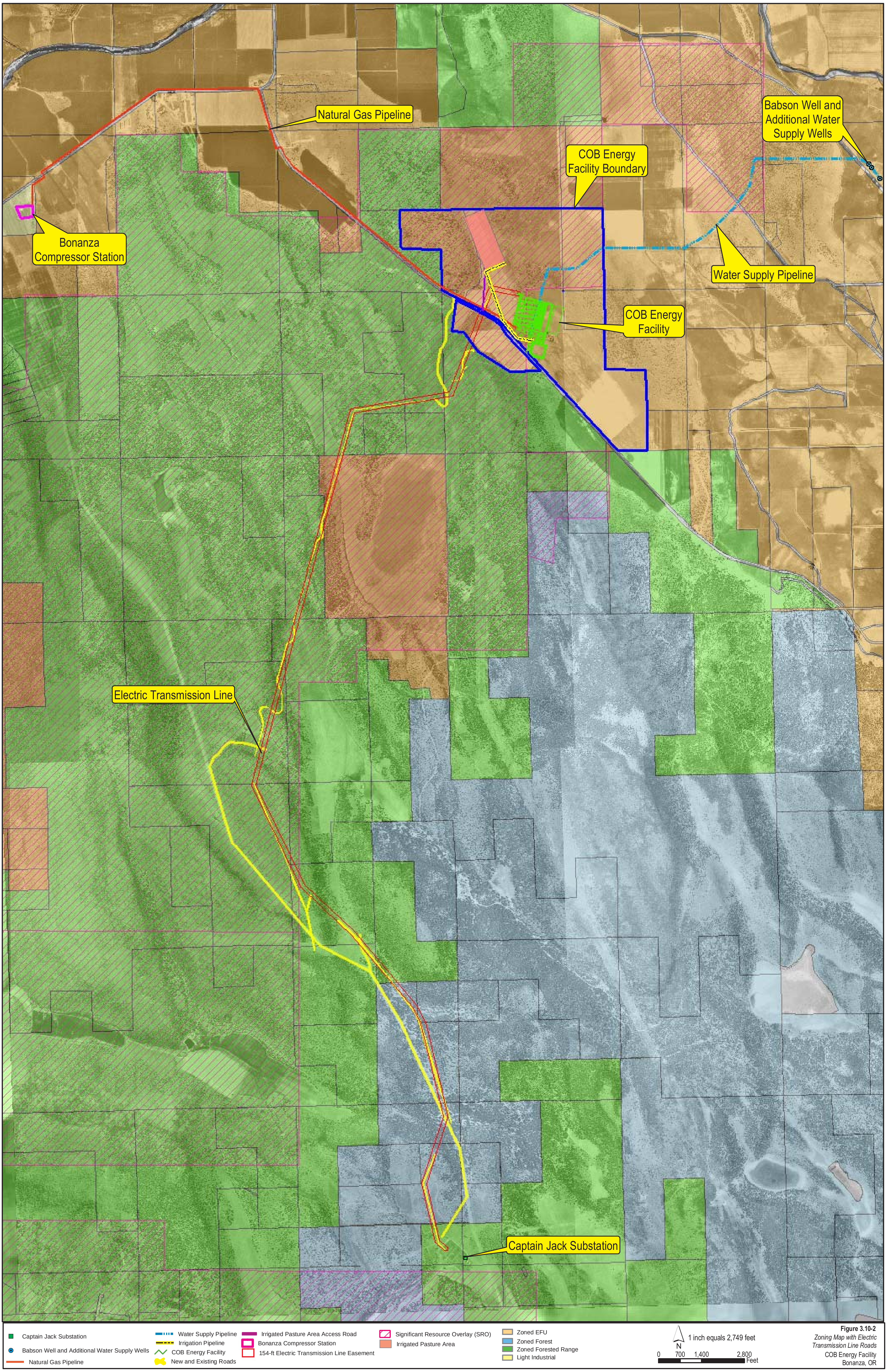
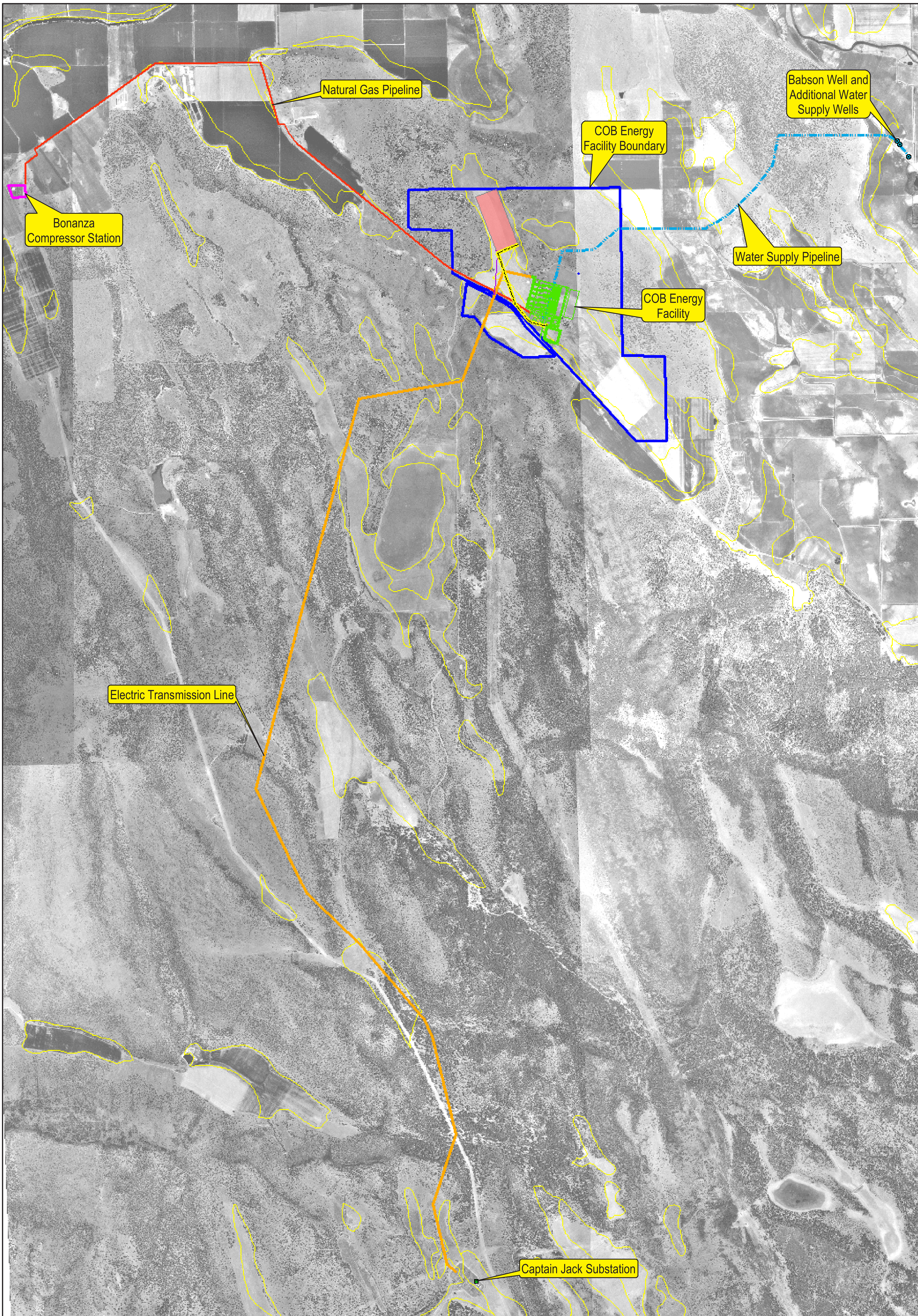


Figure 3.10-2
Zoning Map with Electric Transmission Line Roads
COB Energy Facility
Bonanza, OR

File Path: \\Rosa\Proj\PERC\167426\Gis\EIS\mxds\EIS_October_03\3.10-2_zoning-tline-roads.mxd, Date: October 27, 2003 3:53:13 PM



Legend

- Captain Jack Substation
- Babson Well and Additional Water Supply Wells
- COB Energy Facility Boundary
- Bonanza Compressor Station
- COB Energy Facility
- Electric Transmission Line
- Natural Gas Pipeline
- Water Supply Pipeline
- High-Value Soil (HVS)
- Irrigated Pasture Area Access Road
- Irrigation Pipeline
- Irrigated Pasture Area

N

1 inch equals 2,757 feet

0 1,000 2,000 4,000 Feet

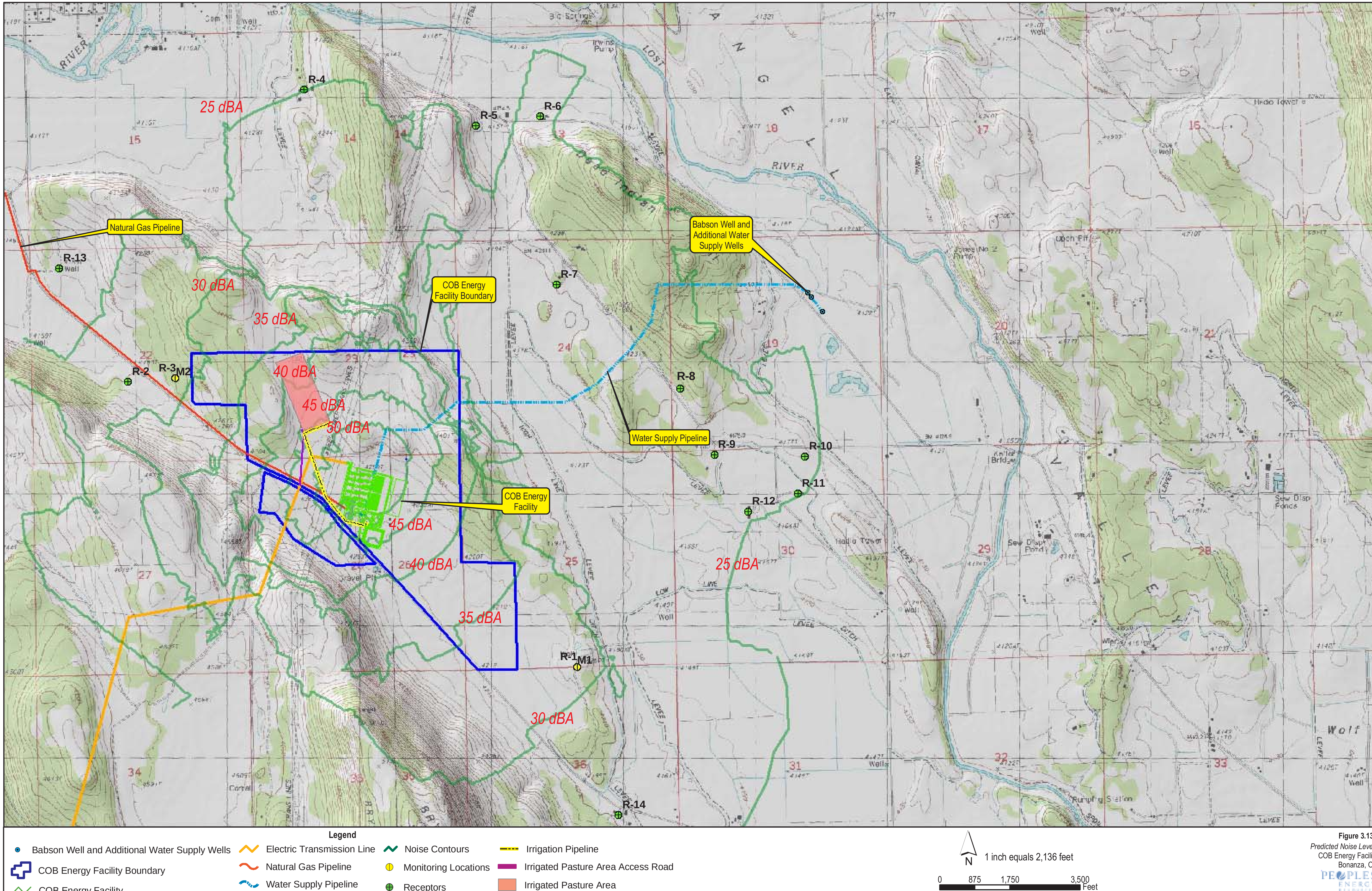
Figure 3.10-3

High-Value Soil

COB Energy Facility
Bonanza, OR

PEOPLES ENERGY RESOURCES

File Path: \\Rosa\Proj\PERC\167426\Gis\EIS\mxds\EIS_October_03\3.10-3_hvs.mxd, Date: October 27, 2003 3:58:12 PM



File Path: \\Rosa\Proj\PERC\167426\Gis\EIS\mxds\EIS_October_03\3.13-1_predicted-noise.mxd, Date: October 27, 2003 4:21:07 PM

CHAPTER 4

Environmental Consultation, Review, and Permit Requirements

A number of Federal environmental laws and administrative requirements must be satisfied by the proposed project. This chapter provides a summary of these requirements and discusses their applicability to the project. Requirements of the state of Oregon must be satisfied; they are not described in detail in this chapter but are listed in the final section.

4.1 National Environmental Policy Act

This document contains information necessary for preparation of an EIS pursuant to regulations implementing the National Environmental Policy Act (42 USC §4321 et seq.), which requires Federal agencies to assess the impacts that their actions may have on the environment. BPA's potential transmission of power from the COB Energy Facility requires BPA to assess the potential environmental effects of the proposed project and describe them in an EIS. Decisions would be based on an understanding of the proposed project's potential environmental consequences and the actions that would be taken to protect, restore, and enhance the environment.

The Bureau of Land Management, which manages property where an easement would be provided, is a cooperating agency in the NEPA process.

4.2 Endangered and Threatened Species and Critical Habitat

The Endangered Species Act of 1973, as amended (16 USC §1536 et seq.), requires Federal agencies to ensure that their actions do not jeopardize endangered or threatened species or their critical habitats. Sources of information for the potential occurrence of sensitive species in an area include both Federal and state lists.

Consultation letters were sent to the U.S. Fish and Wildlife Service (USFWS) and National Marine Fisheries Service (NMFS) to identify Federal species of concern. The Oregon Natural Heritage Program (ONHP) was queried for information on listed and sensitive species. The ODA was contacted for information about protection and conservation programs. The following species has been known to occur or potentially occur within the project area, based on habitat suitability and information received from the USFWS and ONHP.

Bald eagle (*Haliaeetus leucocephalus*)—threatened in Oregon and the U.S.

Potential impacts of the proposed project on the listed species are discussed in Sections 3.4 and 3.5. BPA and BLM have an obligation under Section 7 of the ESA to consult with USFWS concerning these potential impacts. Accordingly, a biological assessment has been prepared and included in this Draft EIS as Appendix C.

4.3 Fish and Wildlife Conservation

The Fish and Wildlife Conservation Act of 1980 (16 USC §2901 et seq.) encourages Federal agencies to conserve and promote conservation of nongame fish and wildlife species and their habitats. Water resources that promote fish and wildlife habitat would not be impacted by the Energy Facility.

4.4 Heritage Conservation

The National Historic Preservation Act of 1966, as amended (16 USC §470 et seq.), requires BPA to take into account the potential effects of its undertakings on properties that are eligible for nomination to the National Register of Historic Places (NRHP). BPA must consult the State Historic Preservation Office regarding the inventory and evaluation of properties potentially eligible for National Register nomination and to determine whether the undertaking would adversely affect them. An archival search and field survey were conducted. No resources were listed on the NRHP or with SHPO. During the field survey, however, two archaeological resources and one cultural resource were found. The *Cultural Resources Technical Report* was prepared for the SCA in cooperation with The Klamath Tribes to document the results of the field survey and the history of the area (CH2M HILL, 2003).

BPA is required to provide the Advisory Council on Historic Preservation (ACHP) an opportunity to comment on the proposed project. The ACHP published implementing regulations for Section 106 of the NHPA at 36 CFR 800. Federal agencies follow 36 CFR 800 to fulfill the cultural resource coordination and compliance process. These include step-by-step procedures for the entire coordination process (including steps for conducting government-to-government consultations with Indian Tribes), from initial identification of a resource, through its evaluation, and to final mitigation, if required. BPA would conduct government-to-government consultations with The Klamath Tribes.

The Native American Graves Protection and Repatriation Act (NAGPRA) of 1990 (25 USC §3001 et seq.) assigns ownership of Native American graves found on Federal land to Native Americans. It requires the Federal agency managing land on which the grave was found to consult with the most likely descendent of the buried person or with a culturally related person regarding the disposition of the remains.

The electric transmission line crosses lands owned and managed by the Bureau of Land Management. Any Native American graves found in this segment would be subject to the NAGPRA.

4.5 State, Areawide, and Local Plan and Program Consistency

4.5.1 Land Use

The Energy Facility would be located in Klamath County. The Klamath County Land Development Code (LDC) and the Klamath County Comprehensive Plan (KCCP) govern development in the project area.

The proposed Facility would alter land use at the Energy Facility site from fallow fields to a utility use. The Energy Facility site is zoned for EFU and has a Significant Resource Overlay, which includes high-density deer winter range and medium-density deer winter range. The electric transmission line route would alter land uses from primarily rangeland and forested land to utility use. The electric transmission line is zoned for EFU, FR, and FU. The natural gas pipeline would be constructed below the surface of the lands zoned for EFU, FU , and industrial use. The water supply pipeline would be constructed below areas used for agriculture, pasture, rangeland, and fallow fields. The water supply well would be constructed on land used as pasture and zoned as EFU.

The Energy Facility would comply with applicable local and state land use regulations, except that it would exceed the acreage conversion limits for high-value soil and commercial forest land found in Goals 3 and 4, respectively, of the KCCP. The Energy Facility would be considered a conditional use by Klamath County.

4.5.2 Notice to the Federal Aviation Administration (FAA)

Construction of any facility 200 feet (61 meters) or taller above ground level requires that notice be given to the FAA. The stacks proposed at the proposed Energy Facility would be less than 200 feet tall.

Additionally, proximity of a facility to an airport requires that notice be given to the FAA. The closest public airport to the Energy Facility would be Klamath Falls International Airport, located approximately 30 miles west of the site. A small, private airport (Juniper Hills Airport) is located approximately 5 miles southwest of the Energy Facility site.

4.5.3 Construction-Related Permits

Grading, building, and related permits would be required from Klamath County. In addition to requiring the proper building permits, the County also requires developers to complete the following activities prior to construction:

- Obtain land use approvals from Klamath County.
- Establish fire suppression and hazardous material safety designs in consultation with the Bonanza Rural Fire Protection District and the State Fire Marshal.
- Have the Energy Facility design reviewed by the Oregon Building Codes Agency for code compliance.

4.6 Coastal Zone Management Program Consistency

The Energy Facility would not be located in a coastal zone, and it would not affect any such zone.

4.7 Floodplains

The Energy Facility would not cause the placement of structures or fill within federally designated floodplains.

4.8 Wetlands

Information on wetlands was obtained from review of U.S. Geological Survey (USGS) 7.5-minute quadrangles, aerial photographs, National Wetland Inventory (NWI) maps, and soil maps for Klamath County, Oregon. Field investigations and wetland delineations were conducted between May 6 and May 10, 2002. Less than 0.5 acres of impact to wetlands associated with three intermittent creeks would occur as a result of the placement of culverts along the electric transmission line access road. A wetland delineation report was filed with the U.S. Army Corps of Engineers (Eugene, Oregon) and the Oregon Division of State Lands (Bend, Oregon) on August 22, 2003.

4.9 Farmlands

The Farmland Protection Policy Act (7 USC §4201 et seq.) directs Federal agencies to identify and quantify adverse impacts for Federal programs on farmlands. The Act's purpose is to minimize the number of Federal programs that contribute to the unnecessary and irreversible conversion of agricultural land to nonagricultural uses. The Energy Facility site and the electric transmission line could permanently disturb up to 4.1 acres of land classified as high value soil. Impacts to these soil are described further in Section 3.2.

4.10 Recreation Resources

No public recreation occurs at the proposed locations of the Energy Facility site, water supply well and pipeline, electric transmission line, and natural gas pipeline. There are six potential recreational opportunities within a 5-mile radius of the Energy Facility: Bonanza City Park, Malin City Park, a primitive BLM campsite, a proposed BLM backcountry byway, a proposed BLM trail, and the Fremont National Forest. Construction and operation of the Energy Facility at distances of several miles from the identified recreational opportunities would not cause the direct or indirect loss of recreational use.

4.11 Global Warming

Emissions of carbon dioxide (CO_2) for the Energy Facility were estimated as a part of the demonstration of compliance with OAR 345-024-0560, as presented in Exhibit Y of the SCA as amended by Amendments No. 1 and No. 2, filed with EFSC on July 25, 2003, and October 15, 2003, respectively. The estimate of 0.51 million tons per year would exceed the CO_2 standard, thereby requiring offsets. This requirement would be met through the monetary path, in terms of a payment of over $13.6 million to The Climate Trust.

4.12 Permit for Structures in Navigable Waters

Section 10 of the Rivers and Harbors Act of 1899 (33 U.S.C. 403) regulates work done in or structures placed below the ordinary high water mark of navigable water of the U.S. No work associated with the proposed Energy Facility would occur in such water bodies.

4.13 Permit for Discharges into Waters of the United States

Discharge of dredged or fill material into waters of the United States is regulated by the Army Corps of Engineers pursuant to Section 404 of the Clean Water Act. The proposed Energy Facility would be located in an upland area. Although the electric transmission line would pass over water of the United States, it would not affect these features. Discharge of dredged or fill material into waters of the United States is not proposed by the project.

4.14 Permits for Right-of-Way on Public Lands

For the most part, the Energy Facility would be constructed on privately owned land. Sections of the water supply pipeline would cross irrigation canals, which would require consultation with the Langell Valley Irrigation District, but no new right-of-way permit. The electric transmission line would cross land managed by BLM. An application has been submitted to BLM for an easement.

4.15 Energy Conservation at Federal Facilities

The proposed project does not include the operation, maintenance, or retrofit of an existing Federal building or the construction or lease of a new Federal Building.

4.16 Pollution Control

Several pollution control acts would apply to the project, including:

- Clean Air Act
- Clean Water Act
- Resource Conservation and Recovery Act
- Toxics Substance Control Act
- Federal Insecticide, Fungicide, and Rodenticide Act

4.16.1 Air

Emissions produced by the proposed project must meet standards established by the Environmental Protection Agency. The Clean Air Act is the principal Federal law governing air pollution control. It was most recently amended in 1990. In the project area, authority for ensuring compliance with the provisions of the Clean Air Act is delegated to ODEQ. The Energy Facility would comply with applicable standards, as described in Section 3.7. ODEQ deemed the air permit application complete for the Facility on December 6, 2002.

4.16.2 Water

The Clean Water Act of 1977, as amended, is the principal Federal law governing water pollution control. The Act was most recently amended in 1987 and reauthorized in 1991. The Clean Water Act authorizes Federal and state regulations of discharges into waters of the United States and municipal sewer systems. The NPDES is the primary instrument for implementing the Act. ODEQ is authorized to administer the NPDES program within the state. An NPDES Stormwater Discharge Permit 1200-Z would not be required for plant operation because stormwater would discharge to an infiltration basin and not to surface water at a point source. However, if the alternative of discharging the stormwater into the West Langell Valley Road side ditch is selected, an NPDES General Construction Permit 1200-C would be required.

An NPDES Stormwater Discharge General Permit for Construction is required to address erosion control for construction activity. The project proponent applied for this permit on September 5, 2002.

4.16.3 Solid and Hazardous Waste

During construction, solid waste generated at the Energy Facility would include scrap metals, cardboard, packing paper, wood, plastic, glass, and excess excavation materials. An estimated 350 tons would be generated each month. During operations, approximately 50 tons per year of solid waste would be generated at the site, including office waste, turbine air filters, metal and machine parts, and electrical materials. During both construction and operations, wastes would be recycled as much as feasible, and any nonrecyclable construction wastes would be collected in roll-off bins and transported to a landfill.

It is expected that special disposal permits would not be required during construction and that the proposed Energy Facility would not produce any solid wastes classified as "special wastes." The project would comply with Federal and state regulations dealing with the use, storage, and disposal of hazardous materials and hazardous wastes, including those covered under Division V of the 1991 Uniform Fire Code entitled "Stationary Tank Storage, Aboveground, Outside of Buildings."

4.16.4 Safe Drinking Water

The Safe Drinking Water Act (42 U.S.C. Section 200f et seq.) protects the quality of public drinking water and its source. During construction, drinking water would be bottled. During operations, drinking water would be supplied from the Babson well. The proposed Energy Facility would comply with state and local public drinking water regulations and would not degrade the quality of aquifers or jeopardize their usability as a drinking water source. The proposed Energy Facility would not affect any sole source aquifer or other critical aquifers, or adversely affect surface water supplies. Section 3.3 provides more information on water quality and hydrology.

4.16.5 Noise

The proposed project is subject to maximum allowable levels of noise by the state of Oregon (OAR 340-035-0035). Regular operation of the Energy Facility with mitigation as proposed would comply with noise standards for nearby sensitive receptors. Potential noise-related impacts of project construction and operation are discussed in Section 3.13.

4.16.6 Pesticides and Asbestos

The proposed project would not use or produce pesticides and would not distribute, use, or dispose of polychlorinated biphenyls (PCBs), although the landscaping conducted for the Energy Facility may include a small amount of pesticides.

Asbestos would not be used in the Facility.

4.16.7 Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA)

The Comprehensive Environmental Response, Compensation, and Liability Act, commonly known as Superfund, was enacted by Congress on December 11, 1980, and amended by the Superfund Amendments and Reauthorization Act (SARA) on October 17, 1986. CERCLA established prohibitions and requirements concerning closed and abandoned hazardous waste sites; provided for liability of persons responsible for releases of hazardous waste at these sites; and established a trust fund to provide for cleanup when no responsible party could be identified. The land on which the Energy Facility would be sited has been used as agricultural land, pasture land, and rangeland. Based on site visits and review of databases, the following observations were made:

- Waste and debris piles were not on the subject property.
- Stained soil were not on the subject property.
- No obvious hazardous substance use, storage, or disposal was on the subject property at the time of the site visit.
- No indications of groundwater or petroleum wells were identified during the site visit on the subject property.
- There were no buildings or evidence of foundations in the aerial photographs or identified during the site visit on the subject property.
- No uses of aboveground or underground tanks were indicated in the regulatory databases or observed at the subject property.
- The subject property was not listed in any regulatory databases checked.

4.16.8 Radon

There is no evidence to suggest that the sites of the Energy Facility and its supporting facilities are affected by regulations concerning radon gas or would be affected by the Radon Gas and Indoor Air Quality Research Act of 1986 (42 USC §7401).

4.17 Permits

Permits would be obtained from a number of agencies before Energy Facility construction and operation could begin. The following state and local permits would be required from the relevant agency:

- Energy Facility Site Certificate (EFSC)
- Onsite Sewage Disposal System Permit—Construction and Operation (ODEQ)
- Water Right Permit or Water Use Authorization (OWRD)
- Water Pollution Control Facility Permit (ODEQ)

- Performing Miscellaneous Operations upon a State Highway (ODOT)
- Oversize Load Movement Permit/Load Registration (ODOT)
- Air Contaminant Discharge Permit Including Prevention of Significant Deterioration Permit (ODEQ)
- Title V Operating Permit (ODEQ)
- Title IV Acid Rain Program (ODEQ)
- Construction Stormwater General and NPDES Permit 1200-C (ODEQ)
- Industrial Activities Stormwater General and NPDES Permit 1200-Z (ODEQ) if discharge is to the West Langell Valley Road side ditch
- Archaeological Artifacts Excavation Permit (SHPO)
- Hazardous Waste Generator Registration (ODEQ)
- Conditional Use Permit (Klamath County)
- Building Permits (Klamath County)

This list does not include Federal permits or permits pertaining to details of construction.

CHAPTER 5

List of Preparers

The COB Energy Facility Draft EIS was prepared by BPA with the technical assistance of CH2M HILL , an environmental consulting firm. Individuals responsible for preparing the Draft EIS, along with their affiliation, experience, and education, are listed below.

Thomas C. McKinney, BPA Project Manager. Twenty-three years in environmental analysis and policy decisionmaking at BPA. Education: B.A. Geography.

Mark L. Bricker, P.E., CH2M HILL Project Manager. Twenty-three years in the utility industry as an environmental engineer. Education: B.S. Mining.

Jim Thornton, Environmental Planner. Twenty-eight years in environmental analysis, EIS preparation, and regulatory compliance. Education: B.A., Psychology.

Christine Arenal, Wildlife Toxicologist. Five years planning and conducting ecological risk assessments, with specialized research concerning toxicological effects of chemicals in birds and mammals. Education: B.S. Biology with a Marine Emphasis, M.S. Zoology.

Dave Baker, Acoustical Technical Reviewer. Thirty years conducting acoustical evaluations and preparing environmental documents. Education: B.S. Mechanical Engineering.

James Bard, **Cultural Resource Specialist.** Twenty-five years in cultural resource management. Education: Ph.D. Anthropology/Archaeology.

Mark Bastasch, **P.E., Acoustical Lead**. Seven years conducting acoustical evaluations and preparing environmental documents. Education: B.S. and M.S. Environmental Engineering.

Phil Brown, Water Resources Lead. Fourteen years managing groundwater supply and aquifer storage/recovery projects from conceptual design through pilot testing and program expansion. Education: B.S. and M.S. Hydrogeology/Geology.

Don Caniparoli, Air Quality Lead. Twenty-four years conducting air quality analysis and evaluations for permitting and other environmental projects. Education: B.S. Atmospheric Sciences and M.S. Civil Engineering/Air Resources.

Gary Collins, Burns & McDonnell, Associate Engineer. Twenty-five years at Burns & McDonnell, 18 as a structural engineer/project manager. Education: B.S. Civil Engineering.

Debra Crowe, Biological Resources/Biologist for the Biological Assessment. Nine years conducting biological surveys, performing wetland delineations, and preparing environmental documentation. Education: B.S. Environmental Biology and Management.

Richard Crowe, Wetlands and Water Quality/Biologist for the Biological Assessment. Eight years conducting biological surveys and threatened and endangered species surveys, performing wetland delineations, and preparing environmental documentation. Education: A.S. Forestry and B.S. Wildlife Biology (in progress).

Dave Dailer, Geotechnical Engineering Specialist. Twenty-one years performing geotechnical explorations, studies, designs, and construction. Education: B.S.E. Civil Engineering and M.S.E. Geotechnical Engineering.

Dorothy DeVaney, Socioeconomic Lead. Thirteen years as local land use planner collecting and coordinating information between multiple jurisdictions. Education: B.L.A. Bachelor of Landscape Architecture.

Marjorie Eisert, Biological Assessment: Biology/Wetlands and Water Quality Lead. Fifteen years conducting biological surveys and preparing environmental documentation. Education: B.S. Wildlife and Fisheries Biology.

Lisa Fall, Environmental Planner. Ten years reviewing and writing state and Federal environmental documents. Education: B.A. American Studies.

Heike Guettel, P.E., Geotechnical Engineering Lead. Seven years in geotechnical analysis, design, field exploration, and construction. Education: Vordiplom in Civil Engineering (equivalent to B.S.) and M.S. Geotechnical Engineering.

Russ Huddleston, Biological Assessment: Wetlands and Water Quality/Botanist. Four years conducting botanical surveys, performing wetland delineations, and preparing environmental documentation. Education: B.S. Biology and M.S. Ecology.

Robin McClintock, Cultural Resource Lead. Eighteen years in cultural resource assessment and management. Education: B.S. Anthropology.

Tom Nilan, P.E., Air Quality Specialist. Eleven years conducting air quality analysis and evaluation for permitting and other environmental projects. Education: B.S. Chemical Engineering and Masters of Business Administration.

Harry M Ohlendorf, Principal Environmental Scientist. More than 30 years planning, implementing, and documenting site ecological characterizations and surveys, contaminant exposure and effect analyses, risk characterization, and project impact evaluations. Education: B.S. Wildlife Management (Fisheries Option), M.S. and Ph.D. Wildlife Science.

Sharon O'Shaughnessy, Water Resource Programs Specialist. Eight years in water resource programs and environmental documentation. Education: A.S. Physical (Earth) Sciences.

Mian Rice, **Transportation Planner/Engineer**. Ten years in transportation planning analysis. Education: M.S. Civil Engineering.

Eric Sack, Lead GIS Analyst. Five years as a GIS analyst working on environmental mapping applications. Education: B.S. Geography.

Bradley E. Sample, Ecological Risk Assessor/Wildlife Toxicologist. More than 10 years as an ecological risk assessor and wildlife ecologist focusing on large, complex sites. Education: Ph.D. Wildlife Ecology and Toxicology.

Ed Shorey, R.G., C.E.G., Geological Impacts Assessment Specialist. Twenty-eight years conducting geotechnical and geoenvironmental assessments. Education: B.A. and M.S. Geology.

Jason Smesrud, CPSS, Agricultural and Soil Lead. Eight years in agricultural and soil research and consulting. Education: B.S. Soil Science and M.S. Bioresource Engineering.

Cathy Sowa, **P.E., Air Quality Specialist**. Eleven years in air quality permitting. Education: B.S. Chemical Engineering.

Connie Thoman, Visual Quality and Aesthetics Lead. Thirteen years in environmental analysis and documentation, project management, planning, and public involvement. Education: B.A. Communications and M.S. Education.

C.L. Allen Tsao, Biological Assessment/Ecotoxicologist. Eight years in ecological risk assessment and research. Education: M.E.M. Environmental Chemistry and Toxicology.

Mark Wirganowicz, Water Resources Specialist. Eight years in groundwater investigations, recharge and recovery projects, and subsurface testing. B.S. and M.S. Geology.

Mary Beth Yansura, Air Quality Modeling Lead. Thirteen years in air quality permitting, regulatory compliance, and dispersion modeling analyses. Education: B.A. Chemistry.

Jenifer Young, EIS Task Manager. Thirteen years in environmental impact analysis and permitting. Education: B.A. English; M.P.A. Master of Public Administration.

CHAPTER 6

List of Agencies, Organizations, and Persons to Whom Copies of the EIS Are Sent

6.1 Federal Agencies

Bob Bachman
USDA Forest Service
333 SW First Avenue
Portland, OR 97204

Dee Morris
National Park Service
12795 West Alameda Parkway
Denver, CO 80225-0287

Dan Meyer
Environmental Protection Agency
1200 Sixth Avenue, MS-OAQ107
Seattle, WA 98101

Eric Stone
Bureau of Land Management
Oregon State Office
P.O. Box 2965
Portland, OR 97208

Jon Raby
Bureau of Land Management
Klamath Falls Resource Area Office
2795 Andersen Avenue, Building 25
Klamath Falls, OR 97603

Barbara Machado
Bureau of Land Management
Lakeview District
1301 S. G Street
Lakeview, OR 97630

Leonard LeCaptain
U.S. Fish and Wildlife Service
6610 Washburn Way
Klamath Falls, OR 97603

6.2 State Agencies

Bob Meinke
Department of Agriculture
635 Capitol Street NE, Room 212
Salem, OR 97310-0110

Bob Rindy
Department of Land Conservation & Development
1175 Court Street NE
Salem, OR 97310-059

Brett McKnight, Dick Nichols, and Peter Brewer
Oregon Department of Environmental Quality
Bend Regional Office
2146 NE Fourth, #104
Bend, OR 97701

Burns District Area Office
c/o Miles Brown
Andrews Resource Area
HC74-12533 Highway 20 West
Burns, OR 97738

David Morman
Oregon Department of Forestry
2600 State Street
Salem, OR 97310

Kammy Kern-Korot
Department of Fish and Wildlife
3406 Cherry Avenue NE
Salem, OR 97303

Michael Thompson
Oregon Public Utility Commission
550 Capitol Street NE, Ste 215
Salem, OR 97301

Janet Morlan
Division of State Lands
775 Summer NE
Salem, OR 97301-1279

Jerry Murray
Oregon Public Utility Commission
550 Capitol Street NE, Ste 215
Salem, OR 97301

Jerry Sauter
Oregon Water Resources Department
725 Summer St. NE, Suite A
Salem, OR 97310-0210

Jim Johnson
Department of Agriculture
635 Capitol Street NE
Salem, OR 97310-0110

Dennis Griffin
Oregon Parks and Recreation Department
725 Summer Street NE
Salem, OR 97301

Catherine Van Horn
Oregon Department of Energy
625 Marion Street N.E. Suite 1
Salem, OR 97301

Mike Stinson
Department of Transportation
2557 Altamont Drive
Klamath Falls, OR 97603

Paul Nees
Oregon Office of State Fire Marshal
4760 Portland Road NE
Salem, OR 97305-1760

Yumei Wang, P.E.
Department of Geology & Mineral
800 NE Oregon Street #28, Suite 965
Portland, OR 97232

Rebai Tamerhoulet
Building Codes Division
1535 Edgewater Street, NW
P.O. Box 14470
Salem, OR 97309-0404

Steve Brutscher
Oregon Parks and Recreation Department
1115 Commercial Street NE
Salem, OR 97301

Tom Collom
Oregon Department of Fish & Wildlife
Klamath Watershed District Office
1850 Miller Island Road
Klamath Falls, OR 97603

6.3 Other Agencies and Local Governments

J.R. Stewart, Chair
Lake County Commissioners
Courthouse
513 Center Street
Lakeview, OR 97630

Jeff Bell, City Manager
City of Klamath Falls
P.O. Box 237
Klamath Falls, OR 97601

Carl Shuck
Klamath County Planning Department
305 Main Street, First Floor
Klamath Falls, OR 97601

Jeff King
Northwest Power and Construction Council
851 SW Sixth Avenue, Suite 1100
Portland, OR 97204 7305

M. Steven West
Klamath County Commissioners
Government Center
305 Main Street
Klamath Falls, OR 97601

Mayor Betty Tyree
City of Bonanza
P.O. Box 297
Bonanza, OR 97623

Mayor Jeff Williamson
City of Malin
P.O. Box 61
Malin, OR 97632

Mayor Rhonda Lyon
City of Merrill
P.O. Box 487
Merrill, OR 97633

Mayor Joyce Smith
City of Chiloquin
P.O. Box 196
Chiloquin, OR 97624

Mayor Todd Kelstrom
City of Klamath Falls
500 Klamath Avenue
Klamath Falls, OR 97601

Ray Simms
Lake County Planning Department
Courthouse
513 Center Street
Lakeview, OR 97630

Delores Pigsley, Tribal Chair
Confederated Tribes of Siletz
P.O. Box 549
Siletz, OR 97380

Gerald Skelton
Cultural Site Protection Specialist
The Klamath Tribes
121 First Avenue
Chiloquin, OR 97624

Robert Kentta, Cultural Resources Director
Confederated Tribes of Siletz
P.O. Box 549
Siletz, OR 97380

CHAPTER 7
References

Chapter 1

Bonneville Power Administration. *Business Plan Final Environmental Impact Statement.* DOE/EIS-0183.

COB Energy Facility, LLC. *COB Energy Facility Site Certificate Application*. Filed with the Energy Facility Siting Council on September 5, 2003.

COB Energy Facility, LLC. *Amendment No. 1 to the Site Certificate Application for the COB Energy Facility*. Filed with the Energy Facility Siting Council on July 25, 2003.

COB Energy Facility, LLC. *Amendment No. 2 to the Site Certificate Application for the COB Energy Facility*. Filed with the Energy Facility Siting Council on October 15, 2003.

Energy Information Administration. 2000. *Annual Energy Review 1999, DOE/EIA-0383(2001)*. Washington, D.C. July 2000.

WECC. 2000. *10-Year Coordinated Plan Summary, 2000-2009: Planning and Operation for Electric System Reliability*. Salt Lake City, UT. October 2000.

Northwest Power Planning Council. 2000. *Northwest Power Supply Adequacy/Reliability Study Phase 1 Report*. Portland, OR. March 6, 2000.

Northwest Power Planning Council. 2002. Web site: http://www.nwcouncil.org/library/releases/2002/1211.htm. December 11, 2002.

Chapter 2

CH2M HILL. 1994. *Groundwater Development Potential and Hydrogeologic Assessment for the Lorella Pumped Storage Project, Klamath County, Oregon.* Appendix E.2.(a). Prepared for Energy Storage Partners.

CH2M HILL. 2002. *Water Supply Supplemental Data Report: Deep Aquifer Testing at the COB Energy Facility Water Supply Well.* Prepared for COB Energy Facility, LLC. November 2002.

COB Energy Facility, LLC. *Amendment No. 1 to the Site Certificate Application for the COB Energy Facility*. Filed with the Energy Facility Siting Council on July 25, 2003.

COB Energy Facility, LLC. *Amendment No. 2 to the Site Certificate Application for the COB Energy Facility*. Filed with the Energy Facility Siting Council on October 15, 2003.

U.S. Environmental Protection Agency. 1999. *Consideration of Cumulative Impacts in EPA Review of NEPA Documents*.

Chapter 3

3.1 Introduction

COB Energy Facility, LLC. 2002. *Site Certificate Application for the COB Energy Facility.* September 5, 2002.

3.2 Geology, Soil, and Seismicity

Ayars, R.S. and D.W. Westcot. 1989. Water Quality for Agriculture. FAO Irrigation and Drainage Paper No. 29 Rev. 1. Food and Agriculture Organization of the United Nations, Rome, Italy.

COB Energy Facility, LLC. 2002. *Site Certificate Application for the COB Energy Facility.* September 5, 2002.

COB Energy Facility, LLC. *Amendment No. 1 to the Site Certificate Application for the COB Energy Facility*. Filed with the Energy Facility Siting Council on July 25, 2003.

COB Energy Facility, LLC. *Amendment No. 2 to the Site Certificate Application for the COB Energy Facility*. Filed with the Energy Facility Siting Council on October 15, 2003.

GeoEngineers, Inc. 2002. *Preliminary Geotechnical Engineering Report, COB Energy Facility, Bonanza, Oregon.* Portland, Oregon. March 14, 2002.

Geomatrix Consultants. 1995. *Seismic Design Mapping, State of Oregon*. Prepared for ODOT. Project No. 2442.

Natural Resource Conservation Service (NRCS). 1985. *Soil Survey of Klamath County, Oregon, Southern Part.* U.S. Department of Agriculture Natural Resource Conservation Service, Washington, D.C.

Walker, G.W., and MacLeod, N.S. 1991. Geologic Map of Oregon: USGS, scale 1:500,000, 2 sheets.

3.3 Hydrology

Anderson, W.E., M. Borman, and W.C. Kruger. 1998. *The Ecological Provinces of Oregon*. Oregon Agricultural Experiment Station, SR990.

CH2M HILL. 1994. *Groundwater Development Potential and Hydrogeologic Assessment for the Lorella Pumped Storage Project, Klamath County, Oregon*. Appendix E.2.(a). Prepared for Energy Storage Partners.

CH2M HILL. 2002a. *OWRD Groundwater Permit Application Supplemental Data Report*. Prepared for Peoples Energy Resources Corporation. February 2002.

CH2M HILL. 2002b. *Water Supply Supplemental Data Report: Deep Aquifer Testing at the COB Energy Facility Water Supply Well.* Prepared for COB Energy Facility, LLC. November 2002.

COB Energy Facility, LLC. 2002. *Site Certificate Application for the COB Energy Facility.* September 5, 2002.

COB Energy Facility, LLC. *Amendment No. 1 to the Site Certificate Application for the COB Energy Facility*. Filed with the Energy Facility Siting Council on July 25, 2003.

COB Energy Facility, LLC. *Amendment No. 2 to the Site Certificate Application for the COB Energy Facility*. Filed with the Energy Facility Siting Council on October 15, 2003.

Franklin and Dyrness. 1988. *Natural Vegetation of Oregon and Washington Wildlife-Habitat Relationships in Oregon and Washington.*

3.4 Vegetation and Wildlife

Anderson, W.W**.** 1975**.** **"**Pole changes keep eagles flying**."** Transmission Distribution**.** November 1975**.** Pp. 28-31.

Anderson, W.E., M. Borman, and W.C. Kruger. 1998. *The Ecological Provinces of Oregon*. Oregon Agricultural Experiment Station, SR990.

Anthony, R.G., R.L. Knight, G.T. Allen, B.R. McClelland, and J.I. Hodges. 1982. "Habitat use by nesting and roosting bald eagles in the Pacific Northwest." Trans. N. Am. Wildl. Nat. Res. Conf. 47:332-342.

Avian Power Line Interaction Committee (APLIC). 1994. *Mitigating Bird Collisions with Powerlines: The State of the Art in 1994*. Edison Electric Institute, Washington, DC.

Avian Power Line Interaction Committee (APLIC). 1996. "Suggested Practices for Raptor Protection on Power Lines: The State of the Art." In 1996 Edison Electric Institute/Raptor Research Foundation, Washington, D.C.

Brown, H.A., Bury, R.B., Darda, D.M., Diller, L.V., Peterson, C.R. & Storm, R.M. 1995. *Reptiles of Washington and Oregon.* Seattle Audubon Society, Seattle, Washington, USA.

Cary, Dan. 2001. Wetland Scientist, Shapiro and Associates, Inc. Personal communication on October 8, 2001.

CH2M HILL. 2003. *Wetland Delineation for COB Energy Facility*. August 22, 2003.

COB Energy Facility, LLC. 2002. *Site Certificate Application for the COB Energy Facility.* September 5, 2002.

COB Energy Facility, LLC. *Amendment No. 1 to the Site Certificate Application for the COB Energy Facility*. Filed with the Energy Facility Siting Council on July 25, 2003.

COB Energy Facility, LLC. *Amendment No. 2 to the Site Certificate Application for the COB Energy Facility*. Filed with the Energy Facility Siting Council on October 15, 2003.

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

Csuti, B., A.J. Kimerling, T.A. O'Neil, M.M. Shaughnessy, E.P. Gaines, and M.M. Huso. 1997. *Atlas of Oregon Wildlife: Distribution, Habitat, and Natural History*.

Federal Register Volume 53, No. 137. July 18, 1998. Pp 27130-27134.

Fenton, M.B., and R. M.R. Barclay. 1980. Myotis lucifugus. Mammalian Species No. 142:1-8, American Society of Mammalogists.

Franklin and Dyrness. 1988. *Natural Vegetation of Oregon and Washington Wildlife-Habitat Relationships in Oregon and Washington.*

Isaacs, Frank B. 2002. Senior Faculty Research Assistant, Oregon State University. Personal communication on August 6, 2002.

Johnson, D.H. and T.A. O'Neil. 2001. *Wildlife-Habitat Relationships in Oregon and Washington.* Oregon State University Press, Corvallis, Oregon.

Kagan, J. and S. Caicco. 1992. *Manual of Oregon Actual Vegetation.* Prepared for the Oregon Gap Analysis Program, U.S. Fish and Wildlife Service, Portland Oregon.

Littlefield, C.D., and D.G. Paullin. 1990. *Effects of land management on nesting success of sandhill cranes in Oregon*. Wildlife Society Bulletin 18:63-65.

Marshall, D.B. 1992. *Sensitive Vertebrates of Oregon*. Oregon Department of Fish and Wildlife, Portland.

McEwen, G A. 2002. Oregon Department of Fish and Wildlife, Portland. Personal Communication on June 6, 2002.

Nelson, and P. Nelson. 1976. "Power lines and birds of prey." Idaho Wildl. Rev. 28:3-7

Natural Resource Conservation Service (NRCS). 1985. *Soil Survey of Klamath County, Oregon: Southern Part.* United States Department of Agriculture, Washington D.C.

Nussbaum, R.A., Brodie, Jr., E.D., Storm, R.M. 1983. *Amphibians and Reptiles of the Pacific Northwest.* The University Press of Idaho.

Orions, G.H. 1961. The ecology of blackbird (*Agelaius*) social systems. *Ecological Monographs* 31:285-312.)

Paullin, D.G., G.L. Ivey, and C. D. Littlefield. 1988. The re-establishment of American White Pelican nesting in the Malheur-Harney Lakes Basin, Oregon. *Murrelet* 69:61-64.

Steenhof, K., M.N. Kochert, and J.A. Roppe. 1993. "Nesting by raptors and common ravens on electrical transmission line towers." J. Wildl. Manage. 57:271-281.

Sitter, G. 2002. Bureau of Land Management, Klamath Falls Resource District, Klamath Falls, Oregon. Personal communication on August 6, 2002.

U. S. Department of Agriculture (USDA). 1979. *Plant Associations of the Fremont National Forest.* U.S. Forest Service, Pacific Northwest Region R6-Ecol-79-004.

Verts, B.J. and L.N. Carraway. 1998. *Land Mammals of Oregon.* University of California Press, Berkeley, CA.

3.6 Traffic and Circulation

COB Energy Facility, LLC. *Amendment No. 1 to the Site Certificate Application for the COB Energy Facility*. Filed with the Energy Facility Siting Council on July 25, 2003.

COB Energy Facility, LLC. *Amendment No. 2 to the Site Certificate Application for the COB Energy Facility*. Filed with the Energy Facility Siting Council on October 15, 2003.

Transportation Research Board. 2000. *Highway Capacity Manual*.

3.7 Air Quality

COB Energy Facility, LLC. 2002. *Site Certificate Application for the COB Energy Facility.* September 5, 2002.

COB Energy Facility, LLC. *Amendment No. 1 to the Site Certificate Application for the COB Energy Facility*. Filed with the Energy Facility Siting Council on July 25, 2003.

COB Energy Facility, LLC. *Amendment No. 2 to the Site Certificate Application for the COB Energy Facility*. Filed with the Energy Facility Siting Council on October 15, 2003.

U.S. Department of Agriculture (USDA) Forest Service, National Park Service (NPS), and U.S. Fish and Wildlife Service (USFWS). 2000. *Federal Land Managers Air Quality Related Values Work Group Phase I Report* (FLAG).

USDA Forest Service. 1992. *Guidelines for Evaluating Air Pollution Impacts on Class I Wilderness Areas in the Pacific Northwest*. May 1992.

U.S. Environmental Protection Agency (EPA). *Interagency Workgroup on Air Quality Modeling Phase 2 Summary Report and Recommendations for Modeling Long Range Transport Impacts* (EPA-454/R-98-019) (IWAQM2).

3.8 Visual Quality and Aesthetics

Beauchmin, Jim. 2002. Oregon Parks and Recreation Department. Personal communication on April 4, 2002.

Beauregard Conseil. 1990. *Rapport Final: Suivi des Impacts de la Traversee du Fleuve par une Ligne Hydro-Electrique entre Grondines et Lotbiniere sur les Residents de la Region Immediate*. Prepared for Hydro-Quebec, vice-Presidence Environnement.

Beauregard Conseil. 1995. *Suivi des Impacts de la Traversee du Fleuve par une Ligne Hydro-Electrique entre Grondines et Lotbiniere sur les Residents de la Region Immediate*. Prepared for Hydro-Quebec, Vice-Presidence Environnement.

Bishop, I.D., R.B. Hull, and P.N.A. Leahy. 1985. "Visual simulation and assessment of electricity transmission towers." Landscape Australia (March): 191-199.

Bureau of Land Management (BLM). 1995. Klamath Falls Resource Area Record of Decision and Resource Management Plan and Rangeland Program Summary. June 1995.

COB Energy Facility, LLC. 2002. *Site Certificate Application for the COB Energy Facility.* September 5, 2002.

COB Energy Facility, LLC. *Amendment No. 1 to the Site Certificate Application for the COB Energy Facility*. Filed with the Energy Facility Siting Council on July 25, 2003.

COB Energy Facility, LLC. *Amendment No. 2 to the Site Certificate Application for the COB Energy Facility*. Filed with the Energy Facility Siting Council on October 15, 2003.

Economics Consultants Northwest. 1987. *Garrison-West High Voltage Transmission Line Social Monitoring Study*. Report submitted to the Facility Siting Bureau of the Energy Division of the Montana Department of Natural Resources and Conservation and the Bonneville Power Administration.

Eisert, Marjorie. 2002. CH2M HILL Wildlife and Fisheries Biologist. Personal Communication on July 3, 2002.

Entre les Lignes. 1993. *Perception des Impacts Generees par la Presence et L'Exploitation des Lignes de Transport*. Prepared for Hydro-Quebec, vice-Presidence Environnement.

U.S. Department of Agriculture (USDA) Forest Service. 1995. *Agriculture Handbook Number 701, Landscape Aesthetics: A Handbook for Scenery Management.*

3.9 Cultural Resources

COB Energy Facility, LLC. 2002. *Site Certificate Application for the COB Energy Facility.* September 5, 2002.

COB Energy Facility, LLC. *Amendment No. 1 to the Site Certificate Application for the COB Energy Facility*. Filed with the Energy Facility Siting Council on July 25, 2003.

COB Energy Facility, LLC. *Amendment No. 2 to the Site Certificate Application for the COB Energy Facility*. Filed with the Energy Facility Siting Council on October 15, 2003.

Howe, C.B. *Ancient Modocs of California and Oregon*. Binfords and Mort, Portland, Oregon. 1979.

Klamath County Historical Society. *The History of Klamath County, Oregon*. Klamath Falls. 1984.

McClintock, Robin. 2002. Personal communication. Letter to Robert Kentta, Cultural Resources Program Director for the Confederated Tribes of the Siletz. July 1, 2002.

Minor, R., S.D. Beckham, and K.A. Toepel. *Cultural Resource Overview of the BLM Lakeview District, South Central Oregon: Archaeology, Ethnography, History*. University of Oregon Anthropological Press, No. 16. Eugene, Oregon. 1979.

Oregon State Historic Preservation Office (SHPO). 2002. Archaeological Survey and Reports Standards. www.shpo.state.or.us/publications.

3.10 Land Use Plans and Policies

COB Energy Facility, LLC. 2002. *Site Certificate Application for the COB Energy Facility.* September 5, 2002.

COB Energy Facility, LLC. *Amendment No. 1 to the Site Certificate Application for the COB Energy Facility*. Filed with the Energy Facility Siting Council on July 25, 2003.

COB Energy Facility, LLC. *Amendment No. 2 to the Site Certificate Application for the COB Energy Facility*. Filed with the Energy Facility Siting Council on October 15, 2003.

3.11 Socioeconomics

California Employment Development Department, 2002. California Labor Market Information System. Web site: http://www.calmis.cahwnet.gov/htmlfile/subject/lftable.htm. April 2002.

Census. 2002a. Portland State University Population Research Center. Profiles of General Demographic Characteristics, Oregon 2000. Web site: www.upa.pdx.edu/CPRC/C2000.html. April 2002

Census. 2002b. U.S. Census Bureau, State and County Quick Facts. Profiles of General Demographic Characteristics, California 2000. Web site: http://quickfacts.census.gov/cgi-bin/cnty_QuickLinks?06093. 2000 Demographic Profile for California, Counties, and Places. April 2002.

COB Energy Facility, LLC. 2002. *Site Certificate Application for the COB Energy Facility.* September 5, 2002.

COB Energy Facility, LLC. *Amendment No. 1 to the Site Certificate Application for the COB Energy Facility*. Filed with the Energy Facility Siting Council on July 25, 2003.

COB Energy Facility, LLC. *Amendment No. 2 to the Site Certificate Application for the COB Energy Facility*. Filed with the Energy Facility Siting Council on October 15, 2003.

Nuebert, Valerie. 2002. Klamath County Tourism, Oregon. Personal and e-mail communication on April 4, 2002.

Oregon Economic and Community Development Department (OECDD). 2002a. Community Profiles. Web site: http://www.econ.state.or.us/BIpubs.htm, community profiles, April 2002.

OECDD. 2002b. Business and Industry Related Publications. Web site: www.econ.state.or.us/BIreg.11.htm. April 2002.

Oregon Employment Department (OED). 2002a. Central Oregon Labor Trends. Web site: http://www.olmis.org/olmisj/PubReader?itemid=00000051. March 2002.

OED. 2002b. Oregon Labor Market Information System. Web site: www.olmis.org/olmis/olmtest.reg_output?p_areacode=000011. April 2002.

3.12 Public Services and Utilities

Brakeman, D. 2002. City Recorder, City of Bonanza, Oregon. Personal communication on April 9, 2002.

Broussard, R. 2002. Chief, Malin Police Department, Oregon. Personal communication on April 3, 2002.

Butte Valley Chamber of Commerce. Health clinic Web site. http://www.buttevalleychamber.com/business/healthclinic/default.htm. April 16, 2002.

CH2M HILL. 1994. *Groundwater Development Potential and Hydrogeologic Assessment for the Lorella Pumped Storage Project, Klamath County, Oregon*. Appendix E.2.(a). Prepared for Energy Storage Partners.

CH2M HILL and FloSonics. 1998. *Water Conservation Assessment of Horsefly Irrigation District.* Prepared for Horsefly Irrigation District. April 1998.

Clark, P. 2002. Planner, Modoc County, California. Personal communication on March 20, 2002.

COB Energy Facility, LLC. 2002. *Site Certificate Application for the COB Energy Facility.* September 5, 2002.

COB Energy Facility, LLC. *Amendment No. 1 to the Site Certificate Application for the COB Energy Facility*. Filed with the Energy Facility Siting Council on July 25, 2003.

COB Energy Facility, LLC. *Amendment No. 2 to the Site Certificate Application for the COB Energy Facility*. Filed with the Energy Facility Siting Council on October 15, 2003.

Colahan, K. 2002. District General Manager, South Suburban Sanitary District, Klamath Falls, Oregon. Personal communication on April 10, 2002.

Coltrane, L. 2002. Assistant to the Superintendent, Butte Valley Unified School District, Macdoel, California. Personal communication on April 3, 2002.

Dailey, R. 2002. Klamath County Sheriff's Department, Oregon. Personal communication on April 8, 2002; April 16, 2002; and May 20, 2002.

Davis, D. 2002. Superintendent, Klamath County School District, Oregon. Personal communication on April 3, 2002.

Grounds, R. 2002. Public Works Director, City of Malin, Oregon. Personal communication on April 15, 2002.

Hamilton, G. 2002. Assistant Superintendent, Klamath Falls City Schools, Oregon. Personal communication on April 3, 2002.

Hapalla, W. 2002. Director, Wastewater and Geothermal Division, Klamath Falls Public Works, Oregon. Personal communication on April 10, 2002.

Henry, J. 2002. Solid Waste Director, Klamath County Solid Waste Department, Oregon. Personal communication on April 4, 2002, and April 9, 2002.

Ketchum, J. 2002. Chief, Keno Rural Fire Protection District, Oregon. Personal communication on April 8, 2002.

King, C. 2002. Office/Incubator Manager, Siskiyou County Economic Development Council, California. Personal communication on March 26, 2002.

Lawrence, D. 2002. Chief, Bly Rural Fire Protection District, Oregon. Personal communication on April 8, 2002.

Lee, L. 2002. Chief, Bonanza Rural Fire Protection District, Oregon. Personal communication on April 15, 2002, and August, 13, 2002.

Longoria, Daryl. 2002. Chief, Klamath County Fire District No. 5. Personal Communication on April 22, 2002.

Matthews, G. 2002. Public Works, City of Merrill, Oregon. Personal communication on April 5, 2002.

Meek, T. 2002. City Recorder, City of Merrill, Oregon. Personal communication on April 5, 2002.

Nelson, D. 2002. Professional Engineer, Klamath County Public Works, Oregon. Personal communication on April 9, 2002.

Newmeyer, K. 2002. City Recorder, City of Malin, Oregon. Personal communication on April 5, 2002.

O'Keeffe, M. 2002. EMT/Medical Assistant, Bonanza Medical Clinic, Bonanza, Oregon. Personal communication on April 4, 2002; April 15, 2002; and August 14, 2002.

Ongman, T. 2002. President, Basin Volunteer Ambulance Service, Malin, Oregon. Personal communication on April 10, 2002.

Oregon Public Health Services. 2002. Emergency Medical Services Division, Ambulance Service Provider List web page. http://www.ohd.hr.state.or.us/ems/amb_lic/docs/list.pdf. April 9, 2002.

Oregon State Fire Marshal. 2002. Oregon Fire Department List web page. http://www.sfm.state.or.us/FireService/fire/htm. March 26, 2002.

Oregon State Police. 2002. Patrol Services Division web page. http://www.osp.state.or.us/. April 17, 2002.

Quifenberry, T. 2002. Klamath Disposal, Klamath Falls, Oregon. Personal communication on April 4, 2002.

Parks, D. 2002. Watermaster, Klamath County, Oregon. Personal communication on April 9, 2002.

Redner, D. 2002. Clerk, Merrill Police Department, Oregon. Personal communication on April 3, 2002.

Romsby, D. 2002. Operations Chief, Klamath County Fire District No. 1, Oregon. Personal communication on April 3, 2002.

Ruddock, P. 2002. Klamath Falls Police Department, Oregon. Personal communication on April 3, 2002.

Scott, L. 2002. District Secretary, Tulelake Basin Joint Unified School District, Tulelake, California. Personal communication on April 3, 2002.

Steiner, D. 2002. Superintendent, Water Division, Klamath Falls Public Works, Oregon. Personal communication on April 10, 2002.

Stratton, R. 2002. Receptionist, Klamath County Economic Development Association, Oregon. Personal communication on April 1, 2002.

Thompson, B. 2002. Manager, Klamath County Emergency Management, Oregon. Personal communication on April 9, 2002.

Tulelake Chamber of Commerce. Member directory web page. http://www/cot.net/~tulefair/MemberDirectory.html. March 28, 2002.

U.S. Bureau of Reclamation. 1966. "Lands Benefiting by Project Works, Langell Valley." Map produced by Bureau of Reclamation for the Klamath Project.

Vickerman, R. 2002. President/EMT, Bly Ambulance, Bly, Oregon. Personal communication on April 4, 2002.

Whisenhunt, T. 2002. Chief, Klamath County Fire District #4, Oregon. Personal communication on April 17, 2002.

3.13 Health and Safety

Barnes, J.D., L.N. Miller, and E.W. Wood. 1976. *Prediction of Noise from Power Plant Construction*. Bolt Beranek and Newman, Inc., Cambridge, Massachusetts. Prepared for Empire State Electric Energy Research Corporation, Schenectady, New York.

Barnes, James D., Laymon N. Miller, Eric W. Wood. 1977. *Power Plant Construction Noise Guide*.

Bonneville Power Administration (BPA). 2002. *Umatilla Generating Project Final Environmental Impact Statement.* January 2002.

COB Energy Facility, LLC. 2002. *Site Certificate Application for the COB Energy Facility*. September 5, 2002.

COB Energy Facility, LLC. *Amendment No. 1 to the Site Certificate Application for the COB Energy Facility*. Filed with the Energy Facility Siting Council on July 25, 2003.

COB Energy Facility, LLC. *Amendment No. 2 to the Site Certificate Application for the COB Energy Facility*. Filed with the Energy Facility Siting Council on October 15, 2003.

National Institute of Environmental Health Sciences (NEIHS). 1999. *Health Effects from Exposure to Power-Line Frequency Electric and Magnetic Fields.* National Institute of Health. May 4, 1999.

National Research Council (NRC). 1996. *Possible Effects of Exposure to Residential Electric and Magnetic Fields Committee on the Possible Effects of Electromagnetic Fields on Biologic Systems.* National Academy of Sciences. October 1996.

O'Keeffe, M. 2002. EMT/Medical Assistant, Bonanza Medical Clinic, Bonanza, Oregon. Personal communication on April 4, 2002.

Oregon Department of Environmental Quality (ODEQ). 1983. *NPCS-1: Sound Measurement Procedures Manual*. Rev. 5, May 6, 1983.

Peterson, Arnold P. G. and Ervin E. Gross, Jr. 1974. *Handbook of Noise Measurement*, 7th edition.

U.S. Environmental Protection Agency (EPA). 1971. *Noise from Construction Equipment and Operations, US Building Equipment, and Home Appliances*. Prepared by Bolt Beranek and Newman for USEPA Office of Noise Abatement and Control, Washington, DC.

Chapter 4 Environmental Consultation, Review, and Permit Requirements

CH2M HILL (Robin D. McClintock, James C. Bard, and James J. Sharpe). 2003. *Amended Cultural Resources Technical Report: COB Energy Facility Site Certificate Application, Klamath County, Oregon.* Prepared for Peoples Energy Resources Corporation. July 2003.

CH2M HILL. 2003. *Wetland Delineation for COB Energy Facility*. August 22, 2003.

COB Energy Facility, LLC. *Amendment No. 1 to the Site Certificate Application for the COB Energy Facility*. Filed with the Energy Facility Siting Council on July 25, 2003.

COB Energy Facility, LLC. *Amendment No. 2 to the Site Certificate Application for the COB Energy Facility*. Filed with the Energy Facility Siting Council on October 15, 2003.

CHAPTER 8

Glossary of Acronyms and Terms

Acronyms

AC	alternating current
ACEC	area of critical environmental concern
ACHP	Advisory Council on Historic Preservation
APLIC	Avian Power Line Interaction Committee
AQRV	Air Quality Related Values
AVO	average vehicle occupancy
BA	Biological Assessment
BACT	Best Available Control Technology
BFP	boiler feed pump
bgs	below the ground surface
BLM	U.S. Bureau of Land Management
BMP	best management practice
BNSF	Burlington Northern Santa Fe
BPA	Bonneville Power Administration
C	cropland
CAA	Clean Air Act
CG	cropland and grazing
CEC	California Energy Commission
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFR	*Code of Federal Regulations*
CMP	corrugated metal pipe
CO	carbon monoxide
COB	California-Oregon Border
CRB	Columbia River Basalt
CRMP	cultural resources management plan
CRMMP	cultural resources mitigation monitoring plan
CSZ	Cascadia Subduction Zone
CTG	combustion turbine generator
CWP	circulating water pump
dB	decibel
dBA	decibel (A-weighted)
DEM	digital elevation map
DLN	dry, low-NO_x
DOE	U.S. Department of Energy
dS/m	deciSiemen per meter

E	state or Federal endangered species
EC	electrical conductivity
EDNA	Environmental Designation for Noise Abatement
EDTA	ethylene diamine triacetic acid
EFSC	Energy Facility Siting Council
EFU	exclusive farm use
EIS	environmental impact statement
EMF	electric and magnetic field
EMS	emergency medical service
EPA	U.S. Environmental Protection Agency
ESA	Endangered Species Act
F	forestry
FAA	Federal Aviation Administration
FCRTS	Federal Columbia River Transmission System
FEMA	Federal Emergency Management Agency
FFPA	Federal Farmland Protection Act
FLM	Federal land manager
FR	forestry range
g	acceleration
g/ha/yr	grams per hectare per year
GE	General Electric
GIS	geographic information system
gpd	gallons per day
gpm	gallons per minute
GSUT	generator step-up transformer
HAP	hazardous air pollutant
HDPE	high-density polyethylene
hp	horsepower
HRSG	heat recovery steam generator
HVAC	heating, ventilation, and air conditioning
HVS	high-value soil
IL	light industrial
ISCST3	Industrial Source Complex Short Term
JARPA	Joint Aquatic Resources Permit Application
KCCP	Klamath County Comprehensive Plan
KCP	Klamath Cogeneration Project
kV	kilovolt
kV/m	kilovolt per meter
kW	kilowatt
kW-hr	kilowatt per hour

L_{eq}	equivalent sound pressure level
LDC	Land Development Code
LOLP	Loss of Load Probability
LOS	level of service
m	meter
MACT	Maximum Achievable Control Technology
m_{eq}/L	milliequivalents per liter
met	meteorological
mG	milligauss
MG	million gallons
mgd	million gallons per day
mm	millimeter
MM	Modified Mercalli
mph	miles per hour
MSDS	material safety data sheet
MW	megawatt
N/A	not available
NA	not applicable
NAAQS	National Ambient Air Quality Standards
NAGPRA	Native American Graves Protection and Repatriation Act
NEPA	National Environmental Policy Act , the
NESHAP	National Emission Standards for Hazardous Air Pollutants
NFPA	National Fire Protection Agency
NH_3	ammonia
NHPA	National Historic Preservation Act
NO_2	nitrogen dioxide
NOAA	National Oceanic and Atmospheric Administration
NOI	Notice of Intent
NPDES	National Pollutant Discharge Elimination System
NPS	National Park Service
NRCS	Natural Resource Conservation Service
NRHP	National Register of Historic Places
NWI	National Wetland Inventory
NWPPC	Northwest Power Planning Council
O&M	operations and maintenance
OAR	Oregon Administrative Rule
ODA	Oregon Department of Agricultural
ODEQ	Oregon Department of Environmental Quality
ODFW	Oregon Department of Fish and Wildlife
ODOT	Oregon Department of Transportation
OR	Oregon Route
OSP	Oregon State Police
OSSC	Oregon Structural Specialty Code

PAH	polycyclic aromatic hydrocarbon
PCB	polychlorinated biphenyl
PERC	Peoples Energy Resource Corporation
PG&E GTN	PG&E Gas Transmission Northwest
PGA	peak ground acceleration
PHS	Priority Habitats and Species
PL	Public Law
PNW/PSW	Pacific Northwest/Pacific Southwest
ppmvd	parts per million, by volume, dry
PSD	Prevention of Significant Deterioration
psig	pounds per square inch, gauge
RCP	reinforced concrete pipe
RFPD	Rural Fire Protection District
RNA	raptor nesting area
ROD	Record of Decision
RV	recreational vehicle
S	state sensitive plant species
SAR	sodium adsorption rate
SARA	Superfund Amendments and Reauthorization Act
SCR	selective catalytic reduction
SCS	Soil Conservation Service
SEPA	State Environmental Policy Act
SHPO	State Historic Preservation Office
SMA	Shoreline Management Act
SoC	Federal Species of Concern
SPL	sound pressure level
SR	State Route
SRO	Significant Resource Overlay
STG	steam turbine generator
SWPCP	Stormwater Pollution Control Plan
T	state or Federal threatened species
TAP	toxic air pollutant
TCP	traditional cultural property
TMDL	total maximum daily load
UBC	*Uniform Building Code*
UGB	urban growth boundary
UHC	unburned hydrocarbons
USC	*U.S. Code*
USDA	U.S. Department of Agriculture
USFS	U.S. Forest Service
USFWS	U.S. Fish and Wildlife Service
USGS	U.S. Geological Survey

V/m	volts per meter
VOC	volatile organic compound
WECC	Western Electric Coordinating Council

Terms

Aquifer Water-bearing rock or sediment below the surface of the earth

Best Management Practice (BMP) A practice or a combination of practices that are the most effective and practical means of preventing or reducing the amount of pollution generated by nonpoint sources to a level compatible with water quality goals

Candidate species (Federal or state) Those species being considered by the U.S. Fish and Wildlife Service or Oregon Department of Fish and Wildlife for possible addition to the list of endangered and threatened species

Cumulative impacts Created by the incremental effect of an action when added to other past, present, and reasonably foreseeable future actions

Clean Water Act (CWA) A Federal law intended to restore and maintain the chemical, physical, and biological integrity of the nation's waters and secure water quality

Decibel (dB) A measure of sound intensity, defined as 10 times the logarithm of the ratio of two sound pressures squared

Electric and magnetic field (EMF) A force field associated with electric charge in motion. It has both electric and magnetic components and contains a specific amount of electromagnetic energy.

Endangered species (Federal or state) Those species officially designated by the U.S. Fish and Wildlife Service, Washington Department of Fish and Wildlife, or Washington Department of Natural Resources as being in danger of extinction throughout all or a significant portion of their range

Energy Facility The power generation equipment and systems, stormwater infiltration basin, evaporation pond alternative, and laydown and storage area

Energy Facility Site The approximately 50.6-acre tract of land on which the Energy Facility would reside

Facility The Energy Facility site and related or supporting facilities (electric transmission line, natural gas pipeline, and water supply pipeline and well system)

Habitat The environment in which an organism or biological population usually lives or grows

Kilovolt (kV) A unit of electric potential and electromotive force, equal to one thousand volts

Listed species Any species of fish, wildlife, or plant which has been determined to be endangered or threatened under section 4 of the Endangered Species Act

Megawatt (MW)	A unit of power, equal to one million watts
Mitigation	The step(s) taken to lessen the potential environmental effects predicted for each resource impacted by the project. Mitigation may reduce the impact, avoid it completely, or compensate for the impact.
PM_{10}	Particulate matter smaller than 10 microns; airborne dust created by disturbance of soil on unpaved roads, construction sites, and tilled land
Proposed action (for BPA)	COB Energy Facility, LLC, proposes to build and operate a natural gas-fired, air-cooled, combined-cycle electric power generation plant near Bonanza, Oregon. Electric power from the proposed plant would enter the regional grid at BPA's Captain Jack Substation.
Right-of-way	An easement for a certain purpose over the land of another owner, such as a strip of land used for a road, electric transmission line, or pipeline
Shrub-steppe habitat	Habitat composed of various shrubs and grasses such as sagebrush, rabbitbrush, annual grasses, bluegrass, and wheatgrass
Species of Concern (Federal)	Those species for which insufficient data have been gathered, but that show a decline in population
Staging areas	Areas set up near construction sites to temporarily store equipment and materials during construction
Threatened species (Federal or state)	Those species officially designated by the U.S. Fish and Wildlife Service or Oregon Department of Fish and Wildlife as likely to become endangered within the foreseeable future throughout all or a significant portion of their range
Topography	The physical shape of the land
Transmission lines	Includes the structures, insulators, conductors, and other equipment used to transmit electrical power from one point to another
Waters of the U.S.	A regulatory term defined in 33 CFR 328.3 to include waters such as lakes, rivers, streams (including intermittent creeks and tributaries), wetlands, sloughs, or natural ponds under the jurisdiction of the U.S. Army Corps of Engineers
Wetlands	Areas where the soil experiences anaerobic conditions because of inundation of water during the growing season. Indicators of a wetland include types of plants, soil characteristics, and hydrology of the area.

CHAPTER 9

Index

N

P

S

T

U

V

W

Z

APPENDIX A

Notice of Intent to Prepare an Environmental Impact Statement

Department of Energy

Bonneville Power Administration
P.O. Box 3621
Portland, Oregon 97208-3621

ENVIRONMENT, FISH AND WILDLIFE

December 21, 2001

In reply refer to: KEC-4

To Those Interested in the COB Energy Facility:

This is to inform you of Bonneville Power Administration's (BPA's) intent to prepare an environmental impact statement on the proposed transmission system interconnection of the COB Energy Facility. The project site is near Bonanza, Klamath County, Oregon. Enclosed is a copy of BPA's official notice.

You may already be aware that Peoples Energy Resources Corporation (Peoples Energy) has submitted a Notice of Intent to apply for an Oregon Energy Facility Site Certificate for the COB Energy Facility. Peoples Energy has also requested that BPA interconnect the proposed facility to BPA's transmission system.

Public meeting: The Oregon Office of Energy (OOE) will manage the Oregon Energy Facility Site Certificate process. As practical, BPA will participate with OOE public involvement opportunities to identify public interests and concerns regarding the COB Energy Facility. Accordingly, BPA will participate in OOE's public meeting scheduled for January 15, 2002, 7:00 pm to 9:00 pm, at Bonanza Public Library, 31703 Highway 70, Bonanza, Oregon. BPA will use comments from this meeting to help determine issues to address in the EIS.

Other ways to comment: You may also write a letter to BPA, Communications – KC-7, P.O. Box 12999, Portland, Oregon 97212; call BPA's toll-free comment line at 800-622-4519, and leave a message; or send an e-mail to comment@bpa.gov. Please comment by February 26, 2002. Release of the draft EIS in late summer 2002 will present another opportunity to comment on BPA's proposed interconnection of the COB Energy Facility.

For more information: You may call me toll-free at 1-800-282-3713, directly at 503-230-4749, or send an e-mail to tcmckinney@bpa.gov.

Sincerely,

Thomas C. McKinney

Thomas C. McKinney
Environmental Project Lead

Enclosure: Notice of Intent to Prepare an EIS

6450-01-U

DEPARTMENT OF ENERGY

Bonneville Power Administration

COB Energy Facility

AGENCY: Bonneville Power Administration (BPA), Department of Energy (DOE).

ACTION: Notice of intent to prepare an Environmental Impact Statement (EIS).

SUMMARY: This notice announces BPA’s intention to prepare an EIS, under the National Environmental Policy Act (NEPA), on a proposed electrical interconnection requested by Peoples Energy Resources Corporation (Peoples Energy), to integrate electrical power from the COB Energy Facility into the Federal transmission grid. BPA proposes to execute an agreement with Peoples Energy to provide them with an interconnection.

DATES: Written comments on the NEPA scoping process are due to the address below no later than February 26, 2002. Comments may also be made at an EIS scoping open house meeting to be held on January 15, 2002, at the address below.

ADDRESSES: Send letters with comments and suggestions on the proposed scope of the Draft EIS to Communications, Bonneville Power Administration—KC-7, P.O. Box 12999, Portland, Oregon, 97212. You may also call BPA's toll-free comment line at 1-800-622-4519; name this project, and record your complete name, address, and comments. Comments may also be sent to the BPA Internet address at comment@bpa.gov. To be placed on the project mail list, call 1-800-622-4520.

An open house will be held on January 15, 2002, 7:00 p.m. to 9:00 p.m., at Bonanza Public Library, 31703 Highway 70, Bonanza, Oregon. At this informal scoping meeting, BPA staff will answer questions and accept oral and written comments, and representatives of BPA and Peoples Energy will be available to discuss the proposed project and topics to be addressed in the EIS. Information on the proposed project will be available for review.

FOR FURTHER INFORMATION CONTACT: Thomas C. McKinney, Bonneville Power Administration—KEC-4, P.O. Box 3621, Portland, Oregon, 97208-3621; toll-free telephone 1-800-282-3713; direct telephone 503-230-4749; or e-mail tcmckinney@bpa.gov. Additional information can be found at BPA's web site: www.bpa.gov.

SUPPLEMENTARY INFORMATION: The EIS will assess the environmental consequences of the agreement which BPA proposes with Peoples Energy, and the consequences of any modifications to the transmission system needed to provide an electrical connection under the terms of the agreement. In addition to these Federal actions, the EIS will consider the environmental consequences of construction and operation of the COB Energy Facility.

The proposed project has several components. In addition to the generating facility itself (described below), other components may include: (1) an electrical connection into the BPA's electrical transmission system, (2) upgrades to existing BPA Substations, (3) a new substation on-site, (4) potential system upgrades to be defined through impact studies of the facility, (5) a natural gas pipeline, and (6) water supply and process water pipelines.

A. Proposed Action. The proposed COB Energy Facility would be a power development project beginning as a simple-cycle generation facility and expanding to a combined-cycle electric generating facility. Nominal generating capacity is 600 megawatts in the simple-cycle configuration and 1,150 megawatts in the combined-cycle configuration. The facility site would be located approximately 3 miles south of the City of Bonanza, on the east side of West Langell Valley Road No. 520 in Klamath County. The combined-cycle facility would consist of four combustion turbine generators, and each turbine generator would be coupled with a heat-recovery steam generator (HRSG) and two HRSG's will couple with a steam turbine generator.

The proposed COB Energy Facility would be fueled by natural gas from the existing Pacific Gas & Electric Gas Transmission Northwest (PG&E GTN) pipeline and delivered through a new, approximately 4.6-mile natural-gas pipeline. Natural gas would be burned in the combustion turbines. Expanding gases from combustion would turn rotors within the turbines that are connected to electric generators. The hot gases exhausted from the combustion turbines would be used to raise steam in the HRSGs. Steam from the HRSGs would be expanded through a steam turbine that drives its own electric generator. To increase steam-generating capacity, a duct burner system will be included in each HRSG. The duct burner will increase the steam generated in the HRSGs and increase the steam generator's electrical output.

Water would be needed at the facility to generate steam and cool the steam process. Water would be supplied from an existing well, known as the Babson well, located approximately 2.8 miles from the facility. The well would draw water from the deep basalt aquifer, which is isolated from the shallow well aquifer in the area. Process water from the facility would be discharged either for land application through nearby irrigation district systems, land applied on site for irrigation, or discharged to the Lost River during periods allowed by the Oregon Department of Environmental Quality.

The COB Energy Facility would deliver electric power to the regional power grid through an interconnection to existing electric transmission lines that cross the facility site. The facility would tie into two or three of the existing electric transmission lines, owned by BPA, PacifiCorp, and Portland General Electric. A transmission planning study conducted by the three utilities will determine the optimal interconnection among the transmission lines. The study also will identify any upgrades to the existing lines or the Malin Substation that may be needed.

B. Process to Date. BPA is the lead Federal agency for the project EIS. The State of Oregon Energy Facility Siting Council is currently evaluating the Notice of Intent to Apply for a Site Certificate for the COB Energy Facility. Oregon's site evaluation process, like NEPA, provides opportunity for public participation, and a public meeting will be held by representatives from the Oregon Office of Energy at the January 15 meeting in Bonanza.

C. Alternatives Proposed for Consideration. Alternatives thus far identified for evaluation in the EIS are: (1) the proposed action and (2) no action. Other alternatives may be identified through the scoping process.

D. Public Participation and Identification of Environmental Issues. BPA intends to prepare an EIS addressing both the COB Energy Facility and the associated electric power interconnection facilities. BPA has established a 45-day scoping period during which affected landowners, concerned citizens, special interest groups, local governments, and any other interested parties are invited to comment on the scope of the proposed EIS. Scoping will help BPA ensure that a full range of issues related to this proposal is addressed in the EIS and also will identify significant or potentially significant impacts that may result from the proposed project. When completed, the Draft EIS will be circulated for review and comment, and BPA will hold a public comment meeting on the Draft EIS. BPA will consider and respond in the Final EIS to comments received on the Draft EIS.

BPA decided to prepare the EIS for the following reasons: (1) the COB Energy Facility would depend on an interconnect to existing electric transmission lines that may include a BPA line, (2) the interconnect could require upgrades to the existing BPA line, (3) the interconnection may include a new substation on the site, (4) the interconnection may require upgrades to the BPA Malin Substation, (5) the interconnect may result in other system impacts identified in the transmission study, and (6) no other Federal or State agency is currently preparing an EIS on the proposed project. Because no other EIS is being prepared, the scope of BPA's EIS will cover both the interconnection elements and the COB Energy Facility itself.

The principal issues identified thus far for consideration in the Draft EIS with respect to the COB Energy Facility are as follows: (1) air and water quality impacts, (2) noise impacts from plant operation, (3) aesthetic impacts, (4) socioeconomic impacts created by an influx of construction workers into a sparsely populated area, (5) impacts on wildlife habitat, and (6) cultural resource impacts. The principal issues identified thus far for consideration in the Draft EIS with respect to the electric power transmission facilities are impacts of electrical interconnection on the grid system.

These issues, together with any additional significant issues identified through the scoping process, will be addressed in the EIS.

Issued in Portland, Oregon, on December 21, 2001

/s/ *Stephen J. Wright*
Stephen J. Wright
Acting Administrator and
Chief Executive Officer

bcc:
Adm. Chron. File – A-7
Official File – KEC (EQ-14)

TMcKinney:ljc:4749:12/18/01
W:\KEC\EISs-EQ-14\COB Energy\NOI FRN.doc

APPENDIX B

Water Supply Supplemental Data Report: Executive Summary

Final Report

Water Supply Supplemental Data Report

Deep Aquifer Testing at the COB Energy Facility Water Supply Well

Prepared for

COB Energy Facility, LLC

May 2003

Prepared by

CH2MHILL

PDX/022750008.DOC

Executive Summary

This report has been prepared in connection with the Energy Facility Siting Council site certificate application filed on September 5, 2002, by COB Energy Facility, LLC, and the water right application (No. G-15757) submitted to the Oregon Water Resources Department on April 24, 2002. These applications pertain to a proposed 1,150-megawatt electric generating facility located approximately 3 miles south of Bonanza, Oregon, in Klamath County. The proposed water supply for the Energy Facility is groundwater from a deep aquifer system encountered in the existing Babson well (KLAM 51920) located in the Energy Facility area. The proposed Energy Facility is designed to conserve water supplies by using a zero-discharge system that will recycle, reuse, and evaporate process wastewater. This document will present the results of an aquifer test conducted to evaluate whether deep aquifer system withdrawals will have a substantial impact on the shallow aquifer system, Bonanza Big Springs, or the Lost River.

Groundwater Sources

Previous borehole geophysics and aquifer testing at the Babson well identified the presence of two separate aquifer systems (CH2M HILL, 1994). The shallow aquifer system (above approximately 500 feet) is a heavily appropriated basalt aquifer that is in varying degrees of hydraulic connection with the Lost River and Bonanza Big Springs. The shallow system is used for irrigation and domestic water supply. The deep aquifer system produces water from water-bearing zones below 1,500 feet. No other Langell Valley area wells or water rights in the deep aquifer system are known to exist.

Previous Investigations

Aquifer testing conducted at the Babson well in 1993 demonstrated that the deep aquifer is hydraulically isolated from surface water and the shallow aquifer system (CH2M HILL, 1994). That test was conducted at just over 3,000 gallons per minute (gpm), which is approximately 60 percent of the average annual production rate (5,390 gpm at average annual conditions) of the proposed Energy Facility. To definitively address public concerns about the proposed use of water, COB Energy Facility, LLC, elected to conduct additional testing at a rate higher than the average annual production rate (approximately 6,800 gpm). The purpose of this additional work was to demonstrate that the proposed use will not impact the shallow aquifer system in the Energy Facility vicinity.

Aquifer Test Description

A 30-day aquifer test was performed in August and September 2002 at an average pumping rate of 6,800 gallons per minute. A pneumatic packer and pump assembly was installed in the Babson well to hydraulically separate the shallow and deep systems and to withdraw water only from the deep aquifer. An extensive monitoring network consisting of 31 stations monitored water levels in groundwater, springs, and the Lost River during the test. The monitoring network extended well beyond the 5-mile monitoring radius required by the Energy Facility Siting Council.

Aquifer Test Results

No data gathered from the monitoring well network indicate that deep aquifer withdrawals will impact water levels in the shallow aquifer system, Bonanza Big Springs, or the Lost River. These data support the previous conclusion from the 1993 testing that there is no apparent measurable hydraulic connection between the shallow and deep aquifers in the Energy Facility area.

The very rapid and complete recovery at the end of pumping suggests that the withdrawal is insignificant relative to the recharge available to the well. The recovery response does not indicate that the proposed withdrawal will have a negative impact on deep system supplies or water levels.

APPENDIX C

Biological Assessment

Report

Appendix C to the COB Energy Facility EIS

Biological Assessment for the COB Energy Facility

Prepared for

U.S. Fish and Wildlife Service

November 2003

Printed on
Recycled and
Recyclable
Paper

Contents

Section **Page**

Appendixes

Tables

Figures

Acronyms

AC	alternating current
BA	biological assessment
BFD	bird flight diverter
bgs	below the ground surface
BLM	Bureau of Land Management
BPA	Bonneville Power Administration
Btu/kWh	British thermal units per kilowatt-hour
CFR	Code of Federal Regulations
cm/sec	centimeters per second
COPEC	chemicals of potential ecological concern
CTG	combustion turbine generator
dBA	decibel (A-weighted)
EFSC	Energy Facility Siting Council
EIS	environmental impact statement
EPA	U.S. Environmental Protection Agency
ERA	ecological risk assessment
ESA	Endangered Species Act
FCRTS	Federal Columbia River Transmission System
GE	General Electric
gpm	gallons per minute
HDPE	high-density polyethylene
HHV	high heating value
HRSG	heat recovery steam generator
kV	kilovolt
MG	million gallon
mg/L	milligrams per liter
MW	megawatt

NEPA	National Environmental Policy Act
NRCS	Natural Resources Conservation Service
NWPPC	Northwest Power Planning Council
ODEQ	Oregon Department of Environmental Quality
ODFW	Oregon Department of Fish and Wildlife
PERC	Peoples Energy Resource Corporation
PVC	polyvinyl chloride
RO	reverse osmosis
ROW	right-of-way
SCA	site certificate application
STG	steam turbine generator
TDS	total dissolved solids
USFWS	U.S. Fish and Wildlife Service
WECC	Western Electricity Coordinating Council
WPCF	water pollution control facility
WWTP	wastewater treatment plant

SECTION 1

Introduction

This section provides an overview of the biological assessment (BA) prepared for the proposed COB Energy Facility. The purpose of the BA is reviewed; terminology used throughout this document is defined; species list are identified; critical habitat is discussed; a list of consultations held to date is provided; and the current federal and state management direction for the proposed project is summarized.

1.1 Purpose

The purpose of this BA is to determine to what extent the proposed COB Energy Facility may affect any of the threatened, endangered, proposed, or sensitive species listed in Section 1.2. This BA is prepared in accordance with legal requirements set forth under Section 7 of the Endangered Species Act (ESA) (16 U.S.C. 1536 (c)), and follows the standards established in the National Environmental Policy Act (NEPA). Information necessary to initiate formal consultation as required by 50 Code of Federal Regulations (CFR) 402.14(c) is provided.

This BA provides the best available scientific and commercial data for threatened, endangered, proposed, or sensitive species and critical habitat listed in Sections 1.2 and 1.3. The Bonneville Power Administration (BPA) is the lead agency to conduct an environmental analysis pursuant to NEPA and the Bureau of Land Management (BLM) is a cooperating agency.

The following terms are used in this BA:

- The power generation equipment and other onsite facilities are referred to collectively as the proposed Energy Facility or proposed project.
- Development of the proposed Energy Facility is referred to as the proposed action.
- The physical location of the Energy Facility is referred to as the proposed Energy Facility site.
- The Energy Facility site and related or supporting facilities (e.g., electric transmission line, water supply well system, water supply pipeline, and natural gas pipeline) are referred to as the Facility.
- The site certification applicant, COB Energy Facility, LLC, is referred to as the project proponent. The project proponent is a subsidiary of Peoples Energy Resource Corporation (PERC).

1.2 List of Threatened, Endangered, and Candidate Species Potentially Affected by the Proposed Project

Federally listed species considered in this BA include:

- Applegate's milk-vetch (*Astragalus applegatei*) E
- Bald eagle (*Haliaeetus leucocephalus*) T
- Shortnose sucker (*Chasmistes brevirostris*) E
- Lost River sucker (*Deltistes luxatus*) E

Any special-status species whose habitat(s) or known distribution is present within the COB Energy Facility project area was evaluated for potential impacts from construction, operation, and maintenance activities. The following describes the occurrence of these species in the project area:

- There are no reported occurrences or historical records of Applegate's milk-vetch in the vicinity of the project area, no plants were identified during biological surveys, and the Facility would have no effect on Applegate's milk-vetch.
- The bald eagle is known to occur in the project area and suitable nesting habitat was identified within the isolated stand of ponderosa pine habitat along the southern portion of the electric transmission line easement; however, no nests were observed.
- The Energy Facility would be designed to be low discharge. Therefore, no process wastewater would be discharged to surface water or irrigation canals. No cumulative affects are expected to occur to the shortnose and Lost River suckers as a result of construction and operation of the Facility.

State-listed species, Species of Concern (state and federal), and other special-status species that were included on the United States Fish and Wildlife Service (USFWS), the Oregon Department of Fish and Wildlife (ODFW), BLM, and the Oregon Natural Heritage Program (ONHP) lists are addressed in a site certificate application submitted to the Oregon Energy Facility Siting Council (EFSC) on September 5, 2002, and are not evaluated further in this BA.

1.3 Critical Habitat

No critical habitat has been designated for any of the listed species evaluated in this document. Therefore, no critical habitat would be affected by the project. Critical habitat was proposed by USFWS for the shortnose sucker and the Lost River sucker on December 1, 1994 (Federal Register Vol. 59, No. 230). The proposed units near the project area include Gerber Reservoir, located approximately 10 miles to the east, and Tule Lake, located approximately 18 miles to the south, as well as Upper Klamath Lake and the Sprague River, which are located approximately 22 miles west and 20 miles north of the proposed project area, respectively.

1.4 Consultation to Date

Exchanges in communication that have occurred since the fall of 2001 are as follows:

- October 23, 2001—A preliminary (informal) list of threatened, endangered, proposed, and candidate species that may occur in Klamath County, Oregon, was obtained from the Endangered Species division of USFWS.
- December 4, 2001—A formal list of threatened, endangered, proposed, and candidate species that may occur in Klamath County, Oregon, was obtained from the Endangered Species division of the U.S. Fish and Wildlife Service.
- April 5, 2002—Information on rare, threatened, and endangered plant and animal records in the vicinity of the proposed project were obtained from the ONHP.
- April 22, 2002—Mr. Robert Wooley, botanist with the Fremont National Forest, was consulted regarding special-status plants potentially occurring in the project area.
- April 30, 2002—A list of special-status plant species was obtained from BLM's Klamath Falls Resource Area.
- June 5, 2002—Ms. Gail McEwen of ODFW was consulted regarding ODFW habitat classifications and winter mule deer habitat in the project area.
- July 26, 2002—A meeting was held with the Oregon Department of Energy (ODOE) at the Klamath County Planning Department. Representatives from state and federal resources agencies present at this meeting included Leonard LeCaptain (USFWS), Chris Carey (ODFW), and Tom Collom (ODFW). At this meeting the project was introduced to USFWS and ODFW to initiate informal consultation and identify preliminary issues related to wildlife and vegetation.
- August 1, 2002—A site visit was conducted with Leonard LeCaptain (USFWS) and Chris Carey (ODFW) to provide an overview of the project area and a discussion of potential habitat and wildlife issues. Concerns expressed at this meeting were focused on minimizing adverse affects to bald eagles and the ponderosa pine habitat. No formal resolution was reached regarding Bald Eagles. Mr. LeCaptain said that USFWS would need to be further consulted on this issue under Section 7 of the Endangered Species Act. If an evaporation pond is the selected alternative for process wastewater disposal, the agencies recommended covering the evaporation pond with netting to exclude wildlife.
- August 1, 2002—Copies of the COB Energy Facility Notice of Intent (dated December 3, 2001) and an Addendum to the Notice of Intent (dated May 10, 2002) were provided to Leonard LeCaptain (USFWS).
- August 6, 2002—Mr. Gale Sitter from the Bureau of Land Management's Klamath Falls Resource District was contacted regarding habitat mitigation and revegetation plantings in Klamath County, Oregon.
- August 8, 2002—Copies of water quality data obtained from the Babson well in January 2002, were provided to Leonard LeCaptain (USFWS).

- September 18, 2002—Richard Crowe (CH2M HILL) contacted Leonard LeCaptain (USFWS) and Chris Carey (ODFW) regarding the observation of fish in the irrigation canal that was receiving water from the Babson well pump test.
- September 24, 2002—Leonard LeCaptain (USFWS) met with Greg White, a fisheries biologist with CH2M HILL, to investigate fish observed in the irrigation canal receiving discharge from the pump test and observe the shutdown of the pump test. The fish were determined to be red side shiners, a species in the minnow family.
- December 3, 2002—Additional information on the distribution and potential for occurrence of special-status fish species was provided by Leonard LeCaptain (USFWS) and Stewart Reid (USFWS).
- January 15, 2003—Russell Huddleston (CH2M HILL) conducted a site visit with Tom Collom (ODFW), Gale Sitter (BLM), and Rob Roninger (BLM). The purpose of the site visit was to provide an overview of the project area, as well as the habitats and potential wildlife issues. Concerns expressed at this meeting were focused on habitat mitigation for listed species.
- March 5, 2003—Robert A. Trotta (PERC) provided Leonard LeCaptain (USFWS) with a letter prepared by Phil Brown and Ken Trotman of CH2M HILL dated March 5, 2003, and titled *Impacts of Babson Well Deep Aquifer Pumping on Surface Water*. The purpose of the CH2M HILL letter was to provide comments and clarification regarding a December 23, 2002, letter from Marshall Gannett of the U.S. Geological Survey (USGS) to Ron Larson (USFWS). The CH2M HILL letter states that no data gathered from the monitoring well network indicate that the deep aquifer withdrawals would impact groundwater levels in the shallow aquifer, or flows at Bonanza Big Springs and the Lost River.
- May 9, 2003—A draft BA for the COB Energy Facility was submitted to Leonard LeCaptain (USFWS) for review and comment.
- May 29, 2003—Leonard LeCaptain (USFWS) provided written comments on the draft BA.
- June 11, 2003—Robert A. Trotta (PERC) and Mark Bricker (CH2M HILL) met with Leonard LeCaptain (USFWS) to discuss comments on the draft BA. In addition Robert A. Trotta (PERC) informed Leonard LeCaptain (USFWS) that the Energy Facility would switch to air cooling from wet cooling, reducing water requirements by 97 percent.

1.5 Current Management Direction

1.5.1 Bonneville Power Administration

NEPA requires federal agencies to consider environmental values in planning and decision making processes. BPA works closely with other agencies to develop comprehensive and coordinated approaches to protect and rebuild species populations that have been listed under the ESA. BPA is committed to working towards regional solutions based on sound biology and currently provides funding for more than 500 fish and wildlife projects a year that range from improvements to rearing and spawning habitats to study of fish diseases.

BPA also has specific duties regarding fish and wildlife under the ESA:

- BPA must avoid jeopardizing listed species.
- BPA must comply with incidental take statements.
- BPA must use its authorities to conserve listed species.

Electricity generated by the proposed Energy Facility would enter the regional grid at BPA's Captain Jack Substation. Providing this connection triggers the requirement for BPA to conduct an environmental analysis pursuant to NEPA. BPA is the lead agency for NEPA compliance review.

1.5.2 Bureau of Land Management

BLM has established a management plan for fish and wildlife which includes proactive management of special-status plant and animal species (BLM, 2000). BLM works closely with other federal and state agencies to achieve conservation goals for listed endangered, threatened, proposed, candidate and other special-status species. In addition, BLM may establish a list of "Bureau Sensitive" species which would be managed similarly to other designated sensitive species. BLM has a responsibility to protect, manage, and conserve any sensitive species and their habitats such that any BLM action would not significantly affect a species status.

The interconnection from the proposed Energy Facility to the Captain Jack Substation requires a 7.2-mile electric transmission line. The line would cross some federal lands. BLM must decide whether to grant the necessary rights-of-way for the electric transmission line. This action triggers NEPA requirements for BLM. BLM is a cooperating agency for the NEPA compliance review.

1.5.3 Oregon Department of Fish and Wildlife

The mission of ODFW is to protect and enhance Oregon's fish and wildlife and their habitats under the ESA. ODFW has established a habitat classification system that ranks habitats according to six categories based on their relative distribution, importance to fish and wildlife, and mitigation potential. Each ODFW habitat category is associated with specific mitigation goals and standards.

SECTION 2

Description of Proposed Action

This section provides a detailed description of the proposed action.

2.1 History

Recent national and regional forecasts project increasing consumption of electrical energy to continue into the foreseeable future. This increased consumption requires development of new generation facilities to satisfy the increasing demand, as documented in the following citations:

- The Energy Information Administration, a statistical agency of the U.S. Department of Energy, states in the *Annual Energy Outlook 2003 with Projections to 2025* (January 2003), that total electricity demand is projected to grow by 1.9 percent per year from 2001 through 2020 and 1.8 percent per year from 2001 to 2025.
- The Western Electricity Coordinating Council (WECC) forecasts electricity demand in the western United States. In the *10-Year Coordinated Plan Summary 2002-2011* (September 2002), the WECC states that from 2001 through 2011, Northwest Power Pool Area peak demand and annual energy requirements are projected to grow at respective annual compound rates of 2.5 percent and 1.9 percent.
- The Northwest Power Planning Council (NWPPC) in the *Draft Forecast of Electricity Demand for the 5th Pacific Northwest Conservation and Electric Power Plan* (August 2002) states, "Total consumption of electricity is forecast to grow from 20,080 average megawatts in 2000 to 25,423 average megawatts by 2025, an average yearly rate of growth of less than one percent per year."

Generation resources require interconnection with a high-voltage electrical transmission system for delivery to purchasing retail utilities. BPA owns and operates the Federal Columbia River Transmission System (FCRTS), comprising more than three-fourths of the high-voltage transmission grid in the Pacific Northwest, including extra-regional transmission facilities. BPA operates the FCRTS, in part, to integrate and transmit electric power from existing and new federal or nonfederal generating units.

An environmental impact statement (EIS) is currently being prepared to provide BPA and BLM with the environmental information they need to determine whether to allow construction of an electric transmission line on public land and a connection of the Energy Facility to the regional power grid at BPA's Captain Jack Substation. There are no other issues to be resolved. In Oregon, the environmental review is conducted through the state's energy facility siting procedures. The project proponent prepared and submitted a site certificate application for the proposed project on September 5, 2002. The site certificate application was determined completed by EFSC on April 30, 2003. Amendment No. 1 to the site certification application was filed on July 25, 2003, to switch the Energy Facility to air cooling from wet cooling. The focus of this BA is specifically on listed threatened and endangered species that may be affected by the proposed project.

2.2 Facility Description

The project proponent proposes to construct a natural gas-fired, combined-cycle electric generating plant near Bonanza, Oregon (Figure 2-1). The Energy Facility would have a nominal generation capacity of 1,160 megawatts (MW). Electric power from the plant would enter the regional grid at BPA's Captain Jack Substation, located approximately 7.2 miles south of the Energy Facility Site (Figure 2-2). Related or supporting facilities include a 4.1-mile natural gas pipeline, a 2.8-mile water supply pipeline, a 7.2-mile electric transmission line, and a water supply well system that would consist of one existing, reconstructed well and two additional water supply wells.

2.2.1 Process Wastewater Management

Process wastewater from the Energy Facility would be managed by one of three alternatives:

- Beneficial use of the water for irrigated pasture
- Evaporation in an onsite, lined evaporation pond
- Storage and hauling to a wastewater treatment plant (WWTP) for offsite disposal

2.2.2 One- or Two-Phase Combined-Cycle Operation

The project description assumes that the Energy Facility would be constructed in one phase. However, based on conditions of the electric power market after EFSC's approval of the site certificate application (SCA), the project proponent may decide to construct the Energy Facility in two phases. One- and two-phase descriptions are as follows:

- One Phase: If the Energy Facility is constructed in one phase, it would consist of two blocks of a two-on-one configuration in combined-cycle operation as described in the original SCA. A block would consist of two General Electric (GE) model 7 FA (or equivalent) combustion turbine generators (CTGs), two heat recovery steam generators (HRSGs), and one steam turbine generator (STG). The nominal generating capacity at average annual conditions would be approximately 1,160 MW. The heat rate on a higher heating value basis (HHV) would be approximately 7,391 British thermal units per kilowatt-hour (Btu/kWh) when supplemental duct firing is used and 6,842 Btu/kWh without supplemental duct firing.

- Two Phases: If the Energy Facility is constructed in two phases, each phase would be a combined-cycle operation consisting of a single block of a two-on-one configuration. Each phase would have a nominal generating capacity of 580 MW at average annual conditions. The base load capacity would be approximately 450 MW and supplemental duct firing would add up to 130 MW at average annual conditions for each 580-MW phase. For the first 580-MW phase, the heat rate on an HHV would be approximately 7,391 British Btu/kWh when supplemental duct firing is used and 6,842 Btu/kWh without supplemental duct firing.

Unless otherwise noted, references to acres and values represent construction of the entire 1,160-MW Energy Facility.

2.2.3 Facility Location

The proposed Energy Facility site is located 20 miles east of Klamath Falls, Oregon, and 3 miles south of Bonanza, Oregon, on the east side of West Langell Valley Road No. 520 in Klamath County. Access to the site would be from Langell Valley Road No. 520 (see Figures 2-1 and 2-2). The Energy Facility site is located in Sections 23, 25, and 26 of Township 39 South, Range 11 East and would be constructed primarily in fallow agricultural land. Of the approximately 2,700 acres the project proponent has under option, approximately 200 acres are for easement purposes, and approximately 2,500 acres constitute land that would be purchased in fee title. The Energy Facility site itself would permanently disturb 108.7 acres during the 30-year operating life of the Energy Facility , and if the evaporation pond is selected as the wastewater management alternative, the Energy Facility site would permanently disturb 128.7 acres.

The Lost River is located approximately 2 miles north of the Energy Facility site and approximately 0.4 mile east of the water supply well system. Bryant Mountain is located approximately 1 mile south of the Energy Facility site and approximately 1 mile east of the new electric transmission line route.

2.2.4 Permanent Facility Components

The principal components of the proposed action are listed here with more detailed descriptions in Section 2.2.7:

- A new 1,160-MW air-cooled, natural gas-fired combined-cycle electric power generation plant on 50.6 acres of land
- A 31-acre irrigated pasture area
- A designated process wastewater management alternative
  - If a lined evaporation pond is the selected process wastewater management alternative, it would permanently impact 20 acres.
  - If the selected wastewater disposal alternative is either trucking offsite or land application, two 5-million-gallon (MG) wastewater tanks would be constructed on the Energy Facility site.
- A 3.0-MG raw water storage tank on the Energy Facility site
- A new 7.2-mile, 500-kilovolt (kV) electric transmission line to deliver electricity from the proposed Energy Facility to the Captain Jack Substation; the transmission towers and access roads would disturb 57.3 acres of land
- A 0.3-acre area for a water supply well system that would consist of a reconstructed well and two additional water supply wells
- A 1.5-acre stormwater pond and a 4.7-acre stormwater infiltration basin

Table 2-1 summarizes the acreage of habitats permanently affected by feature during the 30-year operating life of the Energy Facility.

2.2.5 Temporary Facility Components

In addition to the habitats permanently affected by feature during the 30-year operating life of the Energy Facility, the following habitats would be temporarily affected during construction:

- A 71.0-acre area for temporary construction parking and laydown (does not include a 6.2-acre laydown and storage area located with the Energy Facility)
- A 1.0-acre area for temporary construction parking and laydown for the water supply well system
- A 2.8-mile water supply pipeline to deliver water from the water supply well system to the raw water storage tank (3.0 MG) on the Energy Facility site; the temporary construction easement would be 19.4 acres
- A new 4.1-mile natural gas pipeline to deliver natural gas to the proposed Energy Facility; the temporary construction easement would be 43.8 acres
- A series of temporary staging areas totaling 7.6 acres that would be used for construction of the electric transmission line

2.2.6 Protection and Mitigation Measures

Protection and mitigation measures include:

- Creation and enhancement of an approximately 236-acre mitigation area that would be enclosed with wildlife-friendly fencing and include water troughs for wildlife
- Installation of bird flight diverters (BFDs) on the new 500-kV electric transmission line to reduce collisions
- Predisturbance surveys for nesting birds and other special-status species, salvage and relocation by biological monitor of individual wildlife in construction impact areas, worker environmental awareness training, and onsite biological monitoring in sensitive areas
- Preservation or creation of snags at several locations along the route of the new electric transmission line to provide habitat for cavity nesting species
- Restoration and enhancement of natural habitats in temporarily disturbed areas in accordance with a Habitat Mitigation and Natural Area Revegetation Plan (Appendix A, a modified version of Attachment P-1 to Exhibit P of the EFSC site certificate application), developed in consultation with USFWS, ODFW, and BLM

This Habitat Mitigation and Natural Area Revegetation Plan offsets the permanent disturbance during the operating life of the Energy Facility and also provides wildlife habitat enhancements. At Facility retirement, the project proponent would implement a Facility Retirement and Site Restoration Plan (Exhibit W in the EFSC site certificate application) to ensure that soil in and around the Energy Facility site is returned to conditions suitable for agricultural use. The electric transmission line would be removed (i.e., the transmission towers, conductors and groundwires, and insulators) and the transmission tower footings would be removed to a depth of 5 feet. The natural gas and water supply pipelines would be capped and left in place.

2.2.7 Energy Facility Site

Each major component of the Energy Facility, including the related wastewater disposal options, are described below.

Energy Facility

Construction of the proposed Energy Facility would result in the permanent habitat disturbance of 45.9 acres during the 30-year operating life of the Energy Facility. The Energy Facility would be constructed entirely on fallow agriculture land.

Mechanics. The Energy Facility is proposed to consist of four GE model 7FA (or equivalent) CTGs with some shared balance of plant services**.** The CTGs would be outdoor units with thermal insulation and acoustical attenuation. Combined-cycle operation would consist of two blocks of a two-on-one configuration**.** The exhaust of each CTG would be coupled with a three-pressure HRSG**.** There would be up to four CTGs and four HRSGs**.** Steam from two HRSGs would expand through a single condensing steam turbine that drives a STG. Therefore, there would be two STGs. To increase steam-generating capacity, a duct burner system would be included in each HRSG**.**

Electrical output would be stepped up to 500 kV through generator step-up transformers**.** The step-up transformers would be located in an onsite switchyard.

A make-up demineralizer system would supply the demineralized water required for steam cycle make-up, CTG compressor water wash, and other high-purity water uses. The make-up demineralizer system would be designed to receive and treat raw water and the recycled or reused water. The make-up demineralizer system would consist of a reverse osmosis (RO) unit followed by a polishing demineralizer. Both systems are discussed in Exhibit O of the site certificate application.

Additional Facilities and Equipment. Other facilities include an administration/control room building, warehouse/maintenance building, parking area water treatment building, raw water and demineralized water storage tanks, stormwater pond, switchyard**,** septic tank/leach field, gas metering and regulation station, and air-cooled condensers.

Equipment used during construction would include light and heavy trucks, foundation piling equipment, backhoes, bulldozers, graders, cranes, air compressors, welding machines, and power hand tools. The grading plan for the Energy Facility would be a balance cut/fill; therefore, no excess material would be generated. Recyclable materials would be separated from the solid waste stream. Solid waste that cannot be recycled would be trucked to an approved disposal site.

Wastewater Management

Table 2-2 shows the constituents of the process wastewater generated by the air-cooled Energy Facility. The Energy Facility would not discharge any process wastewater directly to surface waters or irrigation canals.

The total dissolved solids (TDS) for the process wastewater would be approximately 1,203 milligrams per liter (mg/L). The principal constituents would be sulfate, silica, and sodium. The estimated process wastewater quality was based on groundwater samples from the deep aquifer (Babson well, KLAM 51920). Process water flows and process recycle rate were determined using the power cycle design water balances. The groundwater would be mixed with recycled process water in the raw water storage tank, and the combined flow would serve as the water source for the process water for the plant. The process water would be cycled through an RO filtration system and a portion would be reused. The remaining fraction would be land applied under the process wastewater management alternative by beneficial use of the water for irrigated pasture.

The constituents in the projected land application water were calculated on the basis of the parameters of the RO system operation and the chemicals added to the process water streams. Sanitary and stormwater waste streams are completely separate from the process water cycle.

For the onsite evaporation pond alternative, two types of chemicals—phosphonates (organo phosphorus) and polyacrylate polymers—would be added to the system for water treatment purposes. Phosphonate is a scale-inhibitor and polyacrylate is a dispersant. The phosphonate scale inhibitor prevents marginally soluble constituents from precipitating by increasing the solubility of these constituents. In the instance that some of the constituents do precipitate out of solution, the polyacrylate dispersant keeps the small particles of the precipitates in suspension, thereby preventing them from forming scales or fouling the RO membrane surfaces.

Process wastewater from the Energy Facility would be managed by one of three alternatives:

- Beneficial use of the water for irrigated pasture
- Evaporation in an onsite in a lined evaporation pond
- Storage and hauling to a WWTP for offsite disposal

Irrigated Pasture Beneficial Use. Process wastewater from the Energy Facility would be managed to provide beneficial use by irrigating 31 acres of pasture (approximate dimensions would be 711 feet wide by 1,900 feet long). Process wastewater would be stored in two 5-MG tanks (one 5-MG tank for each 580-MW power block) prior to pumping over to and irrigating the pasture area. The pasture area would be reduced in half if one 580-MW power block is constructed and later expanded to 31 acres if the second 580-power block is constructed.

During the winter months, the process wastewater would be stored in the tanks and applied by an irrigation system to the pasture area during the summer months. Positive irrigation demands occur from April through September. Irrigation is planned only for those months.

From October through March, precipitation more than satisfies the evapotranspiration (ET) of the pasture grasses.

Process wastewater would be supplied to the irrigation system from the 5-MG process wastewater storage tanks via a booster pump station and a buried irrigation pipeline. The booster pump station would be located adjacent to the process wastewater storage tanks within the Energy Facility footprint and would consist of a 25-horsepower (hp) centrifugal pump on a concrete pad with a starter panel and electrical service, discharge valving, and a flowmeter.

The irrigation pipeline would consist of approximately 3,770 feet of 6-inch polyvinyl chloride (PVC) pipeline buried with 3 feet of cover. The 31-acre rectangular pasture area would be irrigated using a side-roll irrigation system. The 1,900-foot-long side-roll unit would have wheels 4 to 6 feet in diameter around a 5-inch aluminum irrigation supply line. Sprinklers would be located every 40 feet along the supply line. Every 60 feet along the buried irrigation pipeline on the southern edge of the pasture area, a riser valve would be provided for hose connection to the side-roll sprinkler line. Each riser consists of a 5-inch irrigation riser valve extending 12 inches above ground with an 18-inch-by-18-inch concrete pad around the riser. A total of 11 riser valves would be located along the 711-foot southern edge of the past area, requiring 11 irrigation sets to cover the pasture area. During the peak irrigation month of July, approximately two 7-hour irrigation sets would be run each day for 5 days of the week, plus one additional set on the weekend.

The side-roll unit would be stationary during irrigation. However, after an irrigation set at each riser, the side-roll piping would be automatically drained and the system manually moved to the next riser before the next irrigation set begins. When the side-roll is moved, the drive engine must be manually started to move the irrigation line 60 feet to the next set location. Once the side-roll is advanced to the end of the field, the side-roll is then moved back to its original position to begin the cycle again.

A livestock fence would be used around the pasture area to prevent livestock in the pasture area from traveling out across the rest of the wildlife enhancement areas on the property (immediately north and west of the pasture area). A wildlife-friendly fence would be used to allow mule deer and antelope to safely enter and exit the pasture area. An approximately 100-gallon temporary watering trough would also be provided in the pasture area for livestock watering. This would be served by a 1-inch buried water line tapped off of the water supply system at the Energy Facility and would be routed and buried in the same trench as the buried irrigation pipeline.

Evaporation Pond. In the unlikely event that process wastewater management by irrigated pasture beneficial use does not function as designed, an optional backup of a 20-acre evaporation pond sized to store approximately 7 MG and lined to protect groundwater would be used to manage process wastewater. The evaporation pond alternative is a contingency only and it would not be built until such time as it is determined that process wastewater management by irrigated pasture beneficial use does not function as designed. If the need for the evaporation pond occurs, the water treatment system at the Energy Facility would be changed to incorporate a RO system to increase the cycling of the water and to reduce the quantity of wastewater to be discharged to the evaporation pond.

The evaporation pond would be designed to operate passively. A wastewater pipeline would directly route wastewater from the Energy Facility to the evaporation pond. The evaporation pond would be designed and sized to contain total suspend solids from the wastewater for the life of the Energy Facility with minimal, if any, requirement for sediment removal.

The evaporation pond would be designed to include a composite liner system for containment of the wastewater and suspend solids. Bentonite would be added to the soil at the base of the evaporation pond, mixed to a depth of approximately 12 inches, and then compacted to achieve a permeability of greater than or equal to $1x10^{-6}$ centimeters per second (cm/sec). An alternative to the bentonite-treated soil would be to use a bentomat geotextile system. The bentomat geotextile system is available with a permeability as low as $5x10^{-9}$ cm/sec. A 60-mil high-density polyethylene (HDPE) liner would be placed over the bentonite-treated soil or the bentomat geotextile system, to form the top layer of the composite liner system. The evaporation pond would be netted to prevent access by birds and surrounded by a chain-link fence to prevent wildlife access. A spray enhancement system may be used to increase evaporation.

Storing and Hauling to Wastewater Treatment Plant. If this alternative were to be selected, process wastewater would be managed by storing and hauling to a WWTP for disposal. The project proponent has contacted the two municipal WWTPs in Klamath Falls—the South Suburban Sanitary District and the City of Klamath Falls Sanitary District. The ability of these two WWTPs to accept wastewater from testing and commissioning of the Energy Facility and the wastewater from operation of the Energy Facility is presently being evaluated. According to managers at both facilities, each would be required to evaluate whether they can meet the U.S. Environmental Protection Agency (EPA) categorical standard to accept industrial waste or whether local ordinances provide for acceptance of truck-hauled wastewater. During the life of the Energy Facility, other WWTPs may be constructed or considered for management of wastewater generated at the Energy Facility. The project proponent would arrange with a trucking company to routinely haul the wastewater stored in the wastewater storage tanks at the Energy Facility to the WWTP.

Sanitary Wastewater

During operations, sanitary wastewater from restroom and shower facilities would be routed to an onsite septic tank, which would discharge to a leach field**.** Approximate flows of up to 1,500 gallons per day or about 1 gallons per minute (gpm) are expected. A permit from either Klamath County or the Oregon Department of Environmental Quality (ODEQ) would be required. The permit process requires a site evaluation to be conducted to determine whether the location of the septic field is appropriate for sewage disposal. During construction, portable toilets would be provided for onsite sewage handling and they would be pumped and cleaned regularly by a licensed contractor.

Stormwater Management

While stormwater is not considered wastewater, stormwater would be managed at the Energy Facility by a 4.7-acre infiltration basin and therefore would be covered under a Water Pollution Control Facility (WPCF) permit. Under the preferred alternative, there would be no discharge of stormwater from the Energy Facility into surface waters, stormwater drainage ditches, or irrigation canals.

Stormwater would be managed through three separate systems, including the plant drainage system, the storm sewer system, and the stormwater run-on diversion system. Figure 2-3 shows a schematic of the three separate and segregated systems designed to handle stormwater during Facility operations. The figure shows individual drainage systems as well as a breakdown of the drains connected to each system. The individual drainage systems are described in more detail below.

Plant Drains System. A dedicated plant drains system would be designed and constructed at the Energy Facility to segregate stormwater that comes in direct contact with plant components from the storm sewer system, thus preventing runoff in the plant drains system from reaching the stormwater pond or the infiltration basin. This design would be accomplished by separating the runoff from drains with the potential to come in contact with pollutants from the remainder of the storm drainage system. Drains in areas with the potential for contact with pollutants from materials used or stored at the Energy Facility would be routed to the segregated plant drains system, which would discharge to an oil/water separator. This system includes drains inside buildings and enclosures and drains from the interior of spill containment berms. The resulting oil/water separator discharge water would be routed to a wastewater collection basin and then pumped back to the raw water tank for use as process water. No stormwater collected by the segregated plant drains system would be routed to the stormwater pond or infiltration basin.

The wastewater collection basin would be a concrete sump located in an accessible location so it can be inspected without interfering with Facility operations. It would hold approximately 5,000 to 10,000 gallons.

The oil from the oil/water (O/W) separator would be contained in the oil/water separator itself. The O/W separator would include a level indicator with an alarm that would alert the operations staff when it needs to be emptied. At that point, a licensed contractor would pump the oil out and haul it offsite for proper disposal.

The dedicated plant drains system would include the following:

- Combustion turbine enclosure floor drains
- Steam turbine area foundation and floor drains
- HRSG foundation and stack floor drains
- Warehouse/maintenance building floor drains
- Administration building floor drains

Stormwater Sewer System. Stormwater that falls inside the fence line of the Energy Facility that is not routed to the plant drains system described above, would be collected in the storm sewer system. The collection of rainfall runoff in this system is limited to parking lots, roof drains, graveled areas and vegetated areas. This storm sewer system would consist of ditches, culverts, and piping as required that is routed to the stormwater pond. From the stormwater pond there are two alternatives for discharge of the stormwater. The preferred alternative is to discharge the stormwater into a 4.7-acre infiltration basin. The second alternative is to discharge the stormwater through a ditch adjacent to the Energy Facility access road and into the West Langell Valley Roadside ditch where it would eventually enter the High Line Levee Ditch and then into the Lost River. These alternatives are described in more detail below.

Stormwater Pond. The captured runoff from the Energy Facility in the storm sewer system would be conveyed to a 1.5-acre, 750,000-gallon stormwater pond, located in the southeast corner of the Energy Facility (see Figure 2-4). This stormwater pond would serve two purposes: 1) provide pretreatment of the runoff before it enters the infiltration basin, and 2) provide temporary storage should unwanted material make its way into the stormwater.

The stormwater pond would provide a wide spot in the stormwater flow path. This wide spot would reduce the flow velocity of the stormwater, allowing suspended sediment to settle out. The operating life of the infiltration basin would be increased by removing the sediment.

A ditch would be constructed from the toe of the fill for the Energy Facility over to the infiltration basin to convey stormwater in the stormwater pond to the infiltration basin. An 18-inch-diameter discharge pipe would be installed through the southern end of the dyke of the stormwater pond. The outlet would discharge into the ditch. The pipe would include a manually operated valve that would normally be closed. The 18-inch-diameter discharge pipe would drain the 2.3 acre-foot stormwater pond if it were full in approximately 5 hours.

The stormwater pond is not designed to detain a 100-year, 24-hour storm. It is able to detain only approximately 34 percent (2.3 acre-feet divided by 6.7 acre-feet). The spillway would be sized to handle the peak flow from the 100-year, 24-hour storm, which is approximately 112 cubic feet per second (cfs). The dyke of the stormwater pond would include a 2-foot-deep, concrete-lined flume directly above the discharge pipe. This flume would act as an emergency spillway for storms greater than the volume of the stormwater pond. The spillway routes stormwater overflow to the ditch that directs water into the infiltration basin. The 112-cfs peak flow occurs for less than 15 minutes and is not representative of the average flow for a 100-year storm.

Infiltration Basin Alternative (Preferred). Though not accounted for in the preliminary basin sizing, evaporation of the collected stormwater would occur during the summer months. Vegetation would be planted in the bottom of the infiltration basin to help to improve the infiltration functions and protect these surfaces from rain and wind erosion. There are three primary reasons to vegetate the basin with native grasses or other suitable vegetation:

- The #1 cause of soil erosion in Klamath County is wind on barren soil.
- The infiltration basin would be a collection basin for wind blown soil and noxious weed seeds. Although the soil may become resuspended by the wind, some seeds would germinate and overtime the basin would be vegetated by noxious weeds and require greater maintenance to remove weeds.
- Vegetation would help uptake any nutrients or potential pollutants that may be in the stormwater.

A chain-link fence would be installed around the infiltration basin to prevent debris, such as wind-blown vegetation or litter, from entering and settling on the basin bottom. The fence would also serve to prevent unauthorized personnel or wildlife from entering the basin. A gate would be installed in the fence to allow access for maintenance personnel and equipment. An access road would be constructed from the access road to the Energy Facility over to the infiltration basin (see Figure 2-4).

Runoff calculations were performed using the TR-20 hydrologic model. This model was developed by the Soil Conservation Service and the U.S. Department of Agriculture. The 100-year, 24-hour storm event was used to size the infiltration basin. This return event is consistent for the design of stormwater retention systems. The probability of a 100-year storm event to occur in any one year is one percent.

The infiltration basin would be located adjacent to the Energy Facility on Claimus series loam soil. The NRCS (Natural Resources Conservation Service) Soil Survey for Klamath County lists the saturated infiltration rate for this soil as 0.6 inch per hour (in/hr) to 2.0 in/hr. The infiltration basin was sized using the lower value of 0.6 in/hr. Using this lower infiltration value provides a conservative infiltration basin size. Table E-1.1 summarizes the preliminary infiltration basin sizing.

The primary controlling factor in sizing the infiltration basin is the surface area of the basin bottom, the depth of water storage, and one foot of freeboard. One foot of freeboard is a typical design standard for stormwater ponds. Over designing the infiltration basin reduces the chances of the water over-topping the infiltration basin should a storm, larger than the 100-year event occur or if back-to-back smaller storm events occur. Based on the over-design of the basin configuration for this project, the additional one foot of free board provides approximately 40 percent additional storage volume that could be filled by stormwater before overtopping would occur. A 48-hour drawdown period of the 100-year stormwater volume was used for sizing the infiltration basin and is consistent with the design requirements of similar functioning ponds, such as an extended dry detention pond. This draw-down period reduces the risk of stormwater overtopping the infiltration basin should back to back storm events occur. Drawdown duration would be less than 48 hours for the more frequent return storm events.

Offsite Stormwater Diversion System. Stormwater diversion ditches would be installed on the north and west sides of the Energy Facility to divert stormwater form undisturbed areas adjacent to the Energy Facility from flowing onto the Energy Facility. These diversion ditches would direct water into existing natural drainage system or into the drainage ditch along West Langell Valley Road. Runoff to the south and east of the Energy Facility would naturally drain away from the Energy Facility.

2.2.8 Related or Supporting Facilities

Related or supporting facilities include the water supply system (wells and pipeline), natural gas pipeline, electric transmission line, and temporary construction and parking laydown areas.

Water Supply System

Water would be needed by the proposed Energy Facility to generate steam for the combined-cycle operation. The water supply system would consist of water supply wells and a 2.8-mile water supply pipeline that would connect to two 1.1-MG raw water storage tanks at the Energy Facility.

Water Supply Wells. The water supply wells would consist of an existing well and two additional water supply wells located along East Langell Valley Road (Figure 2-2). The existing well, known as the Babson well, was originally drilled to depths exceeding 5,000 feet for oil and gas exploration in the 1920s and is currently open to a depth of 2,050 feet. The two additional water supply wells would also be constructed to withdraw water from this deep aquifer, which is isolated from the shallow zone aquifer and from surface water. Construction would result in temporary disturbance to 1.0 acre of pasture for parking and laydown. An additional 0.3 acre of pasture would be permanently disturbed during the 30-year operating life of the Energy Facility.

An aquifer test was performed in the summer of 2002 (CH2M HILL, 2002). The Babson well was pumped at an average rate of 6,800 gpm for approximately 30 days. An expanded observation well network (31 different locations) was used that included both shallow wells and deeper irrigation wells in Langell Valley, Yonna Valley, Swan Lake Valley, Malin, and Klamath Falls. There was a hydraulic response in two nearby wells in the observation well network attributable to a leaking well packer. This aside, the data do not indicate that the deep system is in hydraulic connection to a shallow aquifer system. A reconstructed well should eliminate the minor response observed. No hydraulic response was observed at Bonanza Big Springs.

Deep aquifer response suggests extremely high aquifer transmissivity and supply: at the end of the 30-day pumping period, water levels had recovered to the pretest static level within 5 minutes. These observations show that the roughly 294 MG withdrawn for this test were insignificant relative to the rate and volume of water available to the Babson well.

Water requirements for the Energy Facility, under annual average conditions with supplemental duct firing, would be approximately 36 gpm for one 580-MW block or 72 gpm for the 1,160-MW arrangement from the Babson well. Under maximum consumption conditions with supplemental duct firing, that rate increases to 104 gpm for one 580-MW block or 210 gpm for the 1,160-MW arrangement.

Two additional water supply wells would be installed near the Babson well. One would be located up to 50 feet northwest and the other up to 500 feet southeast of the existing Babson well. These maximum distances for well locations were included in the OWRD water right application as additional points of diversion. Each of the three wells (the Babson well and the two additional water supply wells) would be designed to produce the maximum, instantaneous rate of 210 gpm. Flexibility to pump 100 percent of the required maximum, instantaneous rate is necessary in the event that two wells are offline simultaneously because of malfunction or scheduled maintenance.

Water Supply Pipelines. Water from the well system would be pumped through a 2.8-mile, 6-inch-diameter water supply pipeline to a 1.1-MG raw water supply tank at the Energy Facility site.

The 2.8-mile water supply pipeline would be constructed within a temporary, 60-foot-wide easement on land under ownership options by the project proponent, except for portions of the route that cross Klamath County roads. The route of the water supply pipeline would cross two Klamath County roads: East Langell Valley Road and Teare County Road 1161. In addition, the water supply pipeline would cross an irrigation canal operated by the Langell

Valley Irrigation District in three locations. The crossings would be conventionally bored underneath the public roads and irrigation canal. The rest of the water supply pipeline would be constructed by open trench methods. The pipeline would be installed in a 36-inch-wide trench at a depth of about 4 feet.

Construction. In the areas where conventional bores would occur, additional temporary work space would be required on both sides of the road or irrigation canal. Excavations would be larger than in the open trench sections to provide room for workers to safely work down in the excavations. The excavations would be approximately 15 feet deep. The additional work space would be necessary to excavate a safe ditch and store the excavated soil.

Construction would result in temporary disturbance to 10.2 acres of juniper-sage scrub, 1.4 acres of agricultural fields, 6.3 acres of pasture, 0.8 acre of fallow field, and 0.7 acre of ruderal habitat for a total of 19.4 acres. There would be no permanent disturbance for the water supply pipelines because the construction easement would be restored and revegetated.

Figure 2-5 shows a typical construction configuration of the water supply pipelines. The trench would be backfilled with pipe zone material and then with native soil up to the original grade. Equipment used would include cranes, excavators, supply trucks, boom trucks, and line trucks.

Natural Gas Pipeline

A new 4.1-mile, 20-inch-diameter pipeline would be required to supply natural gas to the Energy Facility. The pipeline would connect to an existing PG&E Gas Transmission Northwest (GTN) gas transmission system at the Bonanza Compressor Station. The proposed alignment would be located along the right-of-way (ROW) of existing Klamath County roads (Figure 2-2). The project proponent would be responsible for constructing a gas measurement station to be located either at the Energy Facility site or at the PG&E GTN Bonanza Compressor Station. PG&E GTN would be responsible for the final gas interconnection (side tap installation) with its existing pipelines.

Easement options have been obtained along the pipeline alignment for a temporary 80-foot-wide construction easement needed for equipment staging and material laydown along the pipeline alignment. The easement would be immediately adjacent to and along the Klamath County ROW for Harpold County Road No. 1097 and West Langell Valley Road No. 520. The alignment of the natural gas pipeline would cross the public roads in three places. These crossings would be conventionally bored underneath the public roads. The rest of the natural gas pipeline would be constructed by open trench methods. The natural gas pipeline would be installed in a 36-inch-wide trench at a depth of about 4 feet. Additional temporary work space of 40 feet (for a total of 120 feet) would be required along the north side of West Langell Valley Road near the Energy Facility site, where the natural gas pipeline route goes through an approximate 2,200-foot section of steep topography. The extra width would be needed for soil storage when leveling the easement to create a safe working platform for workers and equipment. Construction of the natural gas pipeline would result in temporary impacts to 9.0 acres of juniper-sage scrub, 23.9 acres of agricultural field, 0.8 acre of pasture, 3.5 acres of fallow field, 3.0 acres of ruderal habitat, and 3.6 acres of developed land for a total of 43.8 acres that would be restored after construction.

Figure 2-6 shows a typical configuration of the natural gas supply pipeline construction. The trench would be backfilled with pipe zone material and then with native soil up to the original grade. Equipment used along the pipeline alignment would include light and heavy trucks, excavators, bulldozers, graders, cranes, air compressors, welding machines, and power hand tools. Some specialized boring equipment would be used to do the conventional bores under the existing roads and the irrigation canal.

Electric Transmission Line

The proposed Energy Facility would include construction of a new 7.2-mile-long, 500-kV, alternating current (AC) electric transmission line running south from the Energy Facility to an interconnection at BPA’s Captain Jack Substation (Figure 2-2). The final route and configuration of the new transmission line (for example, exact number of transmission towers, transmission tower heights, and location of transmission towers) would depend on final design and engineering, geotechnical, and environmental considerations.

Transmission Towers. Approximately 38 transmission towers would be required. The transmission towers would consist of steel lattice structures assembled in sections near the transmission tower site (Figure 2-7). Typical transmission towers would range in height from 100 to 165 feet, with most towers in the 105- to 110-foot range. On average, the towers would be spaced approximately 990 feet apart, with a range from 380 to 1,500 feet to span sensitive areas. Transmission towers would rest on four concrete footings, each about 4 feet in diameter. Allowing room for access and maintenance workspace around the footings would result in a permanent footprint disturbance of approximately 60 feet by 60 feet at each transmission tower.

At nine transmission tower locations, approximately 100 feet by 150 feet of additional, permanent space would be required to ensure safety for vehicles and equipment. Footings would be placed in holes that are excavated, augured, or blasted. The design of the footings would vary based on soil properties, bedrock depth, and the soundness of the bedrock at each transmission tower site. Construction of the transmission towers would result in permanent loss during the 30-year operating life of the Energy Facility of 3.5 acres of juniper-sage scrub, 0.6 acre of sagebrush-steppe, 0.8 acre of ponderosa pine, 0.1 acre of unimproved pasture, and 0.5 acre of fallow field for a total of 5.5 acres.

Conductors and BFDs. Typically, 500-kV AC transmission lines require three sets of wires (or “conductors”). Each set is referred to as a phase, and typically consists of a pair of bundled aluminum cables. One or two “shield wires” are placed near the top of the transmission structure, above the conductors, to shield the towers from lightning strikes. To prevent electrocutions, conductor wires would be spaced further apart than the wing span of a large birds (24 feet on the vertical and 25 feet on the diagonal) (APLIC, 1996). The top groundwire would be fitted with BFDs to visually enhance the wire and subsequently deflect birds from colliding with hard to see wires. Annual monitoring of the lines would be conducted to determine if the lines are a significant impact to waterfowl and special-status birds that forage or nest in the area.

Access Roads. A permanent access road would be required for construction and to access the new electric transmission line for maintenance during operation. The access road would be designed for use by cranes, excavators, supply trucks, boom trucks, and line trucks. The access road would be surfaced with gravel. Approximately 6.6 miles of new access road would be required. The access road would be approximately 15 feet wide, and grades would be less than 15 percent. To minimize clearing, the access road would remain within the electric transmission line ROW where possible. Construction of the electric transmission line access roads would result in permanent conversion of 28.1 acres of juniper-sage scrub, 9.8 acres of sagebrush-steppe, 11.6 acres of ponderosa pine, 2.0 acres of unimproved pasture, and 0.3 acre of fallow field for a total of 51.8 acres. Where temporary roads are used, any disturbed ground would be repaired and the area would be revegetated with the appropriate native species to minimize erosion.

Vegetation Management. To minimize fire hazards for safe and uninterrupted operation of the electric transmission line, vegetation more than 10 feet tall would be cleared or trimmed within the 154-foot easement. The easement would consist of 79.5 acres of juniper-sage scrub, 22.3 acres of sagebrush-steppe, 23.7 acres of ponderosa pine, 2.1 acres of unimproved pasture, and 6.4 acres of fallow field for a total of 134.0 acres. Removal of juniper trees would provide an overall benefit to the habitat by improving understory growth of grasses and shrubs.

Clearing may include removal of vegetation or managing vegetation so that it does not grow above 10 feet in height. Considerations that influence the amount and type of clearing include vegetation species, height and growth rates, ground slope, wind and snow patterns, conductor elevation above ground, and clearance distance required between the conductors and other objects. Some form of selective vegetation removal may be required at the edge of the 154-foot easement. Leaning or diseased trees that could fall into the electric transmission line or pose a threat to reliable operation would be removed as necessary. At transmission tower sites, trees, brush, stumps, and snags would be removed, including root systems. After construction, vegetation management would be necessary, and would include controlling noxious weeds and managing growing vegetation in and adjacent to the easement. Vegetation management would consist of manual, mechanical, biological, and chemical methods.

Construction Parking and Laydown Areas

During construction, temporary parking and laydown areas would be required as follows:

- At the Energy Facility site there would be four areas for construction parking and laydown totaling 71.0 acres.
- In the water supply well area, the construction parking and laydown area would total 1.0 acre.
- Along the electric transmission line, there would be 7.6 acres of staging and construction areas.

2.2.9 Construction Schedule

Based on conditions of the electric power market after approval of the site certificate application, the project proponent may decide to construct the Facility in one phase or two phases. If the Facility is constructed in two phases, construction of the second phase may start up to 2 years after the first phase starts commercial operation.

If the Facility is constructed in one phase, construction would be expected to take 23 months. If the Facility is constructed in two phases, the first phase of construction would be expected to take approximately 18 months.

Because the conditions of the power market fluctuate and are volatile, the project proponent may choose not to start construction of the Facility until 3 years after the site certificate application is approved.

TABLE 2-1
Permanent and Temporary Disturbance by Habitat Type

Feature	Total	Juniper-Sage	Sage-Steppe	Pine	Ag Field	Pasture	Unimproved Pasture	Fallow	Ruderal	Developed	Sensitive Biological Resources Affected
Permanent Effects to Habitat During the 30-Year Operating Life of the Energy Facility Site											
Energy Facility Site	50.6							50.6			Loss of marginal upland bald eagle foraging habitat during the 30-year operating life of the Energy Facility and from temporary disturbance during construction activities. After site restoration activities, the Energy Facility would be revegetated and restored to conditions suitable for agricultural use.
Permanent Effects to Habitat for the Related or Supporting Facilities During the 30-Year Operating Life of the Energy Facility											
Alternative wastewater evaporation pond	20.0							20.0			Potential toxicity to wildlife. The evaporation pond would be netted with a 1-inch square-knotted polypropylene netting to prevent bird access. Also, the evaporation pond would be enclosed with a chain-link fence to prohibit wildlife access.
Water supply well system	0.3					0.3					Loss of marginal upland bald eagle foraging habitat during the 30-year operating life of the Energy Facility and from temporary disturbance during construction activities.
Electric transmission line towers and access roads	57.3	31.6	10.4	12.4			2.1	0.8			Potential for bald eagle collisions with new electric transmission line and loss of upland bald eagle foraging habitat. Potential for increased road kill that increases carrion forage for bald eagle. Bird flight diverters would be installed on top groundwires of new electric transmission line. Awareness training would be provided to employees responsible for using the access roads to perform maintenance and inspection.
Access road to irrigated pasture *	0.5							0.5			
Subtotal—Related or supporting facilities without evaporation pond	58.1	31.6	10.4	12.4	0.0	0.3	2.1	1.3	0.0	0.0	
Subtotal—Related or supporting facilities with evaporation pond	77.6	31.6	10.4	12.4	0.0	0.3	2.1	21.3	0.0	0.0	
Project Total—without evaporation pond	108.7	31.6	10.4	12.4	0.0	0.3	2.1	51.9	0.0	0.0	
Project Total—with evaporation pond	128.7	31.6	10.4	12.4	0.0	0.3	2.1	71.9	0.0	0.0	
Temporary Effects to Habitat Not Included in the Permanent Effects											
Temporary construction parking and laydown areas	71.0	5.4							65.6		Temporary disturbance during construction to marginal upland bald eagle foraging habitat.
Water supply well system construction parking and laydown area	1.0					1.0					Temporary disturbance during construction to marginal upland bald eagle foraging habitat.
Water supply pipeline construction easement	19.4	10.2			1.4	6.3		0.8	0.7		Temporary disturbance during construction to marginal upland bald eagle foraging habitat.
Natural gas pipeline construction easement	43.8	9.0			23.9	0.8		3.5	3.0	3.6	Temporary disturbance during construction to marginal upland bald eagle foraging habitat.
Irrigation pipeline	5.2							5.2			
Electric transmission line (additional construction and storage areas at each transmission tower)	7.6	3.6	1.8	1.6			0.3	0.3			Potential temporary disturbance to bald eagle nesting and foraging on Bryant Mountain during construction.
Total: Temporary—without evaporation pond	148.0	28.2	1.8	1.6	25.3	8.1	0.3	9.8	69.3	3.6	
Total: Temporary—with evaporation pond	148.0	28.2	1.8	1.6	25.3	8.1	0.3	9.8	69.3	3.6	
Project Total—with evaporation pond	256.7	59.8	12.2	14.0	25.3	8.4	2.4	61.7	69.3	3.6	
Project Total—without evaporation pond	276.7	59.8	12.2	14.0	25.3	8.4	2.4	81.7	69.3	3.6	
Habitat Areas Modified for Related or Supporting Facilities During the 30-Year Operating Life of the Energy Facility											
Clearing within the 154-foot electric transmission line easement (includes the transmission towers and access roads inside the easement)	134.0	79.5	22.3	23.7			2.1	6.4			Modification of upland habitat would occur when vegetation above 10 feet in height within the 154-foot easement would be cleared. Removal of juniper trees would provide an overall benefit to the habitat by improving understory growth of grasses and shrubs.

* If the evaporation pond is the selected alternative, the access road to the irrigated pasture would not be constructed.

TABLE 2-2
Process Wastewater Characteristics

Parameter	Land Application Case	Evaporation Pond Case	Units
PH	7.5-9.0	7.5-9.0	Standard units
Iron	0.14	0.68	mg/L
Copper	0.00	0.032	mg/L
Manganese	0.02	0.044	mg/L
Calcium	28.92	65.6	mg/L
Magnesium	11.74	26.6	mg/L
Sodium	20.12	52.0	mg/L
Potassium	4.22	9.57	mg/L
Boron	0.54	1.22	mg/L
Silica	71.12	183.0	mg/L
Chloride	4.14	15.7	mg/L
Nitrate as N	0.84	1.9	mg/L
Nitrite as N	0.02	0.044	mg/L
Ammonia as N	0.00	0.35	mg/L
Sulfate	6.29	269.8	mg/L
Total Alkalinity	164.12	250.0	mg/L as $CaCO_3$
Fluoride	0.20	0.44	mg/L
Phosphorous	0.05	20	mg/L
Orthophosphate as P	0.05	20	mg/L
Sulfite	1.00	25.0	mg/L
Oil and Grease	0.30	10.7	mg/L
Total Organic Content (TOC)	1.50	69.6	mg/L
TDS [1]	203	1,077	mg/L
TSS	1.00	1.0	mg/L
Phosphonates [2]	0.00	30.0	mg/L
Polyacrylate [2]	0.00	20.0	mg/L
Free Chlorine [2]	0.00	0.20	mg/L

[1] Includes treatment chemicals identified in [2].

[2] Added as treatment chemical.

mg/L = milligrams per liter.

Insert Figures 2-1 through 2-7:

2-1 Site Map

2-2 Facility Map

2-3 Stormwater Drainage Flow Schematic

2-4 Energy Facility Site Layout

2-5 Typical Water Supply Pipeline Configuration

2-6 Typical Natural Gas Pipeline Configuration

2-7 Typical Transmission Tower Structure

SECTION 3

Study Methods

This section describes the study methods used to develop the BA.

3.1 Data Review

Before conducting field surveys, several natural resource agencies were consulted and a literature review was conducted to obtain information about sensitive biological resources known to occur or that potentially could occur within the project area. As part of the literature review process, USFWS was consulted regarding special-status species that could occur within Klamath County, and a search was conducted of the ONHP database to provide information on reported occurrences of special-status plant and wildlife species in the project area. Because the route of the electric transmission line crosses land owned and managed by BLM (Figure 2-2), BLM was contacted to obtain a list of sensitive and special interest wildlife and plants. The list was provided on April 30, 2002.

Resource agency biologists at ODFW and the U.S. Forest Service were also contacted regarding site-specific special-status wildlife species with the potential to occur in the project area. Lists of special-status species potentially occurring in the project area that were provided by the natural resource agencies and the project impact analysis for those species are presented in Exhibit P of the site certification application.

Federally listed species with habitat or known distribution in the project area are evaluated for potential impacts from construction, operation, and maintenance activities in the BA.

3.2 Onsite Field Surveys

Reconnaissance-level surveys for the Energy Facility site, the water supply pipelines, and the natural gas pipeline were conducted on October 10 and 11, 2001, to evaluate potential effects of the preliminary project design on sensitive biological resources. Detailed habitat assessment and field surveys for sensitive plants and wildlife potentially occurring in the project area were conducted by the following CH2M HILL staff: Marjorie Eisert (Senior Biologist), Russell Huddleston (Biologist), Debra Crowe (Senior Biologist), Heather Johnson (Mammalian Biologist), and Richard Crowe (Senior Environmental Technician). Surveys of the proposed Energy Facility site and the proposed natural gas, water supply, and electric transmission line alignments were conducted from May 6 to May 10, 2002. Additional rare plant and breeding bird surveys were conducted from June 17 to 20, 2002, and on July 9 and 10, 2002.

Prior to conducting the 2002 biological surveys, the centerlines of the water supply pipeline, natural gas pipeline, and electric transmission line were flagged by surveyors. Habitat surveys were conducted for areas within ¼ mile of the Energy Facility site and the water supply pipeline, natural gas pipeline, and electric transmission line. Aerial photography, topographic maps, visual identification, and field verification at specific locations were used to categorize habitat types. Methodology of detailed field surveys for special-status wildlife and plants within each project feature are discussed below. Plant and wildlife species observed during the surveys are presented in Appendix B.

3.2.1 Energy Facility Site and Process Wastewater Application Areas

The majority of the Energy Facility site lies within unirrigated fallow agricultural fields and was surveyed by driving or walking transects. Areas with natural vegetation, relatively little disturbance, or potential habitat for special-status species (e.g., old farm buildings) were inspected on foot. Selected areas of the fallow barley field, where there was a potential for additional wildlife observations, were also surveyed on foot. Wildlife and identifiable plant species observed on the Energy Facility Site were noted. Trail Master photo stations were established at several locations containing wildlife signs (e.g., scat latrines on rock escarpments, woodrat structures, and near burrow systems in the fallow field) to monitor for cryptic and/or nocturnal species.

3.2.2 Electric Transmission Line

The electric transmission line route was surveyed by walking six meandering transects along the entire length of the alignment. These transects covered approximately 300 feet on either side of the centerline, for a total survey width of approximately 600 feet. Wildlife and plant species observed within the survey corridor were noted. Habitat types were mapped based on the characteristic trees, shrubs, and herbaceous vegetation. Visual estimation and field verification at specific locations was used to categorize habitat types beyond the survey corridor. Aerial photos and topographic maps were used in the field to help identify adjacent habitat areas within ¼ mile of the survey area. These areas were further investigated for potential sensitive wildlife and plant species that potentially could be indirectly affected by the proposed project.

3.2.3 Water Supply Pipeline and Natural Gas Pipeline

The proposed water supply pipeline and natural gas pipeline routes were surveyed by walking meandering transects covering approximately 100 feet to either side of the centerline for a total width of 200 feet. Wildlife and identifiable plant species observed within the survey corridor were noted. Habitat types were mapped based on the characteristic trees, shrubs, and herbaceous vegetation. Visual estimation was used to categorize habitat types beyond the survey corridor. As with the electric transmission line, aerial photos and topographic maps were used in the field to help identify areas that may have been overlooked during the meandering transects. Each of these areas was investigated in the field for potential sensitive species. Active cultivated crops and developed areas along the natural gas supply pipeline were not included in the surveyed area.

SECTION 4

Environmental Setting

This section describes current land use, habitat types, and hydrologic resources in the proposed project area.

4.1 Geological Setting

The proposed project is located in the Klamath Ecological Province (East Cascades Ecoregion) on the eastern side of the Cascade Mountains. This region is characterized by large basins surrounded by ancient lake terraces and basaltic fault block mountains. Elevations range generally range from around 4,000 to 6,500 feet. Regionally the project is located within the Klamath River Basin, which extends from the Williamson River in southern Oregon to the Trinity River in northern California and covers approximately 10.5 million acres. The watersheds included in the Klamath Basin provide habitat for genetically distinct anadromous fishes as well as endemic freshwater species. Approximately 75,000 acres of shallow lakes and fresh water wetlands also provide habitat for numerous species, including the largest wintering population of bald eagles in the lower 48 states. Approximately 80 percent of the migratory birds in the pacific flyway use habitats within the Klamath Basin.

4.2 Current Land Use

The majority of the lowland areas in the Langell Valley have been converted to agricultural use, including cultivated crops and irrigated pastures. The Energy Facility site is unirrigated. The few developed areas included scattered residential, agricultural, and industrial sites, such as farm homes, dairies, the PG&E GTN compressor station, and the Captain Jack Substation. The hills and terraces around the valleys are characterized by juniper woodlands with an understory of low sagebrush, rabbitbrush, native perennial bunchgrasses, and forbs, and are used primarily as open rangeland managed by Federal and private landowners. Selective timber harvesting has occurred in the ponderosa pine forest habitat located along the southern section of the proposed electric transmission line near Bryant Mountain. Linear utilities in the area include three existing transmission lines and the PG&E GTN interstate gas pipeline system.

4.3 Habitat Types in the Study Area

4.3.1 Western Juniper Woodland

Western juniper woodland is the driest forest community in the Pacific Northwest and is generally found in the transition zone between ponderosa pine forest and shrub-steppe habitats. This type occurs widely throughout eastern Oregon on shallow, often rocky soil, at elevations ranging from 1,500 and 6,500 feet, and is widespread on low hills and terraces at elevations between 4,000 and 5,000 feet. It is found on well-drained stony to very stony loams derived from weathered tuff and basalt, as well as on loamy soil derived from lacustrine and alluvial deposits (NRCS, 1985).

Western juniper woodland is characterized by the almost sole dominance of western juniper (*Juniperus occidentalis*) in the canopy layer. Throughout much of this habitat type the trees are generally widely spaced, creating a savanna-like setting with shrub cover between 10 to 40 percent in the understory. In some areas, western juniper creates a woodland or forested habitat with only a few scattered shrubs in the understory. Low sagebrush (*Artemisia arbuscula*) is the dominant shrub in most areas with big sagebrush (*Artemisia tridentata*), desert gooseberry (*Ribes velutinum*), and rabbitbrush (*Chrysothamnus nauseosus*, *C. viscidiflorus*) also found within the shrub layer. Native bunchgrasses such as Sandberg's bluegrass (*Poa secunda*), Idaho fescue (*Festuca idahoensis*), bluebunch wheatgrass (*Pseudoroegneria spicata*), Thurber's needlegrass (*Achnatherum thurberianum*) and squirrel tail (*Elymus elymoides*) make up approximately 5 to 25 percent of the ground cover in most areas. Common native forbs include larkspur (*Delphinium nuttallianum*), lupine (*Lupinus lepidus*), phlox (*Phlox diffusa*), lomatium (*Lomatium* spp.), and alpine waterleaf (*Hydrophyllum capitatum*). Where intensive livestock grazing has occurred in this habitat type, the understory vegetation is relatively sparse and made up of non-native species. Shrubs and native perennial bunchgrasses are either absent or very sparse in these areas.

The majority of western juniper habitat observed during field surveys was along the proposed electric transmission line, with sparse distribution along the natural gas and water supply pipelines (Figure 4-1). Wildlife species observed within the western juniper woodland were typical of species associated with this habitat type. Several raptors including, bald eagles (*Haliaeetus leucocephalus*), red-tailed hawks (*Buteo jamaicensis*), Cooper's hawk (*Accipter cooperii*), sharp-shinned hawk (*Accipiter striatus*), and turkey vultures (*Cathartes aura*) were observed foraging and patrolling this habitat. In addition to raptors, numerous passerines were observed. Common species included ruby-crowned kinglet (*Regulus calendula*), mountain bluebird (*Sialia currucoides*), American robin (*Turdus migratorius*), spotted towhee (*Pipilo maculatus*), lark sparrow (*Chondestes grammacus*), golden-crowned sparrow (*Zonotrichia atricapilla*), house finch (*Carpodacus mexicanus*), and evening grosbeak (*Coccothraustes vespertinus*). A limited number of mammals were observed and included Nuttall's cottontail (*Sylvilagus nuttallii*), California ground squirrel (*Spermophilus beecheyi*), yellow-bellied marmot (*Marmota flaviventris*), bushy-tailed woodrat (*Neotoma cinerea*), coyote (*Canis latrans*), mule deer (*Odocoileus hemionus*), and pronghorn antelope (*Antilocapra americanc*). The western fence lizard (*Sceloporus occidentalis*) was the only common reptile observed in this habitat type.

4.3.2 Ponderosa Pine Forest

Ponderosa pine habitats are widely distributed throughout eastern Oregon and often are found adjacent to sagebrush-steppe and western juniper habitat types. Ponderosa pine forests generally occur on dry sites characterized by coarse-textured, well-drained soil at elevations between 1,000 and 6,000 feet. An isolated stand of ponderosa pine was observed along the southern portion of the proposed electric transmission line at elevations between 4,300 and 4,600 feet. This habitat type generally occurs on well-drained, loamy soil derived from weathered sandstone, basalt, and lacustrine sediments (NRCS, 1985).

Ponderosa pine (*Pinus ponderosa*) is the dominant species in the canopy layer of this forested habitat. Western juniper, curl-leaf mountain mahogany (*Cercocarpus ledifolius*), and Klamath plum (*Prunus subcordata*) are present in the lower canopy layer. The soil is covered by a moderate accumulation of duff, with Sandberg's bluegrass and Idaho fescue the most common species in the herbaceous layer, accounting for 10 to 50 percent of the cover. This habitat is considered to have moderately high commercial value (USDA, 1979). The isolated stand observed was surrounded by juniper woodland and appeared to have been selectively logged in the past.

The isolated ponderosa pine stand encountered along the southern end of the proposed electric transmission line represents less than 1.5 miles of the proposed 7.2-mile electric transmission line. In general, there was considerable overlap in the wildlife species observed in the ponderosa pine and western juniper habitats. One notable exception was the siting of a great horned owl (*Bubo virginianus*) along an existing access roadway in this habitat.

4.3.3 Sagebrush-Steppe

Sagebrush-steppe is extensively distributed throughout southeastern Oregon on stony shallow soil at elevations ranging from 3,500 to 7,000 feet. Within the analysis area this habitat type generally occurs between 4,000 and 5,000 feet, adjacent to western juniper habitats on well-drained and stony loams derived from weathered tuff and basalt (NRCS, 1985). Scattered sagebrush–steppe habitat was observed along the proposed electric transmission line.

This habitat is characterized by shrubs. Low sagebrush is the most common species, accounting for 15 to 30 percent of the cover. Big sagebrush and rabbitbrush are also common in some areas. Sandberg's bluegrass is the most common species in the herbaceous layer, accounting for 10 to 20 percent of the cover. Other grasses such as Idaho fescue, Thurber's needlegrass, cheatgrass, and intermediate wheatgrass (*Elytrigia intermedia*) were also present but generally made up less than 5 percent of the cover. Common forbs included blue-eyed Mary, stoneseed (*Lithospermum ruderale*), phlox, buckwheat (*Eriogonum umbellatum*), and fleabane (*Erigeron* spp.).

Sagebrush-steppe supports wildlife species comparable to the western juniper woodland, with the major exceptions being the Pygmy rabbit (*Brachylagus idahoensis*), which was observed at three locations along the proposed electric transmission line (see Exhibit P in the site certificate application).

4.3.4 Ruderal Areas

Ruderal areas were observed along the margins of agricultural and developed areas at elevations between 4,100 and 4,200 feet. In the project area, this habitat type occurs on loamy soil derived from weathered diatomite, basalt, and tuff as well as sandy loams formed from alluvial and lacustrine sediments. The vegetation in these areas is generally sparse and characterized by dominance of non-native species such as cheatgrass, tansy mustard, and clasping pepperweed (*Lepidium perfoliatum*). Native vegetation is either absent or provides only minimal cover.

Ruderal areas were encountered mainly along the proposed natural gas pipeline, which runs adjacent to West Langell Valley Road and Harpold Road and small areas along the proposed water supply pipeline (Figure 4-1). Typical wildlife species encountered were mule deer, turkey vulture, Swainson's hawk (*Buteo swainsoni*), rough-legged hawk (*Buteo lagopus*), mourning dove (*Zenaida macroura*), northern flicker (*Colaptes auratus*), western kingbird (*Tyrannus verticalis*), black-billed magpie (*Pica pica*), American crow (*Corvus brachyrhynchos*), loggerhead shrike (*Lanius ludovicianus*), and western meadowlark. The majority of these wildlife observations were made while the wildlife was moving from one natural habitat to another.

4.3.5 Agricultural Lands

The majority of the lowland areas within the analysis area have been converted to agricultural use. These areas occur on the loamy soil, formed in alluvial and lacustrine deposits on low terraces throughout the analysis area. Agricultural lands include cultivated crops, irrigated pasture, unimproved pasture, and fallow fields.

Cultivated crops areas are intensely managed for agricultural production. Common crops within the analysis area include alfalfa, hay, wheat, barley, and oats. Irrigated pastures are areas that have been disked and planted with livestock forage crops such as intermediate wheatgrass, tall fescue (*Festuca arundinacea*), and Kentucky bluegrass (*Poa pratensis*). Pasture land within the analysis area is used for cattle, sheep, and horses. In the higher elevations and more remote basins, pasture areas are not irrigated. The unimproved pasture areas appear to have been disked at some point and planted with forage grasses such as intermediate wheatgrass, tall fescue, and Kentucky bluegrass. Rabbitbrush and low sage are often present along the margins of unimproved pastures. These habitats are currently used for sheep and cattle grazing. Fallow fields are areas that were recently used for dryland farming of wheat and barley, but are no longer in production. These areas are characterized by a sparse cover (10 to 15 percent) of intermediate wheatgrass and ruderal species such as tansy mustard, clasping pepperweed, blue-eyed Mary, and yellowspine thistle (*Cirsium ochrocentrum*). Most of these lands are currently leased for seasonal cattle grazing.

Wildlife observed within the agricultural lands was similar to the wildlife observed within the ruderal lands. These areas have been altered by human activity and generally support few or no native plant species, but provide habitat for a variety of wildlife species including but not limited to ground squirrels, marmots, a badger and badger sign, kangaroo rats, and pack rats, all of which were observed within these areas.

4.4 Hydrologic Resources

4.4.1 Klamath River Basin

The Energy Facility site lies within the Klamath River Basin. By geographic definition, the Klamath Basin is the area drained by the Klamath River and its tributaries. The Klamath is one of only three rivers that pierce both the Cascades and the Coastal mountain ranges before emptying into the Pacific Ocean. In Oregon, the Klamath Basin occupies more than 5,600 square miles and covers almost all of Klamath County and smaller portions of Jackson and Lake Counties to the west and east. At the California-Oregon border, the Klamath River Canyon marks the Basin's low point and at an elevation of 2,755 feet, is its drain point.

4.4.2 Lost River

The project area is located in the Lost River watershed in the northeastern section of the Klamath Basin, approximately 20 miles east of the Upper Klamath Lake. The Lost River watershed is an interior basin covering approximately 3,000 square miles of southern Oregon and Northern California. The headwaters originate east of the Clear Lake Reservoir in Modoc County, California, and flow approximately 75 miles to the Tule Lake Sump. Seasonal flows in the Lost River are controlled by releases from the Clear Lake Dam and Gerber Reservoir. Historical channel modification, water diversion, and wetland drainage associated with the U.S. Bureau of Reclamation's Klamath Project have resulted in a highly altered system. The Link River is a canal constructed by the U.S. Bureau of Reclamation to connect the Lost River to the Klamath River system as part of the Klamath Basin Project. Water from the Lost River is currently used for domestic and industrial water supply, irrigation, and livestock.

4.4.3 Water Conveyance Features

Aquatic habitats within the survey area included intermittent creeks, freshwater marsh, seasonal wetlands, wet meadows, stock ponds, and agricultural canals.

Several intermittent creeks were observed along the electric transmission line. These creeks were dry at the time of the time of the surveys, but had defined bed and bank features. Most of the drainages contained lava rock substrate and either lacked vegetation or contained only sparse upland vegetation within the channel.

4.4.4 Wetlands

Freshwater marsh habitat was observed approximately 2,000 feet south of the water supply wells and was characterized by a mosaic of perennial, emergent monocots and areas of open water. Species such as cattail (*Typha latifolia*) and bulrush (*Scirpus* sp.) are found in the deeper areas where sedges (*Juncus* sp.) and rushes (*Carex* sp.) are found in the seasonally-flooded areas around the perimeter of the marsh. These wetlands occur on the somewhat poorly-drained soil formed in alluvial lacustrine sediments. A hardpan is present between 20 and 40 inches and the water table is typically shallow, ranging from 1 to 3.5 feet below the ground surface (bgs) (NRCS, 1985).

There were numerous aquatic associated wildlife species observed within the project area. The majority of the observations occurred near the Babson well and along the water supply pipeline route. A freshwater marsh is located approximately 1,200 feet southeast of the Babson well, and several irrigation ditches flow along the proposed water supply pipeline route. The footprint avoids wetland habitats and the Facility affects less than 0.5 acre of wetlands.

The wildlife species observed included pie-billed grebe (*Podilymbus podiceps*), great blue heron (*Ardea herodias*), sandhill crane (*Grus canadensis*), green-winged teal (*Anas crecca*), mallard (*Anas platyrhynchos*), northern shoveler (*Anas clypeata*), American wigeon (*Anas americana*), bufflehead (*Bucephala albeola*), common merganser (*Mergus merganser*), wouldet (*Catoptrophorus semipalmatus*), common snipe (*Gallinago gallinago*), gull (*Larus* sp.), Forster's tern (*Sterna forsteri*), common raven (*Corvus corax*), red-winged blackbird (*Agelaius phoeniceus*), tricolored blackbird (*Agelaius tricolor*), yellow-headed blackbird (*Xanthocephalus*

xanthocephalus), Brewer's blackbird (*Euphagus cyanocephalus*), brown-headed cowbird (*Molothrus ater*), and northern oriole (*Icterus galbula*).

4.4.5 Sedge Wet Meadow

Sedge wet meadow habitat is characterized by seasonal inundation, with surface water present during the winter and early spring, but absent by the end of the growing season. This habitat type occurs on soil derived from weathered diatomite, tuff, and basalt (NRCS, 1985). The vegetation is characterized by a dense cover of low-growing monocots such as sedges and rushes. A few forb species such as dock (*Rumex crispus*), mouse-tail (*Myosurus minimus*), and downingia (*Downingia* sp.) were observed along the outer margins during field surveys, but accounted for only a minimal amount of the total vegetative cover. Aquatic buttercup (*Ranunculus aquatilus*) was present where there was open water. This habitat was observed in the project area, with the nearest location approximately 2,000 feet east of the proposed electric transmission line.

4.4.6 Wet Meadow

Wet meadow habitats occurred on poorly-drained clay soil that formed in sediments from weathered tuff and basalt (NRCS, 1985). This habitat is characterized by the presence of surface water during the winter and early spring, and the absence of water during the summer months. Characteristic vegetation includes species such as tufted hairgrass (*Deschampsia cespitosa*), Baltic rush (*Juncus balticus*), and sedges (*Carex* spp.). Some areas have been disked and planted with pasture grasses such as tall fescue, timothy (*Phleum pratense*), and meadow foxtail (*Alopecurus pratensis*). This habitat was observed in the project area, with the nearest location approximately 2,000 feet east of the proposed electric transmission line.

4.4.7 Stock Ponds

Stock ponds were observed in areas where berms had been constructed within natural drainages to retain water for livestock. The hydrology in these areas was variable, with some ponds containing several inches of water and other areas dry at the time of the survey. Vegetation in these areas included sedges, rushes, aquatic buttercup, and dock. Stock ponds were observed in several areas along the electric transmission line, but none were located within the ROW.

4.4.8 Agricultural Drainages

Several irrigation canals have been constructed to facilitate surface drainage and water transport for agricultural crops and pasture lands in the basin areas. These channels appear to be routinely maintained and were largely devoid of vegetation.

Irrigation canals were observed in the following locations:

- Along the route of the water supply pipeline between the water supply wells and the Energy Facility, the pipeline would cross an irrigation canal in three locations.
- The route of the natural gas pipeline would cross an irrigation canal in one location.

Insert Figure 4-1:

4-1 Habitat Types

SECTION 5

Species Accounts and Status

Federally listed species are addressed in this section. Federal and state candidate or species of concern, state-listed species, and special wildlife corridors or other sensitive biological resources potentially affected in the project area are addressed in Exhibit P of the site certificate application filed with OOE (see Appendix B of this BA).

5.1 Federally Listed Plant Species

One federally listed plant species—the Applegate's milk-vetch—is evaluated in this biological assessment. Additional special-status plant species considered in the survey area but not evaluated further for project effects are discussed in Exhibit P of the site certificate application filed with OOE (see Appendix B).

Applegate's milk-vetch (*Astragalus applegatei*) was listed as an endangered species on July 23, 1993 (58 FR 40551). Applegate's milk-vetch is a perennial forb endemic to the Klamath Basin in southern Oregon. Information on the historical range of Applegate's milk-vetch is sparse. Presumably this species once occurred on alkaline floodplain habits throughout the lower Klamath Basin. Currently, the plant exists in only three populations near Klamath Falls, where it occurs on strongly alkaline, seasonally moist soil in areas with sparse vegetation (USFWS, 1998). The flowering period is between June and August. Population estimates suggest that there are approximately 12,000 individuals remaining, the majority of which occur on The Nature Conservancy's Ewauna Flat Preserve in Klamath Falls. Principle threats included invasion of non-native species, and hydrologic modification resulting from drainages and retention dikes.

There are no reported occurrences or historical records of Applegate's milk-vetch in the vicinity of the project area. Suitable soil conditions for this species are present in the analysis area. However, most of these areas have been converted to agricultural uses. No plants were identified during biological surveys. The project would have no effect on Applegate's milk-vetch.

5.2 Federally Listed Animal Species

5.2.1 Bald Eagle (*Haliaeetus leucocephalus*)

The bald eagle was listed as an endangered species in the lower 48 states on March 11, 1967 (32 FR 4001). Bald eagles were reclassified to threatened status on August 11, 1995. Bald eagle populations have made a significant recovery since listing and the bald eagle was proposed to be removed from listing in the lower 48 states on July 6, 1999 (64 FR 36453). Bald eagles are large raptors that feed primarily on fish, but also take mammals, birds, reptiles, and carrion. They typically hunt by watching prey from a high perch and swooping down to catch birds, fish, or mammals in their talons. Bald eagles also feed on carrion, take prey from other predators, or hunt by slowly soaring over water bodies and land areas and often flushing flocks of birds, taking the weak individuals. The breeding season begins in late winter to early spring depending on latitude. Nest locations are found in tall trees and rocky cliffs, and may be located as far as 10 miles from foraging areas (Csuti et al., 1997). This species is found in a variety of habitats, but is most often associated with open water bodies such as rivers, lakes, and marshes with abundant fish and waterfowl populations.

Bald eagles historically ranged throughout North America. On the west coast they are found from middle Alaska to California. As many as 1,000 bald eagles migrate to the Klamath Basin during January and February, where they feed primarily on the abundant waterfowl populations wintering in the Basin. The Upper Klamath region also supports the largest nesting bald eagle population in Oregon, where approximately 80 percent of the nest locations occur in ponderosa pine habitat (Anthony et al., 1982). The bald eagle is known to occur in the survey area and suitable nesting habitat was identified within the isolated stand of ponderosa pine habitat along the southern portion of the proposed electric transmission line. No nests were observed. The isolated stand of ponderosa pine is located 3,000 feet north of the Captain Jack Substation. Suitable upland foraging habitat that supports small mammals and carrion in the form of pronghorn antelope, wintering and resident deer, and cattle occurs on the Energy Facility site and routes of the water supply and natural gas pipelines.

The BLM Klamath Falls Resource Area has been collecting information on bald eagle nest locations in the vicinity of the Energy Facility since 1984. As of 2003, nest locations have been identified at McFall Reservoir and Bryant Mount. Large, mixed-conifer forests on Bryant Mountain also are used as winter roost sites for bald eagles. BLM has been conducting mid-winter bald eagle counts in the Langell, Poe, and Yonna Valleys since 1996. Mid-winter observations along the Poe and Yonna Valley survey routes have ranged from four to 16 eagles, and seven to 22 eagles have been sighted along the Langell Valley route (Raby, 2003).

Survey Results

During the mid-June 2002 biological surveys conducted by CH2M HILL biologists, two adult and two juvenile bald eagles were observed at McFall Reservoir, approximately 1 mile east of the proposed electric transmission line (Figure 5-1). On June 11, 2002, Steve Hayner (biologist for the Bureau of Land Management) reported a nest site at McFall Reservoir to Frank B. Isaacs, Senior Faculty Research Assistant at Oregon State University. Mr. Isaacs is a recognized bald eagle expert in this region. At this time, two mostly-feathered chicks, two adults, and four juvenile bald eagles were observed in trees around the reservoir (Isaacs, 2002). Adult and juvenile bald eagles were also observed flying and foraging over the area of the water supply wells, the water supply pipeline, the electric transmission line, and the Energy Facility site during the May, June, and July 2002 surveys. On July 9, 2002, one adult and six juvenile bald eagles were observed at McFall Reservoir. Nest locations have also been reported in the Bryant Mountain area (Figure 5-1) approximately 2 miles east of the proposed electric transmission line (ONHP, 2002).

Potential Project Effects

Construction and operation of the proposed Energy Facility would result in loss of marginal upland foraging habitat, potentially modify breeding behavior when temporary loud construction noise is present, and potentially increase collision with electric transmission line wires.

Loss of Forage Habitat. The proposed Energy Facility site and associated linear features would result in the permanent loss during the 30-year operating life of the Energy Facility of approximately 103.5 acres of potential upland foraging habitat for bald eagles. This area is composed of 31.6 acres of juniper-sage, 10.4 acres of sagebrush-steppe, 12.4 acres of ponderosa pine, 0.3 acre of pasture, 2.1 acres of unimproved pasture, and 40.9 acres of fallow field. Approximately 76 percent of the affected area is currently fallow agricultural land (46.7 acres) and juniper-sagebrush woodland (31.6 acres). Waterfowl prey species like bald eagles typically do not use this type of habitat. Other habitat types affected to a lesser degree include sagebrush-steppe, ponderosa pine forest, and agricultural lands. The loss of forage associated with project impacts to these habitat types would be offset by the additional forage created in the approximately 236-acre mitigation area. At Facility retirement, the project proponent would implement a Facility Retirement and Site Restoration Plan (Exhibit W of the EFSC site certificate application) to ensure that soil in and around the Energy Facility site is returned to conditions suitable for agricultural use.

Bald eagles are piscivores, preferring to feed on fish, although part of their diet may be small mammals, water birds and carrion. Eagles forage over large areas close to large water bodies and would travel several miles to foraging areas. The minimum home range for bald eagles reported in EPA's *Wildlife Exposure Factors Handbook* is 4,500 acres. Because the Energy Facility site is located at least 2 miles from documented foraging areas (the Lost River and several lakes on the west side of Bryant Mountain), which are more preferable foraging areas.

Salinity in Process Wastewater. Table 5-1 lists biological effects on selected waterfowl observed at various salinity concentrations. Salinity is not precisely equivalent to TDS, but for most purposes, they can be considered equal (United States Department of the Interior, 1998). For sodium, levels as low as 821 parts per million (ppm) reduced growth in 1-day-old mallard ducklings exposed for 28 days (Mitcham and Wobeser, 1988a). Mallard ducklings that drank water with 3,000 ppm of sodium had reduced thymus size and bone strength (Mitcham and Wobeser, 1988b). No apparent effects were observed at concentrations up to 911 ppm in 14-day mallard duckling exposures, while concentrations between 8,800 and 12,000 ppm caused 100 percent mortality (Mitcham and Wobeser, 1988a). In adult waterfowl, sodium concentrations of 17,000 ppm of sodium caused a die-off in North Dakota when fresh water was unavailable (Windingstad et al., 1987). If the evaporation pond alternative for management of process wastewater is selected, the evaporation pond would be netted and enclosed by a chain-link fence to prevent access by wildlife and birds to the evaporation pond.

Air Emissions. Maintenance of resident aquatic resources is important to the success of bald eagles. Moreover, maintenance of resident terrestrial habitats also is important to bald eagles, which use upland areas during the winter months when lakes and rivers are frozen (Brown and Amadon, 1968). Therefore, a screening-level ecological risk assessment (ERA) was conducted to address the potential risk from air emissions (and subsequent deposition to surface water) to aquatic organisms and to the bald eagle (with exposure by way of food web transfer). Upland areas surrounding the Energy Facility also were evaluated for possible risks to terrestrial plants, soil invertebrates, and terrestrial birds and mammals resulting from terrestrial deposition of air emissions. The procedures used in conducting the ERA were consistent with standard ODEQ and EPA guidance and consisted of the following sections: problem formulation, including identification of the chemicals of potential ecological concern (COPECs); exposure assessment; effects assessment; and risk characterization, including uncertainty analysis. The full-text screening-level ERA, including methods, assumptions, receptors, and screening values, is attached as Appendix C.

Ecological risks were evaluated based on conservative assumptions, maximum estimated media concentrations, and screening toxicity values. Because this screening assessment was based on conservative assumptions, constituents that passed the screen were considered to pose no significant risk to ecological receptors. Failure to pass the screen, however, cannot be concluded to represent the presence of risk. Rather, these results indicate that available data are insufficient to support a conclusion that ecological risks are absent. Constituents that failed the screen were reevaluated using more realistic assumptions.

None of the COPECs exceeded benchmarks for aquatic receptors; therefore, deposition of air emissions from the Energy Facility to surface water would pose no risk to aquatic organisms and bald eagles. For terrestrial receptors (i.e., plants, soil invertebrates, and birds and mammals), chromium, manganese, and nickel failed to pass the screening evaluation when total (incremental + background) concentrations were evaluated. However, in each case, these exceedances were driven by background concentrations. Background concentrations were obtained from readily available literature and regulatory agency guidance. Receptor-specific evaluation of chromium and cobalt exposure to birds resulted in no exceedances of literature-based toxicity thresholds.

Therefore, exposure to arsenic, cadmium, cobalt, and mercury associated with air emissions from the Energy Facility would pose no risk to plants, soil invertebrates, and birds and mammals, whereas potential risks to plants, soil invertebrates, and birds from exposure to chromium, manganese, and nickel are expected to be negligible. The conclusion from the screening-level ERA is that air emissions from the Energy Facility would not pose significant risk to bald eagles or their habitat.

Beneficial Use of Process Wastewater for Irrigation Pasture. For the process wastewater management alternative consisting of beneficial use of the water for irrigated pasture, constituents in the process wastewater would not be expected to be toxic to wildlife. A screening-level ERA following EPA and ODEQ guidance was conducted to determine the potential risk to plants, soil invertebrates, and wildlife from the process wastewater application (see Appendix C). Soil screening-level values for plants, invertebrates, birds, and mammals were available from ODEQ (2001) for many of the inorganic wastewater constituents. For birds, cobalt, iron, silver, thallium, and tin were lacking ODEQ screening values, but studies from which benchmarks could be developed for these metals were available. Similarly, iron, silver, tin, cyanide, and phenol benchmarks were developed for mammals from other sources.

Unlike the ODEQ screening values, which are presented as milligram (mg) constituent per kilogram (kg) soil, these benchmarks are presented as a dose (mg constituent/kg body weight/day) to the receptor. For comparison of these benchmarks, doses based on the maximum soil concentration, literature-derived wildlife parameters (i.e., diet, body weight, food ingestion rate, and soil ingestion rate), and literature-derived bioaccumulation factors for wildlife food items (i.e., plants and arthropods) were calculated for one bird (western meadowlark) and one mammal (deer mouse) for which exposure is likely to be high.

The process wastewater constituents evaluated, except aluminum, barium, boron, chromium III, copper, fluoride, iron, manganese, molybdenum, and nickel, passed the screening evaluation and are considered to present no risk to ecological receptors. After further evaluation, background concentrations were found to be the primary driver for screening failures of aluminum, barium, chromium III, copper, fluoride, iron, manganese, and nickel, with negligible incremental contributions of these constituents to the risk estimation. Considering the bioavailability of boron to plants (less than 5 percent of total boron) substantially reduced the risk estimation for boron. Although both incremental and total (incremental + background) boron concentrations continued to exceed screening levels for sensitive plant species, incremental and total exposures were below toxicity thresholds for invertebrates and for boron-tolerant plant species when adjusted for boron bioavailability. Estimated maximum concentrations of molybdenum exceeded the soil benchmark for plants; however, risk to terrestrial plants from molybdenum exposure is considered low because of the low exceedance of the screening value and the highly conservative assumptions applied to the risk estimation. Thus, none of the constituents evaluated are considered to present significant risk to ecological receptors.

Noise. Construction and noise from operating the Energy Facility may affect foraging and nesting behavior of bald eagles in the project area. Noise modeling was conducted to predict the Energy Facility's noise emissions during operation. The modeling assumes a "worst-case" scenario, with the Energy Facility operating under steady-state conditions at full capacity and with the combustion and steam turbines at base load and cooling tower fans on. After Energy Facility noise emissions were determined, modeling was performed to predict sound levels in the area around the Energy Facility (Figure 5-2). This modeling conservatively assumes environmental conditions that facilitate sound transmission and does not take into account additional mitigation factors such as vegetation and topography.

The Energy Facility site is located in a rural and relatively quiet area with ambient background noise at approximately 20 to 30 dBA. Peaks exceed 70 dBA near farm equipment. Ambient noise levels resulting from the operation of the proposed Energy Facility are estimated to be 40 dBA at approximately 2,500 feet from the Energy Facility. For comparison, a typical cooling fan on a desktop computer is 40 to 45 dBA at the operator's ears, and rustling leaves in a light breeze are generally louder than 30 dBA. Operational noise levels are expected to dissipate to approximately 35 dBA at a distance of approximately 4,000 feet from the Energy Facility (Figure 5-2). Power plant noise is typically very steady in nature, with no significant tones or impact type noises. The noise is similar to an idling car or a neighbor's air conditioning unit. The Energy Facility noise would tend to be a steady faint background noise source that is part of the steady background noise environment.

Because the Energy Facility site would be located in a low area (relative to surrounding topography), noise impacts to nearby habitat areas would be limited in geographic area and would likely be minor. The noise level during operations is estimated to be a maximum of 50 dBA immediately adjacent to the Energy Facility (Figure 5-2). Maximum noise levels resulting from the electric transmission line are expected to be 43 dBA at the edge of the right-of-way, dissipating to less than 30 dBA beyond 3,000 feet. It is unlikely that operation of the Energy Facility would result in adverse effects on the wildlife-inhabiting areas near the Energy Facility site, as the operational noise levels would likely be below the reported levels (80 to 100 dBA) known to be detrimental to wildlife and wildlife typically become habituated to the relatively low operation noise levels (Bowles, 1995).

Noise resulting from construction activities is expected to be greater than operational noise. Noise during construction would be temporary, but may cause bald eagles to reduce their use of nearby habitats and alter their behavior during the day when construction noise is present by modifying foraging and nesting locations. Additional noise impacts may result if blasting is required for installation of transmission tower footings. Noise associated with blasting and intermittent noise from pile driving would result in disturbance to nesting eagles in the area. See Appendix D for more detailed discussion of noise impacts on wildlife.

Ambient Light. Operation of the Energy Facility would result in an increase in ambient light. The disturbance effects would be localized to the immediate area of the Energy Facility and eagles would be expected to habituate to these changes. Low-impact directional lighting would be used to focus the light directly toward the Energy Facility, thus reducing ambient light into adjacent areas.

Avian Electrocution. The electric transmission line should not pose risk of electrocution to eagles. The towers would be designed and constructed with adequate separation between phase conductors and conductors to ground so that they would be wider than a large bird's wings and would not bridge any space that could result in the conduction of current. With these design features, there should be no risk of electrocution from the electric transmission line.

Avian Collisions. The Energy Facility may affect the bald eagle through collisions with the electric transmission line. Critical factors in determining the potential for a strike include the height of the towers and lines compared with the normal flight behavior of the bird, wing-loading and its effects on maneuverability, visibility, and the number of times a bird crosses the electric transmission line during daily flight. Collisions by raptors and songbirds are considered to be low owing to the maneuverability and flight behavior of these birds (APLIC, 1994). Most areas with high rates of collisions are located close or parallel to areas used by waterfowl (high-wing-load birds) with adverse sight conditions (e.g., fog and low clouds). Collisions typically occur when birds are moving between foraging areas and resting areas during bad weather conditions. To reduce the potential of avian collisions, the project proponent would provide mitigation by installing BFDs on the top static wires along the entire electric transmission line.

Avoidance and Minimization Measures for Bald Eagles

Preconstruction Surveys. Preconstruction surveys would be conducted by qualified biologist for suitable nesting habitat within a 1/2 mile line-of-site and 1/4 mile no line-of-site radius of the proposed Energy Facility, water supply pipeline, natural gas pipeline, and electric transmission line. Surveys would note any foraging areas used by bald eagles. Any active nest locations identified within the survey area would be recorded using a submeter accuracy Global Positioning System (GPS) and mapped on aerial photo base maps of the survey area. Information on known nest locations would also be obtained from previous surveys conducted in the area.

Monitoring Active Nest Sites. In the event that an active nest location is identified in the study area, maps showing ½- to ¼-mile avoidance areas would be generated and construction timing restrictions would be implemented to minimize or avoid potential impacts to nesting birds. Potential impacts include abandonment of young birds or nests by adults, and disturbance of essential forage habitats that result in unsuccessful reproduction. Construction in areas within a ½-mile line-of-site or ¼-mile no-line-of-site from active nests should be postponed, if possible, until after the fledglings are no longer dependent on the nest tree. If construction cannot be postponed in the area of an active nest until the young are fledged, then the nest site would be monitored by a qualified biologist during courtship, nest building, incubation, and the period while raising their young in relation to project activities. The monitoring biologist would stop work if it appears the activities impede reproduction. The biologist would coordinate with ODFW and USFWS on when to allow construction to resume. Monitoring reports would be prepared and submitted.

Avian Electrocution. The electric transmission line would be designed to prevent avian electrocutions. To prevent electrocutions, conductor wires would be spaced further apart than the wing span of a large birds (24 feet on the vertical and 25 feet on the diagonal) (APLIC, 1996).

Avian Collision. Avian collision with the top groundwires could occur year-round. The potential for eagle collisions with the electric transmission line is considered to be low because their foraging behavior is relatively slow (compared to peregrine falcon and other raptors). To minimize impacts to bald eagles (and other birds in the area), colored BFDs would be installed on the top groundwires to make them more visible to birds during flight and minimize bird collisions. BFDs are 15-inch-long PVC tubing coiled to a height of 7 inches, spaced 16 feet apart along the wires (see the avian collision monitoring plan in Appendix E). BFDs are especially effective at increasing visibility of wires during fog and rain events and have reduced avian collisions by 57 to 89 percent (Brown and Drewien, 1995).

Annual monitoring of the lines would be conducted to determine if the lines have substantial effects on waterfowl and special-status birds that forage or nest in the area. Avian collision studies are being developed to monitor the effectiveness of the BFDs, as discussed in Appendix E. The monitoring plan would include observations at the Energy Facility site and along the route of the new electric transmission line. If monitoring results show that bald eagles are foraging at the water supply reservoir, remedial actions may be implemented as described in Appendix E.

Compensatory Mitigation Measures

Compensatory mitigation for the loss of upland bald eagle foraging habitat would be managed with the establishment and restoration of an approximately 236-acre mitigation area in fallow agricultural field and degraded juniper woodland habitat north and west of the Energy Facility (see Appendix A). The mitigation area would benefit the bald eagle by creating new forage to offset the relatively minor impacts to sagebrush-steppe and ponderosa pine stand. The mitigation would also benefit several wildlife species besides the bald eagle. The mitigation area would be fenced with wildlife-friendly fencing and include water troughs for wildlife.

5.2.2 Shortnose and Lost River Sucker

The shortnose sucker (*Chasmistes brevirostris*) and Lost River sucker (*Deltistes luxatus*) were listed as endangered on July 18, 1988 (53 FR 27130). The shortnose sucker is endemic to the Upper Klamath Basin of southern Oregon and northern California. Shortnose suckers are found in numerous lakes and rivers throughout the region, including Upper Klamath Lake, Clear Lake Reservoir, Gerber Reservoir, Tule Lake, the Klamath River, and the Lost River system. While primarily a lake-dwelling fish, it spawns between February and May in river habitats with gravelly substrates including the Sprague, Williamson, and Wood Rivers, as well as Crooked Creek and the Clear Lake watershed. Shoreline areas with a mosaic of open water, emergent vegetation, and woody structures are important for larval development. The shortnose sucker is a bottom feeder whose diet includes detritus, zooplankton, algae, and aquatic invertebrates.

Shortnose Sucker

Historically, shortnose suckers were abundant throughout the Klamath Basin (Federal Register, 1988). However, dams, diversion structures, irrigation canals, and development of the Klamath Basin have resulted in habitat fragmentation and population isolation. Additional factors leading to the population decline include loss of wetland habitat, hybridization, predation and competition from exotic fish species, and poor water quality. Hypereutrophication of lake habitats appears to be a principle factor in poor recruitment of this species (USFWS, 1993).

The shortnose sucker has historically been reported in the Lost River above Harpold Reservoir, approximately 4 miles south of the Energy Facility site, and at Bonanza Big Springs, located approximately 3 miles north of the Energy Facility Site (USFWS, 1993).

Lost River Sucker

The Lost River sucker is endemic to the Upper Klamath Basin of southern Oregon and northern California. The Lost River sucker is found in Upper Klamath Lake, Clear Lake Reservoir, Tule Lake, the Klamath River, and the Lost River. The Lost River sucker is a lake-dwelling fish that spawns between February and May in tributary rivers and streams with gravelly substrates. Shoreline habitats that have open water intermixed with emergent vegetation are important for larval and juvenile development. This species feeds on a variety of aquatic invertebrates, algae, detritus, and zooplankton found on lake bottoms.

Dams, diversion structures, irrigation canals, and development have resulted in habitat fragmentation and population isolation. Competition and predation by exotic species, wetland drainage, poor water quality, and eutrophication have also contributed to the decline of this species.

The Lost River sucker historically has been reported in the Lost River above Harpold Reservoir, approximately 4 miles south of the Energy Facility site, and at Bonanza Big Springs, located approximately 3 miles north of the Energy Facility Site (USFWS, 1993).

Survey Results

No perennial fish-bearing streams were identified in the area immediately adjacent to any of the proposed Facility features. However, irrigation canals may provide habitat for listed fish species (LeCaptain, 2002). While surveys were not conducted in any of the irrigation canals located in the project area, fish were observed in one of the irrigation drainages near the Babson well site during the Babson well pump test. Greg White, a fisheries biologist with CH2M HILL, met with Leonard LeCaptain of USFWS on September 24, 2002, to investigate this drainage and determined that these fish were most likely red shiners, a nonlisted minnow species. This discharge of water from the deep zone occurred only during the pump test and as described above. During operation of the Energy Facility, there would be no discharge of wastewater to surface water.

Critical Habitat

Critical habitat was proposed by USFWS for the shortnose sucker and the Lost River sucker on December 1, 1994 (FR 59, No. 230). Proposed units near the project area include:

- Unit 2—Tule Lake. Located approximately 13 air miles south of the project area, this unit includes Tule Lake and the Lost River up to the Anderson Rose Dam.
- Unit 3—Klamath River. Located approximately 20 air miles west of the project area, this unit includes the Klamath River from the Iron Gate Dam in northern California to the Link River Dam in southern Oregon.
- Unit 4—Upper Klamath Lake. Located approximately 22 air miles west of the project area, this unit includes Upper Klamath Lake and portions of the watershed on the west side and Agency Lake, including much of the Wood River Watershed.
- Unit 5—Williamson and Sprague River. Located approximately 20 air miles north of the project area, this unit includes the Williamson River from Upper Klamath Lake to the confluence with the Sprague River and the Sprague River upstream to the confluence with Brown Creek.
- Unit 6—Gerber Reservoir. Located approximately 10 air miles east of the project area, this unit includes Gerber Reservoir and portions of the Ben Hall, Barnes, Barnes Valley, Pitchlog, and Wildhorse Creek Watersheds.

Air Emissions. The potential risk from air emissions (and subsequent deposition to surface water) to aquatic organisms (e.g., shortnose and Lost River suckers) was included in the screening-level ERA described above for bald eagles. The full-text screening-level ERA, including methods, assumptions, receptors, and screening values, is attached as Appendix C.

Although these the shortnose and Lost River suckers are located north of the proposed Energy Facility, which is outside the area predicted to experience the maximum concentrations from the air emissions, the maximum concentration was used in the risk evaluation. Additionally, ODEQ screening level values for aquatic biota were used to evaluate potential risk to the two endangered fish species. These values are intended to protect 95 percent of aquatic species, 95 percent of the time. Therefore, constituents that passed the screen were considered to pose no significant risk to aquatic organisms.

None of the COPECs exceeded benchmarks for aquatic receptors; therefore, deposition of air emissions from the Energy Facility to surface water are considered to pose no risk to shortnose and Lost River suckers.

Project Impacts

Process Wastewater Management and Stormwater. Under the preferred alternative, the Energy Facility would not discharge to surface waters. Process wastewater from the Energy Facility (excluding the sanitary wastewater) would be managed by one of three alternatives:

- Beneficial use of the water for irrigated pasture
- Evaporation in an onsite, lined evaporation pond
- Storage and hauling to a WWTP for offsite disposal

Stormwater runoff from the Energy Facility would be collected in an engineered stormwater system and routed to a stormwater pond. The stormwater pond would be sized to detain approximately 750,000 gallons (2.3 acre-feet) of water based on a 25-year storm event. This stormwater pond would allow sediment and other suspended solids to settle before the stormwater is discharged and routed to a 4.7-acre infiltration basin. For these reasons, stormwater runoff from the Energy Facility would not likely have any measurable impact on surface water quality in the vicinity of the Energy Facility, including the Lost River or irrigation canals. The stormwater pond is located on the Energy Facility site immediately adjacent to the air-cooled condensers. Bald eagles and other birds are not expected to forage around the stormwater pond owing to the proximity of noise generating equipment.

No surface water would be used for Facility operations. The raw water for the Energy Facility would come from a well system that produces water from water-bearing zones below 1,500 feet bgs.

Improbable Worst-Case Connection. Previous borehole geophysics and aquifer testing at the Babson well identified the presence of two separate aquifer systems (CH2M HILL, 1994). The shallow aquifer system (above approximately 500 feet) is a heavily appropriated basalt aquifer that is in varying degrees of hydraulic connection with the Lost River and Bonanza Big Springs. The shallow system is used for irrigation and domestic water supply. The deep aquifer system produces water from water-bearing zones below 1,500 feet bgs. No data gathered from the monitoring well network during a pump test conducted in August and September 2002 indicate that the deep aquifer withdrawals would impact groundwater levels in the shallow aquifer, or flows at Bonanza Big Springs and the Lost River.

The available evidence supports the conclusion that there is no hydraulic connection between the deep and shallow zones, which include the Lost River. However, if one were to assume that an extremely efficient hydraulic connection did in fact exist between the deep system and the Lost River, any impact on the Lost River from the proposed pumping would be imperceptible. To demonstrate this fact, the project proponent conducted a "worst-case" analysis (Appendix F). The analysis is not intended to describe an outcome that is likely or even plausible, but rather shows that even if one makes the most conservative assumptions at every step of the process, there still is no potential for a measurable impact on the Lost River.

The assumptions used in this analysis are sufficiently conservative that they do not actually represent the most probable outcome: no impact at all. This analysis is provided only to create a framework for understanding the magnitude of any potential impact, not to describe a physical mechanism for what might actually occur. The repeatedly conservative assumptions used in this analysis indicate that the maximum reduction in the lowest range of summer flows of the Lost River is roughly 0.00074 gpm as the river passes through the 2-mile reach closest to the Babson well. This reduction would represent a 0.000004 percent reduction in the lowest range of summer flows. This degree of connection is unlikely, and it is additionally unlikely that this impact would result in an impact to fish habitat or passage if it were to occur.

Avoidance and Minimization Efforts

The use of water from a deep zone aquifer system would avoid impacts to surface water. The zero discharge wastewater system would minimize water use and water quality impacts to surface water and the shallow groundwater under the Energy Facility site. The stormwater system would minimize water quality impacts to irrigation canals and to the Lost River.

Mitigation Measures

No additional mitigation measures are proposed for listed fish species.

5.3 Cumulative Effects

In the Klamath Ecological Province, agricultural development and water diversions have had a significant impact on the amount of native plant communities and wetlands throughout the Klamath Basin. Biodiversity has been reduced by the loss and fragmentation of native habitats. The proposed Energy Facility would contribute marginally to the further loss of habitat. At Facility retirement, the project proponent would implement a Facility Retirement and Site Restoration Plan (Exhibit W in the EFSC site certificate application) to ensure that soil in and around the Energy Facility site is returned to conditions suitable for agricultural use.

The new electric transmission line could increase the overall avian collisions in the Bryant Mountain area. The installation of BFDs on the top groundwires of the proposed new electric transmission line would minimize the potential for increased collisions in the area.

No cumulative affects on the Applegate’s milk-vetch, Lost River sucker, and shortnose sucker are expected to occur as a result of the proposed project.

TABLE 5-1
Known Effects to Selected Waterfowl Species from High Salinity Levels

Species	Salinity Concentration in Water (ppm)	Effects/Comments	Reference
Mallard	~ 11,000	Reduced growth	Swanson et al., 1984
	8,800–12,000 (as sodium)	100% mortality	Mitcham and Wobeser, 1988a
	9,000–12, 000	No Effect	Nystrom and Pehrsson, 1988
	10,000–15,000	Level of concern	Swanson et al., 1984
	15,000	100 percent mortality (7-day-old ducklings)	Barnes and Nudds, 1991
Mottled Duck	9,000	Threshold level for adverse effects	Moorman et al., 1991
	12,000	Reduced growth, 10% mortality	
	15,000	90% mortality	
	18,000	100% mortality	
Peking Duck	20,000	Level of concern	Nystrom and Pehrsson, 1988

Source: U.S. Department of the Interior. 1998. *Guidelines for Interpretation of the Biological Effects of Selected Constituents in Biota, Water, and Sediment*. National Irrigation Water Quality Program Information Report. No. 3. Table 30.

Insert Figures 5-1 and 5-2:

5-1 Rare, Threatened, and Endangered Species

5-2 Predicted Noise Levels

SECTION 6
Conclusion

This section summarizes the conclusions reached for the following federally listed species.

6.1 Applegate's Milk-Vetch

The proposed project would have no effect on Applegate's milk-vetch. No populations of this species are known to occur in the vicinity of the project area and none were identified during field surveys.

6.2 Lost River and Shortnose Suckers

The proposed project would have no effect on either the Lost River sucker or the shortnose sucker. Water would be supplied from a deep aquifer system that is isolated from surface water features providing habitat to these species. The Energy Facility would be designed to be zero discharge. Therefore, no wastewater would be discharged into any surface water or irrigation canal.

6.3 Bald Eagle

The conclusion of the BA for bald eagles is as follows: "The project may affect, likely to adversely affect, bald eagles." Bald eagles are known to occur in nest locations that have been confirmed approximately 1 mile from the proposed new electric transmission line. Temporary effects to bald eagles foraging in the project area may occur from temporary construction noise at the Energy Facility site and along the route of the electric transmission line. Bald eagles are expected to acclimate to the continuous noise from the Energy Facility and the noise should not adversely affect foraging efforts. Preconstruction surveys and timing restrictions on certain activities would be required to minimize adverse effects if active nest locations are identified within ½ mile of project activities. Impacts to bald eagles from the loss of marginal foraging habitat at the Energy Facility site would be less than significant with implementation of the mitigation area.

The proposed new electric transmission line may cause an increase in avian collisions in the area. Bird flight diverters would be placed on the top groundwires to reduce the potential for collisions. Annual monitoring of the new lines would be conducted to determine if the lines cause substantial effects to the bald eagle population.

Implementing the compensatory mitigation measure (preserving, enhancing, and managing the approximately 236-acre mitigation area north and west of the Energy Facility) would benefit bald eagle foraging in the long-term, and would also benefit other wildlife such as mule deer, antelope, sagebrush lizard, and prey species for raptors such as mice and gophers. At Facility retirement, the project proponent would implement a Facility Retirement and Site Restoration Plan (Exhibit W in the EFSC site certificate application) to ensure that soil in and around the Energy Facility site is returned to conditions suitable for agricultural use.

SECTION 7

References

Anthony, R.G., R.L. Knight, G.T. Allen, B.R. McClelland, and J.I. Hodges. 1982. "Habitat use by nesting and roosting bald eagles in the Pacific Northwest." Trans. N. Am. Wildl. Nat. Res. Conf. 47:332-342.

Avian Power Line Interaction Committee (APLIC). 1994. *Mitigating Bird Collisions with Powerlines: The State of the Art in 1994*. Edison Electric Institute, Washington, DC.

Avian Power Line Interaction Committee (APLIC). 1996. *Suggested Practices for Raptor Protection on Power Lines: The State of the Art in 1996*. Edison Electric Institute/Raptor Research Foundation, Washington, D.C.

Barnes, G. and T. D. Nudds. 1991. "Salt tolerance in American black ducks, mallards, and their F1 hybrids." *The Auk*, 108:89-98.

Bureau of Land Management (BLM). 2001. *Manual* 6840 – *Special Status Species Management*. U.S. Department of the Interior. Washington, D.C. Issued January 17, 2001.

Bowles, A.E. 1995. "Responses of Wildlife to Noise." In: Knight, R.L. and Gutzwoulder, K.J. (Eds.), *Wildlife and Recreationists, Coexistence Through Management and Research* (pp. 109-156). Washington, D.C.: Island Press.

Brown, L, and D. Amadon. 1968. *Eagles, Hawks and Falcons of the World.* Volume 2. New York: McGraw-Hill.

Brown, W., and Drewien, R. 1995. "Evaluation of Two Power Line Markers to Reduce Crane and Waterfowl Collision Mortality." *Wildlife Society Bulletin*, 23(2): 217-227.

CH2M HILL**.** 1994**.** *Groundwater Development Potential and Hydrogeologic Assessment for the Lorella Pumped Storage Project, Klamath County, Oregon.*

CH2M HILL. 2002. *Water Supply Supplemental Data Report: Deep Aquifer Testing at the COB Energy Facility Water Supply Well.* Prepared for COB Energy Facility, LLC. November 2002.

Csuti, B., A.J. Kimerling, T.A. O'Neil, M.M. Shaughnessy, E.P. Gaines, and M.M. Huso. 1997. *Atlas of Oregon Wildlife: Distribution, Habitat, and Natural History.*

Isaacs, Frank B. 2002. Senior Faculty Research Assistant at Oregon State University. Personal communication in June 2002.

LeCaptain, Leonard. 2002. Endangered Species Division, U.S. Fish and Wildlife Service, Klamath Falls, Oregon. Personal communication in December 2002.

Mitcham, S. A., and G. Wobeser. 1988a. "Effects of Sodium and Magnesium Sulfate in Drinking Water on Mallard Ducklings." *J. Wildl. Dis.*, 24:30-44.

Mitcham, S. A., and G. Wobeser. 1988b. "Toxic Effects of Natural Saline Waters on Mallard Ducklings." *J. Wildl. Dis.*, 24:45-50.

Moorman A.M. T.E. Moorman, G.A. Baldassarre, and D.M. Richard. 1991. "Effects of saline water in growth and survival of mottled duck ducklings in Louisiana." *Journal of Wildlife Management*, 55: 471-476.

Natural Resource Conservation Service (NRCS). 1985. *Soil Survey of Klamath County, Oregon: Southern Part.* United States Department of Agriculture, Washington D.C.

Nystrom, K. G. K. and Pehrsson, O. 1988. "Salinity as a constraint affecting food and habitat choice of mussel-feeding diving ducks." *Ibis*, 130:94-110.

Oregon DEQ (Department of Environmental Quality). 2001. Guidance for Ecological Risk Assessment Level II – Screening Level Values. Last accessed: Aug 13, 2003. Available from http://www.deq.state.or.us/ wmc/documents/eco-2slv.pdf

Oregon Natural Heritage Program (ONHP). 2002. Database search conducted by ONHP staff, April 5, 2002. Oregon Natural Heritage Program, Portland, OR.

Raby, John. 2003. Manager, Bureau of Land Management Klamath Falls Resource Area. Personal communication on August 25, 2003.

Swanson, G. A., V. A. Adomaitis, F.B. Lee, J.R. Serie and J.A. Shoesmith. 1984. "Limnological conditions influencing duckling use of saline lakes in south central North Dakota." *Journal of Wildlife Management*, 48:340-349.

United States Department of Agriculture (USDA). 1979. *Plant Associations of the Fremont National Forest.* U.S. Forest Service, Pacific Northwest Region R6-Ecol-79-004.

U.S. Department of the Interior. 1998. *Guidelines for Interpretation of the Biological Effects of Selected Constituents in Biota, Water, and Sediment*. National Irrigation Water Quality Program Information Report. No. 3. Table 30.

USEPA (U.S. Environmental Protection Agency). 1993. *Wildlife Exposure Factors Handbook. Volume I.* Office of Research and Development, Washington, DC. EPA/600/R-93/187a.

U.S. Fish and Wildlife Service (USFWS). 1993. *Lost River (Deltistes luxatus) and Shortnose (Chasmistes brevirostris) Sucker Recovery Plan*. Prepared by Kevin Stubbs and Rolland White for Region 1.

U.S. Fish and Wildlife Service (USFWS). 1998. *Applegate's milk-vetch (Astragalus applegatei) recovery plan.*

Windingstad, R.M., F.X. Kartch, R.K. Stroud, and M.R. Smith. 1987. "Salt Toxicosis in Waterfowl in North Dakota." *Jour. Wildlife Diseases*, 23(3):443-446.

APPENDIX A

Habitat Mitigation and Natural Area Revegetation Plan

APPENDIX A TO THE BIOLOGICAL ASSESSMENT

Habitat Mitigation and Natural Area Revegetation Plan

Introduction

The proposed COB Energy Facility would be a combined-cycle electric generating plant fired solely on natural gas. The biological assessment (BA) contains a detailed description of the Energy Facility and its associated related and supporting facilities, collectively referred to as the Facility.

This Habitat Mitigation and Natural Area Revegetation Plan (the Revegetation Plan) describes revegetation and habitat improvement practices to be employed by COB Energy Facility, LLC (the project proponent) in areas that are in native condition, and not in agricultural use. It has been adapted from the revegetation plan (Exhibit P, Attachment P-1) in the site certificate application filed for the COB Energy Facility with the Oregon Office of Energy on September 5, 2002, as amended by Amendment No. 1, filed with the Oregon Energy Facility Council (EFSC) on July 25, 2003.

Conclusion

The project proponent would mitigate for permanently disturbed habitat by restoring, enhancing, and protecting habitat in accordance with Oregon Department of Fish and Wildlife (ODFW) habitat mitigation goals. Mitigation would include preservation, restoration, and habitat improvement of approximately 236 acres, including fallow agricultural land that has been heavily grazed, and degraded juniper sagebrush habitat on land that would be purchased by the project proponent (Figure 2-2 in the Biological Assessment). Detailed revegetation and habitat improvement plans for the mitigation site would be developed through consultations with the U.S. Fish and Wildlife Service (USFWS), ODFW, and the Bureau of Land Management (BLM).

Permanently disturbed habitats during the 30-year operating life of the proposed Facility are described in Table 2-1 of the BA. Only the Energy Facility site, water supply well system, and electric transmission line would have permanent disturbance. The water supply and natural gas pipelines would not have permanent disturbance, but would have temporary construction disturbances of 4 months and 3 months, respectively.

The revegetation goal for mitigation of permanently disturbed habitat is no net loss in either existing habitat quantity or quality. The Revegetation Plan has been prepared to guide the revegetation efforts and achieve this mitigation goal. The proposed Facility would permanently disturb approximately 108.7 acres during the 30-year operating life of the Energy Facility. At Facility retirement, the project proponent would implement a Facility Retirement and Site Restoration Plan (Exhibit W in the site certificate application) to ensure that soil in and around the Energy Facility site is returned to conditions suitable for agricultural use. The electric transmission line would be removed (i.e., the transmission towers, conductors and ground wires, and insulators) and the transmission tower footings would be removed to a depth of 5 feet. The natural gas and water supply pipelines would be capped and left in place. Proposed habitat mitigation and revegetation for temporary disturbances are summarized in Tables A-1 and A-2, respectively.

As shown in Table A-3, included in the mitigation is 94.9 acres of Klamath County mapped, high-density deer winter range (ODFW Category 2). A total of 46.0 acres would be permanently disturbed and 48.9 acres would be temporarily disturbed by the Facility. However, a large portion (approximately 57.9 acres) actually consists of fallow agricultural fields, which provide minimal habitat and forage value for wintering deer. This land does not provide biological value consistent with its Category 2 designation. If the approximately 51.9 acres were to be rated based on biological criteria, they would be Category 4. Nonetheless, the project proponent has evaluated these areas and would mitigate for them as Category 2.

The mitigation for Category 2 habitats would include restoration and improvement of areas permanently disturbed during the 30-year operating life of the Energy Facility by disturbance from the footprint area of the various Facility features. Mitigation for these areas would also involve a net improvement of existing habitat through removal of western juniper trees to promote growth of desirable forage species and the addition of watering stations for wildlife. The revegetation goal for temporarily disturbed areas is to return the disturbed habitat to preconstruction (or better) conditions.

Preliminary seed mixes, planting methods, and weed control techniques have been developed for the Facility site through a biological evaluation of the existing plant communities in the area and reviews of relevant literature. Final seed mixtures would be developed during consultation with the BLM, USFWS, and ODFW staff. The revegetation plan specifies monitoring procedures to evaluate the success of the revegetation efforts, and contingency measures if initial revegetation efforts prove unsuccessful in certain areas.

Environmental Setting

The Facility is located within the Klamath Ecological Province (East Cascades Ecoregion) on the eastern side of the Cascade Mountains. This region is characterized by large basins surrounded by ancient lake terraces and basaltic fault block mountains. Elevations range from about 4,000 to 8,000 feet. The soil in the area is derived from basaltic parent material and generally has loamy surface horizons overlaying loamy to clayey subsurface horizons. A silica cemented hardpan occurs at depths of about 3 feet in many of the ancient dry lakebeds in the area (Anderson et al., 1998; Franklin and Dyrness, 1988).

Historically, ponderosa pine forest accounted for nearly 50 percent of the vegetative cover in this region. However, since 1936, western juniper woodlands and agricultural areas have significantly expanded (Anderson et al., 1998). Sagebrush-steppe is also a major habitat type throughout this ecoregion (Franklin and Dyrness, 1988).

Proposed Habitat Preservation and Mitigation Site

Much of the area proposed for habitat mitigation and enhancement is located on a fallow agricultural field, as shown on Figure 2-2 in the BA. Until 1999, this land was used for dryland farming of cereal rye grass. Existing vegetation is sparse and includes species such as tansy mustard (*Descurainia sophia*), clasping pepperweed (*Lepidium perfoliatum*), blue-eyed Mary (*Collinsia parviflora*), and yellowspine thistle (*Cirsium ochrocentrum*).

The remaining mitigation and enhancement area is characterized by juniper woodland habitat consisting of a sparse understory with few shrubs and native grasses. Mapped habitat types are shown on Figure 4-1 in the BA.

Climate

The regional climate is characterized by warm, dry summers and cool, moist winters. The average annual precipitation in Klamath County is 14 inches, of which only 27 percent occurs during the growing season (Anderson et al., 1998).

Data from the Oregon Climate Service for Klamath Falls collected between 1971 and 2000 suggest that the average yearly precipitation is 13.95 inches, with average annual snowfall of 32.36 inches. Most of the precipitation occurs between November and March. The average maximum temperature for the year is 61.8 °F, and the average minimum temperature is 35.3 °F. The growing season extends from late April through October.

Current Land Use

The Energy Facility site is located on a fallow field that was used for dryland grain farming until 1999. The vegetation in this area is sparse and consists primarily of ruderal, non-native grasses and forbs. The fallow field and adjacent juniper-sagebrush habitats are currently leased for seasonal cattle grazing.

Water Supply Well System

The water supply well system is located on the east side of East Langell Valley Road at the existing Babson Well. The present-day land use is irrigated pasture, which is currently grazed by sheep.

Water Supply Pipeline

Land uses observed along the water supply pipeline route include irrigated pasture, an alfalfa hay field, open rangeland/woodlands managed by private landowners, and dryland farming and cattle grazing on a fallow field. The rangeland/woodlands are characterized by western juniper with an understory of low sagebrush, rabbitbrush, and annual grasses and forbs. Most of the juniper woodland area has been heavily grazed. Understory vegetation in these areas is sparse and consists primarily of non-native annual species.

Natural Gas Pipeline

Land uses observed along the natural gas pipeline route include irrigated pasture, a dairy, industrial land (the compressor station), farming practices related to cattle feed (alfalfa hay and grain silage), rangeland/woodlands where residents are located, and dryland farming and cattle grazing on a fallow field (the last section of the natural gas pipeline before it connects with the Energy Facility).

Electric Transmission Line

Land uses observed along the electric transmission line route include existing electric transmission lines, fallow agricultural fields used for cattle grazing, ponderosa pine woodland, open rangeland/woodlands managed by federal and private landowners, and the PG&E Gas Transmission Northwest (PG&E GTN) interstate gas pipeline system. The ponderosa pine woodland is isolated in a lowland area and is surrounded by rangeland areas characterized by western juniper.

Irrigated Pasture Area

The vegetation in this area is sparse and consists primarily of ruderal, non-native grasses and forbs. The fallow field and adjacent juniper-sagebrush habitats are currently leased for seasonal cattle grazing.

Soil

Several soil types are present on the Facility site, but most of the lands subject to revegetation are mapped as part of the Calimus or Lorella series. Other soil series found in the vicinity of the Facility include Harriman, Henly, Calimus fine sandy Loam, and the Stukel-Capona complex. .

The excavated topsoil (upper 12 inches) from the natural gas and water supply pipelines would be salvaged and stored prior to trench excavation. Once the pipelines have been installed, the topsoil would be replaced over the refilled trench and the surface would be regraded to original contours. Prior to seeding, the soil may be disked to ensure good seedling establishment.

Existing Vegetation

General habitat and vegetation descriptions are provide in the BA. Juniper-sagebrush is the predominant natural habitat in the Facility vicinity. Other impacted natural habitat types include sagebrush-steppe and ponderosa pine woodland.

Noxious Weeds

A noxious weed is a plant that is considered aggressive and intrusive, resulting in detrimental impacts to important native species, habitats, and agriculture. Such plants are difficult to control or eradicate. The Oregon Department of Agriculture designates plant species as noxious weeds and classifies species on the size of the infestation, ability to control and eradicate, and economic as well as ecological significance.

The project proponent would use Best Management Practices (BMPs) to avoid and minimize potential impacts from noxious weeds. During construction, efforts would be made to minimize the spread of noxious weeds and other undesirable non-native species. Removal of exotic invasive plants would be performed on an as-needed basis during the revegetation process. Weed control treatment methods may include hand pulling of small, isolated, herbaceous populations; limited spot application of herbicide (e.g., Roundup); mechanically disking to a 6-inch depth; or cutting (e.g., weed-eaters, mowing).

The goal of weed control efforts would be to remove competitive, non-native vegetation and prevent the spread and establishment of noxious weeds and other undesirable plant species into new areas as a result of Facility construction. In areas where weedy species are present, the goal is to prevent increased weed density, control and maintain the spread, and reduce the population where possible. Complete eradication of undesirable species is not likely. However, weed populations should not exceed the baseline conditions in any of the revegetated areas. Establishment of native vegetation would prevent establishment of noxious weeds in the mitigation and enhancement areas.

The following noxious weeds have been observed in the Facility area and have the potential to spread as a result of increased disturbance, inhibit natural regeneration of desirable species, and reduce the success of revegetation efforts:

- Leafy spurge (*Euphorbia esula*)—Widespread, but not abundant in the project area.
- Bull thistle (*Cirsium vulgare*)—Widespread, but not abundant in the project area.
- Field bindweed (*Convolvulus arvensis*)—Common in fallow agricultural fields, but limited distribution in the project area
- Medusa-head (*Taeniatherum caput-medusae*)—Limited to the area around Captain Jack Substation; species is present, but not abundant
- Quack grass (*Elytrigia repens*)—Limited distribution in the project area in pastures and along roadsides
- Scotch thistle (*Onopordum acanthium*)—Locally common in disturbed areas, limited where dense native vegetation is present
- Musk thistle (*Carduus nutans*)—Locally common in disturbed areas, limited where dense native vegetation is present

Other non-native, weedy species common in the area included:

- Yellow spine thistle (*Cirsium ochrocentrum*)—Common in fallow agricultural fields
- Cheatgrass (*Bromus tectorum*)—Locally common in highly disturbed areas, but limited where dense native vegetation is present
- Tansy mustard (*Descurainia sophia*)—Common in fallow agricultural fields and highly disturbed areas
- Field pepperweed (*Lepidium campestre*)—Common in fallow agricultural fields
- Tumble mustard (*Sisymbrium altissimum*)—Common in fallow agricultural fields
- Tubercled crowfoot (*Ranunculus testiculatus*)—Common in some highly disturbed areas
- Common mullein (*Verbascum thapsus*)—Locally abundant in areas along the PGT natural gas easement

Erosion Control

The project proponent would implement and follow an erosion and sediment control plan as part of the 1200-C construction National Pollutant Discharge Elimination System (NPDES) permit. For temporary disturbance, control measures would be used to redirect surface runoff, decrease the velocity of surface runoff, capture suspended sediment, and stabilize exposed soil. These measures include, but are not limited to, the use of straw bales, sandbags, and silt fences. These erosion control measures would be used along the perimeters of the work areas and wherever else appropriate to prevent sediment runoff and debris from entering drainages or other sensitive habitat. Following construction, areas of disturbance would be seeded with native vegetation to provide long-term erosion control.

Restoration of Temporarily Disturbed Sites and Habitat Mitigation

Temporary Disturbance

The goal for revegetation of temporarily disturbed areas is to return the site to the predisturbance condition or better (with the exception of ponderosa pine trees within the electric transmission line easement). The existing vegetation in adjacent, undisturbed areas would provide reference conditions for revegetation of the disturbed areas. If the adjacent areas are generally denuded or characterized by undesirable species, the revegetation goal is to enhance the habitat by planting desirable native species. Where temporary disturbance occurs in areas that are considered relatively undisturbed, the mitigation goal is to return the habitat to predisturbance conditions.

Habitat Preservation, Mitigation and Enhancement

The goal for mitigation and enhancement areas for the Facility’s permanent disturbance during the 30-year operating life of the Energy Facility is to transform relatively poor quality habitat such as fallow agricultural land and barren juniper woodland into productive, high-quality wildlife habitat by planting desirable species for deer, antelope, pygmy rabbits, and other wildlife species. Improvement of Category 2 habitat areas would involve the removal of dense juniper to improve the growth and establishment of desirable species, and the addition of wildlife watering stations.

Revegetation and Habitat Improvement Procedures

Select Qualified Revegetation Contractor

The revegetation contractor would have a demonstrated record of successfully implementing revegetation projects of comparable size and type.

Determine Seed Mixture and Application Rates

A list of potential plant species to be used in temporarily and permanently disturbed natural habitats as well as in the habitat mitigation and enhancement area is provided in Table A-4. Species were selected based on existing vegetation, current land use, and habitat enhancement and mitigation goals in each disturbance location. The final seed mixture, planting rates, and seed source would be subject to approval by ODFW, USFWS, and the BLM prior to revegetation planting. Revegetation planting and management for temporary disturbance on private lands in native condition (including native areas in degraded condition), for which the project proponent has obtained a construction easement, would be subject to the approval of the landowner. These areas may include some non-native species (e.g., annual grasses) which are better suited for the current land use activities.

Planting Methods

Planting methods would be based on site-specific factors, such as slope, soil, and the size of the planting area. Certified weed-free seed would be used for all areas.

Rangeland Seed Drill Method

A seed drill would be used for revegetation of pastureland and natural areas along the natural gas and water supply pipelines, and for the mitigation and habitat enhancement of areas such as fallow agricultural fields.

Broadcast Seeding

Broadcast seeding would be used to replant small areas or sites where drill seeding is not possible, such as steep slopes and extremely stony or rocky soil. In these areas, seed would be spread using a belly grinder or some other form of dispersal mechanism.

Container Planting

Curl-leaf mountain mahogany (*Cercocarpus ledifolius*) and antelope bitterbrush (*Purshia tridentata*) have poor germination and survival when planted as seed. Therefore, establishment of these species would be accomplished by planting container grown plants. Mulch would be placed around the base and each plant would be protected with mesh to prevent browsing during initial seedling establishment.

Juniper Removal

Removal of western juniper trees would promote growth of desirable browse species as well as herbaceous vegetation. Juniper thinning would be done in areas of the 235.5-acre habitat preservation site as well as on the 62.3 acres of temporarily and permanently disturbed ODFW Category 2 habitat (see Figure 2-2 in the BA). Removal of juniper tree would most likely be done using a mechanical harvester with rubber tires.

Success Criteria

Revegetation success criteria would be determined through (1) comparison of the restored and enhanced habitats with vegetation on adjacent, undisturbed areas, (2) selected reference sites nearby the Facility, or (3) other success criteria established by ODFW, BLM, and/or USFWS. Restoration success would be based on the results as determined by the monitoring procedures discussed below.

Monitoring Procedures

During the year following each seeding, a qualified botanist or restoration expert would examine a representative sample of the revegetated sites. Care would be taken to survey areas in all the major habitat types and throughout the geographic extent of the revegetation area. At least 10 percent of the revegetated acreage would be examined.

Reference sites are areas of natural vegetation that have not been subject to disturbance as a result of the project. Restored and mitigation areas should be similar in composition and structure to undisturbed natural vegetation in the area or meet otherwise predetermined standards. Reference sites nearby the Facility would be selected on the basis of target plant community composition and environmental parameters (soil, slope, aspect, grazing pressure) similar to the revegetated areas. A minimum of three reference sites would be used to establish success criteria. Within each selected reference area, a minimum of three 16.5 feet by 16.5 feet sample plots would be randomly located. Data collected from each plot would include:

- Species composition
- Plant density
- Percent cover of vegetation (both native and non-native herbaceous and woody species), as well as bare soil and rock
- Community structure
- Degree of erosion due to construction activities (high, moderate, or low)
- Representative photos from each sampling location

The same sampling protocol would be used to assess the revegetation success of the disturbed natural habitats and the mitigation and enhancement planting areas. The objective of revegetation and mitigation planting is no net loss in habitat quantity or quality. Success of the revegetation areas would be determined relative to the conditions of the selected reference sites. Parameter measures in the revegetated areas should be within 15 percent of the reference locations. Access to revegetation sites would be provided to pertinent regulatory agencies with 48 hours advance notice.

Fencing

The habitat mitigation and improvement sites would be fenced prior to seeding. Fences would be designed to exclude cattle and other domestic ungulates, but would allow access to mule deer and antelope in accordance with ODFW guidelines. Domestic grazing would not occur in the habitat mitigation and enhancement areas unless it is determined that limited grazing would be a beneficial management practice. The fences would be maintained throughout the life of the Facility.

Maintenance

The COB Energy Facility would be responsible for the continued maintenance activities associated with the habitat mitigation and preservation areas. Maintenance activities could include fence repair, periodic weed control, juniper removal, monitoring of improvement success, and reseeding (in areas where vegetation establishment fails to meet the success criteria).

Remedial Actions

During the initial stages of monitoring, the germination and establishment success of target species would be closely tracked. In the event that the initial planting appears insufficient to achieve revegetation goals, additional seeding, mulching, or plug planting may be required.

Reporting Schedule

Within 60 days of completion of seeding and planting the revegetation project, an as-built report would be prepared. The as-built report would identify any changes from the original plan, such as changes in composition of the seed mix and application methods. The as-built report would serve as a baseline for future monitoring reports.

In addition, an annual monitoring report would be submitted by October 1 of each year that monitoring is conducted. The monitoring report would outline results of vegetation sampling and photo monitoring, and identify any remedial action recommended to meet goals.

References

Anderson, W.E., M. Borman, and W.C. Kruger. 1998. *The Ecological Provinces of Oregon*. Oregon Agricultural Experiment Station, SR990.

Franklin, J.F and C.T. Dyrness. 1988. *Natural Vegetation of Oregon and Washington*. Oregon State University Press, Corvallis, Oregon.

Natural Resource Conservation Service (NRCS). 1985. Soil Survey of Klamath County, Oregon: Southern Part. United States Department of Agriculture.

TABLE A-1
Proposed Mitigation for Permanent and Temporary Disturbance of Natural Habitat Areas

Summary of Disturbance	Proposed Mitigation Measures
54.4 acres of permanent disturbance during the 30-year operating life of the Energy Facility to natural habitats including juniper-sagebrush (31.6 acres), sagebrush- steppe (10.4 acres), and ponderosa pine woodland (12.4 acres).	Creation and preservation of an approximately 236-acre habitat mitigation site. Creation of a minimum of 2 snag trees per acre within the ponderosa pine woodland area.
46.0 acres of permanent disturbance during the 30-year operating life of the Energy Facility to high-density winter deer range habitat (ODFW habitat category 2). 48.9 acres of temporary disturbance to high-density winter deer range habitat (ODFW habitat category 2).	Creation and preservation of an approximately 236-acre habitat mitigation site. Implementation of net habitat improvement by thinning western juniper trees within the 154-foot easement for the electric transmission line on 79.7 acres of juniper-sage habitat. The purpose would be to promote growth of desirable browse species. Installation of wildlife watering stations on the mitigation site and along the electric transmission line.
Additional temporary disturbance to 26.2 acres of natural habitats including juniper-sagebrush (22.8 acres), sagebrush-steppe (1.8 acres), and ponderosa pine woodland (12.4 acres).	Revegetation of temporary disturbed sagebrush habitat areas to predisturbance conditions or better. Revegetation of temporary disturbed habitats within the right-of-way in the ponderosa pine habitat. Would include a variety of low-growing shrubs, native grasses, and forbs to promote habitat diversity, forage availability and wildlife habitat.

TABLE A-2
Revegetation and Restoration of Temporarily Disturbed Areas

Facility Feature	Habitat and Soil	Impacts	Revegetation and Habitat Enhancement[1]
Electric transmission line	Juniper-Sagebrush (35.2 acres) Lorella and Calimus gravelly, stony loams, with 2 to 35% slopes	Tree removal, tower construction, and conductor installation	Broadcast seeding of native grasses, forbs, and shrubs (mostly low sagebrush, with some serviceberry and gooseberry)
	Sagebrush-steppe (12.2 acres) Calimus fine sandy loam and Harriman loams, with 2 to 15% slopes	Tower construction and conductor installation	Broadcast seeding of native grasses, forbs, and big sagebrush. Plug planting of bitterbrush.
	Ponderosa Pine (14.0 acres) Harriman loam with 2 to 15% slopes	Tree removal, tower construction, and conductor installation	Juniper clearing, creation of snags. Broadcast seeding of native grasses, forbs, and shrubs (service berry, gooseberry), plug planting of curl-leaf mountain mahogany
	Pasture (2.4 acres) Harriman loam with 0 to 15% slopes	Tower construction and conductor installation	Minimization and mitigation practices in accordance with Attachment K-5 of the COB Energy Facility site certificate application
	Fallow Field (1.1 acres) Harriman loam with 0 to 15% slopes	Tower construction and conductor installation	Drill seeding of native grasses and forbs
Natural gas pipeline easement corridor (not including 3.6 acres of temporary disturbance on PG&E Gas Transmission Northwest property, which is industrially developed land)	Juniper-sagebrush (9.0 acres) Lorella and Calimus loam and gravelly, stony loam with 2 to 35% slopes	Clearing, trench excavation, and soil stockpiling	Drill seeding of native grasses, forbs, and shrubs (low sagebrush, gooseberry, and serviceberry). Plug planting of bitterbrush and curl-leaf mountain mahogany.
	Agricultural fields (23.9 acres) Calimus and Henly loams with 0 to 5% slopes and Stukel-Capona loams with 2-15% slopes.	Clearing, trench excavation, and soil stockpiling	Minimization and mitigation practices in accordance with Attachment K-5 of the COB Energy Facility site certificate application
	Pasture (0.8 acre) Calimus loam with 0 to 5% slopes and Stukel-Capona loams with 2 to 15 percent slopes	Clearing, trench excavation, and soil stockpiling	Minimization and mitigation practices in accordance with Attachment K-5 of the COB Energy Facility site certificate application

TABLE A-2
Revegetation and Restoration of Temporarily Disturbed Areas

Facility Feature	Habitat and Soil	Impacts	Revegetation and Habitat Enhancement[1]
	Fallow Field (3.5 acres) Calimus loam with 2 to 5% slopes	Clearing, trench excavation, and soil stockpiling	Drill seeding of native grasses, forbs
	Ruderal—private property (3 acres) Calimus loam with 0 to 5% slopes	Clearing, trench excavation, and soil stockpiling	Per landowner specifications
Water pipeline construction corridor	Juniper-Sagebrush (10.2 acres) Lorella and Calimus loam and gravelly, stony loam, with 2 to 35% slopes	Clearing, trench excavation, and soil stockpiling	Drill seeding of native grasses, forbs and shrubs (low sagebrush, gooseberry and serviceberry). Plug planting of bitterbrush and curl-leaf mountain mahogany.
	Agricultural fields (1.4 acres) Stukel-Capona loam, with 2-15% slopes	Clearing, trench excavation, and soil stockpiling	Minimization and mitigation practices in accordance with Attachment K-5.
	Pasture (6.3 acres) Calimus loams with 0-5% slopes, Laki and Henly loams with 0-2% slopes	Clearing, trench excavation, and soil stockpiling	Minimization and mitigation practices in accordance with Attachment K-5 of the COB Energy Facility site certificate application
	Fallow fields (0.8 acres) Calimus loam, 2-5% slope	Clearing, trench excavation, and soil stockpiling	Drill seeding of native grasses, forbs and shrubs (low sagebrush, gooseberry and serviceberry). Plug planting of bitterbrush and curl-leaf mountain mahogany.
	Ruderal (0.7 acre) Calimus fine sandy loam and Laki-Henly loams with 0-5% slopes	Clearing, trench excavation, and soil stockpiling	Minimization and mitigation practices in accordance with Attachment K-5 of the COB Energy Facility site certificate application.
Water supply staging area	Pasture (1.3 acres) Calimus loam, 0-5% slopes	Clearing and leveling	Minimization and mitigation practices in accordance with Attachment K-5 of the COB Energy Facility Site Certificate Application.
Irrigation pipeline	Fallow field (5.2 acres)	Clearing, trench excavation, and soil stockpiling	Drill seeding of native grasses and forbs

TABLE A-3
Permanent and Temporary Disturbances of ODFW Habitats (in acres)

Feature	Total	ODFW 2	ODFW 3	ODFW 4	ODFW 5	ODFW 6
Permanent						
Energy Facility site	50.6	13.9	4.2	32.5		
Water supply well system	0.3			0.3		
Water supply pipeline	0.0					
Natural gas pipeline	0.0					
Electric transmission line	57.3	31.6	25.7			
Access Road to Pasture	0.5	0.5				
Total—Permanent	**108.7**	**46.0**	**29.9**	**32.8**	**0.0**	**0.0**
Additional Temporary Disturbance						
Construction parking/laydown	71.0	19.7	6.4	44.9		
Water supply well system	1.0			1.0		
Water supply pipeline	19.4	6.6	1.8	11.0		
Natural gas pipeline	43.8	13.1		27.1		3.6
Electric transmission line	7.6	4.7	2.9			
Irrigation Pipeline	5.2	4.8		0.4		
Total—Additional Temporary Disturbance	**148.0**	**48.9**	**11.1**	**84.4**	**0.0**	**3.6**
Total—Permanent and Temporary	**256.7**	**94.9**	**41.0**	**117.2**	**0.0**	**3.6**

TABLE A-4
Proposed Native Plant Species for Revegetation

Native Grasses	
Thurber's needlegrass	*Achnatherum thurberianum*
Squirrel Tail	*Elymus elymoides*
Idaho Fescue	*Festuca idahoensis*
Sandberg's Bluegrass	*Poa secunda*
Bluebunch wheatgrass	*Pseudoroegneria spicata*
Native Forbs	
Sagebrush buttercup	*Ranunculus glaberrinus*
Common Lomatium	*Lomatium utriculatum*
Wooly sunflower	*Eryophylum lanatum*
Prairie lupine	*Lupinus lepidus*
Velvet Lupine	*Lupinus leucophyllus*
Spreading Phlox	*Phlox diffusa*
Showy Penstemon	*Penstemon speciosus*
Shrubs	
Low sagebrush	*Artemisia arbuscula*
Big Sagebrush	*Artemisia tridentata*
Antelope bitterbrush	*Purshia tridentata*
Curl-leaf mountain mahogany	*Cercocarpus ledifolius*
Desert gooseberry	*Ribes velutinum*
Serviceberry	*Amelanchier alnifolia*

APPENDIX B

Plant and Wildlife Species Observed During Field Surveys in the Project Area

APPENDIX B TO THE BIOLOGICAL ASSESSMENT

Plant and Wildlife Species Observed During Field Surveys in the Project Area

TABLE B-1
Plant Species Observed During Botanical Surveys of the Project Area

Scientific Name	Common Name	Native/ Non-native	Habitat
Apiaceae			
Lomatium nudicaule	Pestle lomatium	Native	Perennial
Lomatium triternatum	Lewis' lomatium	Native	Perennial
Lomatium utriculatum	Common lomatium	Native	Perennial
Perideridia oregana	Oregon yampah	Native	Perennial
Asclepiadaceae			
Asclepias speciosa	Showy milkweed	Native	Perennial
Asteraceae			
Achillea millefolium	Yarrow	Native	Perennial
Agoseris glauca	Pale agoseris	Native	Perennial
Antennaria rosea	Rosy pussytoes	Native	Perennial
Anthemis arvensis	Corn chamomile	Non-native	Annual
Artemisia arbuscula	Low sagebrush	Native	Shrub
Artemisia tridentata	Big sagebrush	Native	Shrub
Balsamorhiza sagittata	Arrow-leaved balsam-root	Native	Perennial
Bidens cernua var. *cernua*	Nodding bur-marigold	Native	Perennial
Blepharipappus scaber	Blepharipappus	Native	Annual
*Carduus nutans**	Musk thistle	Non-native	Perennial
Chrysothamnus nauseosus	Grey rabbitbrush	Native	Shrub
Chrysothamnus viscidiflorus	Green rabbitbrush	Native	Shrub
*Cirsium ochrocentrum**	Yellow-spine thistle	Non-native	Perennial
*Cirsium vulgare**	Bull thistle	Non-native	Bien.
Crepis acuminata	Tapertip hawksbeard	Native	Perennial
Crepis modocensis	Low hawksbeard	Native	Perennial
Crocidium multicaule	Spring gold	Native	Annual
Erigeron bloomeri	Scabland fleabane	Native	Perennial
Erigeron filifolius var. *filifolius*	Thread-leaved fleabane	Native	Perennial
Eriophyllum lanatum	Wooly sunflower	Native	Perennial
Microseris laciniata	cutleaf silverpuffs	Native	Perennial
Microseris nutans	Nodding microseris	Native	Perennial
Onopordum acanthium ssp. *acanthium**	Scotch thistle	Non-native	Bien.
Psilocarphus brevissimus	Dwarf wooly-heads	Native	Annual
Senecio canus	Grey groundsel	Native	Perennial

TABLE B-1
Plant Species Observed During Botanical Surveys of the Project Area

Scientific Name	Common Name	Native/ Non-native	Habitat
Senecio integerrimus var. *exaltatus*	Western groundsel	Native	Perennial
Senecio integerrimus var. *major*	Lambstongue groundsel	Native	Perennial
Stenotus stenophyllus	Narrow -leaf goldenweed	Native	Annual
Taraxacum officinale	Dandelion	Non-native	Perennial
Tragopogon dubius	Goat's beard	Non-native	Perennial
Wyethia angustifolia	Narrow-leaf mule ears	Native	Perennial
Boraginaceae			
Amsinckia sp.	Fiddleneck	---	---
Cryptantha ambigua	Basin cryptantha	Native	Annual
Cryptantha sp.	Cryptantha	---	---
Hackelia cusickii	Cusicks stickseed	Native	Perennial
Lithospermum ruderale	Stoneseed	Native	Perennial
Plagiobothrys stipitatus	Popcorn flower	Native	Annual
Brassicaceae			
Alyssum alyssoides	Small alyssum	Non-native	Annual
Arabis X*divaricarpa*	Rockcress	Non-native	Perennial
Descurainia sophia	Tansy mustard	Non-native	Annual
Idahoa scapigera	Flat-pod	Native	Annual
Lepidium campestre	Field pepperweed	Non-native	Annual
Lepidium perfoliatum	Clasping pepperweed	Non-native	Annual
Phoenicaulis cheiranthoides	Daggerpod	Native	Perennial
Sisymbrium altissimum	Tumble mustard	Non-native	Annual
Campanulaceae			
Downingia sp.	Downingia	---	---
Caprifoliaceae			
Sambucus mexicana	Blue elderberry	Native	Shrub
Caryophyllaceae			
Arenaria aculeata	Needleleaf sandwort	Native	Perennial
Arenaria congesta var. *congesta*	Ballhead sandwort	Native	Perennial
Silene sp.	Campion	---	---
Chenopodiaceae			
Chenopodium album	Lambs quarters	Non-native	Annual
Salsola tragus	Russian thistle	Non-native	Annual
Convolvulaceae			
*Convolvulus arvensis**	Field bindweed	Non-native	Annual
Cupressaceae			
Juniperus occidentalis	Western juniper	Native	Tree
Cyperaceae			
Carex filifolia	Thread-leaf sedge	Native	Perennial
Carex sp.	Sedge	---	---

TABLE B-1
Plant Species Observed During Botanical Surveys of the Project Area

Scientific Name	Common Name	Native/ Non-native	Habitat
Eleocharis macrostachya	Creeping spikerush	Native	Perennial
Scirpus acutus	Tule	Native	Perennial
Dryopteridaceae			
Cystopteris fragilis	Fragile fern	Native	Fern
Euphorbiaceae			
*Euphorbia esula**	Leafy spurge	Non-native	Perennial
Fabaceae			
Astragalus curvicarpus var. *curvicarpus*	Curvepod milkvetch	Native	Perennial
Astragalus filipes	Basalt milkvetch	Native	Perennial
Astragalus purshii	Pursh's milkvetch	Native	Perennial
Lupinus lepidus var. *sellulus*	Prairie lupine	Native	Perennial
Lupinus leucophyllus	Velvet lupine	Native	Perennial
Medicago sativa	Alfalfa	Non-native	Perennial
Melilotus indica	Sour clover	Non-native	Annual
Vicia americana	American vetch	Non-native	Annual
Gentianaceae			
Swertia albicaulis	Whitestem gentian	Native	Perennial
Geraniaceae			
Erodium cicutarium	Storksbill	Non-native	Annual
Grossulariaceae			
Ribes velutinum	Desert gooseberry	Native	Shrub
Hydrophyllaceae			
Hydrophyllum capitatum	Alpine waterleaf	Native	Perennial
Nemophila pedunculata	Meadow nemophila	Native	Annual
Phacelia hastata	Silverleaf phacelia	Native	Perennial
Phacelia heterophylla ssp. *virgata*	Varileaf phacelia	Native	Perennial
Phacelia linearis	Threadleaf phacelia	Native	Annual
Juncaceae			
Juncus balticus	Baltic rush	Native	Perennial
Lamiaceae			
Agastache urticifolia	Nettle-leaved horsemint	Native	Perennial
Marrubium vulgare	Horehound	Non-native	Perennial
Lemnaceae			
Lemna minor	Duckweed	Native	Perennial
Liliaceae			
Calochortus macrocarpus	Sagebrush mariposa lily	Native	Perennial
Fritillaria atropurpurea	Spotted fritillary	Native	Perennial
Smilacina racemosa	Western Solomon's seal	Native	Perennial
Zigadenus venenosus var. *venenosus*	Death camas	Native	Perennial

TABLE B-1
Plant Species Observed During Botanical Surveys of the Project Area

Scientific Name	Common Name	Native/ Non-native	Habitat
Linaceae			
Hesperolinon micranthum	Threadstem flax	Native	Annual
Linum lewisii	Western blue flax	Native	Perennial
Loasaceae			
Mentzelia veatchiana	Veatchs blazingstar	Native	Annual
Malvaceae			
Malva neglecta	Common mallow	Non-native	Perennial
Sidalcea oregana	Oregon checker mallow	Native	Perennial
Onagraceae			
Camissonia tanacetifolia	Tansy-leaved evening primrose	Native	Perennial
Clarkia rhomboidea	Forest clarkia	Native	Annual
Pinaceae			
Pinus ponderosa	Ponderosa pine	Native	Tree
Poaceae			
Achnatherum thurberianum	Thurber’s needlegrass	Native	Perennial
Alopecurus pratensis	Meadow foxtail	Non-native	Perennial
Agropyron desertorum	Desert crested wheatgrass	Non-native	Perennial
Agrostis exarata	Spike bentgrass	Native	Perennial
Beckmannia syzigachne	Slough grass	Native	Annual
Bromus madritensis ssp. *rubens*	Red brome	Non-native	Annual
Bromus tectorum	Cheat grass	Non-native	Annual
Deschampsia danthonioides	Annual hairgrass	Native	Annual
Elymus elymoides	Squirreltail	Native	Perennial
Elytrigia elongata	Tall wheatgrass	Non-native	Perennial
Elytrigia intermedia	Intermediate wheatgrass	Non-native	Perennial
*Elytrigia repens**	Quack grass	Non-native	Perennial
Festuca arundinacea	Tall fescue	Non-native	Perennial
Festuca idahoensis	Idaho fescue	Native	Perennial
Hordeum murinum spp. *leporinum*	Farmers foxtail	Non-native	Annual
Leymus triticoides	Creeping wildrye	Native	Perennial
Poa pratensis	Kentucky bluegrass	Non-native	Perennial
Poa secunda	Bluegrass	Native	Perennial
Polypogon monspeliensis	Annual beardgrass	Non-native	Annual
Pseudoroegneria spicata	Bluebunch wheatgrass	Native	Perennial
Secale cereale	Cereal rye	Non-native	Annual
*Taeniatherum caput-medusae**	Medusa head	Non-native	Annual
Polemoniaceae			
Collomia grandiflora	Mountain collomia	Native	Annual
Ipomopsis aggregata	Scarlet gilia	Native	Perennial

TABLE B-1
Plant Species Observed During Botanical Surveys of the Project Area

Scientific Name	Common Name	Native/ Non-native	Habitat
Navarretia leucocephala	White-headed navarretia	Native	Annual
Phlox diffusa	Spreading phlox	Native	Perennial
Polygonaceae			
Eriogonum sphaerocephalum var. *halimioides*	Rock buckwheat	Native	Perennial
Eriogonum umbellatum	Sulfur-flower buckwheat	Native	Perennial
Rumex crispus	Curly dock	Non-native	Perennial
Portulacacaea			
Claytonia perfoliata	Miner's lettuce	Native	Annual
Potomagetonaceae			
Potamogeton sp.	Pondweed	---	---
Primulaceae			
Dodecatheon conjugens	Shooting star	Native	Perennial
Dodecatheon pulchellum	Dark-throat shooting star		Perennial
Ranunculaceae			
Adonis aestivalis	Summer pheasant's eye	Non-native	Annual
Delphinium nuttallianum	Dwarf larkspur	Native	Perennial
Myosurus minimus	Mouse-tail	Native	Annual
Ranunculus aquatilus	Aquatic buttercup	Native	Perennial
Ranunculus glaberrimus	Sagebrush buttercup	Native	Perennial
Ranunculus testiculatus	Tubercled crowfoot	Non-native	Annual
Rosaceae			
Amelanchier alnifolia	Service-berry	Native	Shrub
Cercocarpus ledifolius	Mountain mahogany	Native	Perennial
Geum triflorum	Old man's beard	Native	Perennial
Prunus subcordata	Klamath Plum	Native	Perennial
Purshia tridentata	Antelope bitterbrush	Native	Shrub
Rosa woodsii	Interior rose	Native	Shrub
Rubiaceae			
Galium aparine	Common bedstraw	Native	Annual
Galium sp.	Bedstraw	---	---
Salicaceae			
Populus tremuloides	Quaking aspen	Native	Tree
Saxifragaceae			
Lithophragma parviflorum	Woodland star	Native	Perennial
Scrophulariaceae			
Castilleja linariifolia	Desert paintbrush	Native	Perennial
Collinsia parviflora	Blue-eyed Mary	Native	Annual
Penstemon laetus	Mountain blue penstemon	Native	Perennial
Penstemon rydbergii var. *oreocharis*	Meadow beardtongue	Native	Perennial
Penstemon speciosus	Showy penstemon	Native	Perennial

TABLE B-1
Plant Species Observed During Botanical Surveys of the Project Area

Scientific Name	Common Name	Native/ Non-native	Habitat
Verbascum thapsus	Common mullein	Non-native	Perennial
Veronica anagallis-aquatica	Water speedwell	Non-native	Perennial
Veronica peregrina var. *xalapensis*	Purslane speedwell	Native	Annual
Solonaceae			
Nicotiana attenuata	Coyote tobacco	Native	Annual
Typhaceae			
Typha latifolia	Broad-leaved cattail	Native	Perennial
Valerianaceae			
Plectritis brachystemon	Short-spurred plectritis	Native	Annual
Violaceae			
Viola bakeri	Baker’s violet	Native	Perennial

Note:

* Indicates that the species is an Oregon Department of Agriculture List B noxious weed.

Taxonomy follows the protocol in *The Jepson Manual—Higher Plants of California.* 1993. J.C. Hickman, ed. University of California Press, Berkeley.

TABLE B-2
Wildlife Species Observed During Field Surveys of the Project Area

Common Name	Scientific Name	Observed Habitat*
Birds		
Pied-billed grebe	*Podilymbus podiceps*	WO
American white pelican	*Pelecanus erythrorhynchos*	T, P
Great blue heron	*Ardea herodias*	WO
Sandhill crane	*Grus canadensis*	WO
Green-winged teal	*Anas crecca*	WO
Mallard	*Anas platyrhynchos*	WO, T
Northern shoveler	*Anas clypeata*	WO
American wigeon	*Anas americana*	WO
Bufflehead	*Bucephala albeola*	WO
Common merganser	*Mergus merganser*	WO
Turkey vulture	*Cathartes aura*	P, GP, WO, T
Bald eagle	*Haliaeetus leucocephalus*	WO, P, T, GP
Northern harrier	*Circus cyaneus*	WO, GP, P
Sharp-shinned hawk	*Accipiter striatus*	T
Cooper’s hawk	*Accipiter cooperii*	T
Red-tailed hawk	*Buteo jamaicensis*	T, WO, GP, P
Swainson’s hawk	*Buteo swainsoni*	WO, T, GP, P
Rough-legged hawk	*Buteo lagopus*	WO, GP, P
California quail	*Callipepla californica*	WO, P
American coot	*Fulica americana*	WO
Killdeer	*Charadrius vociferus*	T, WO, GP, P
Wouldet	*Catoptrophorus semipalmatus*	WO
Common snipe	*Gallinago gallinago*	WO
Gull	*Larus* sp.	WO, P, GP
Forster’s tern	*Sterna forsteri*	WO
Rock dove	*Columba livia*	WO, GP
Mourning dove	*Zenaida macroura*	T, GP
Great horned owl	*Bubo virginianus*	T
Common nighthawk	*Chordeiles minor*	T
Anna’s hummingbird	*Calypte anna*	T, WO
Calliope hummingbird	*Stellula calliope*	T
Red-breasted sapsucker	*Sphyrapicus ruber*	T
Downy woodpecker	*Picoides pubescens*	T

TABLE B-2
Wildlife Species Observed During Field Surveys of the Project Area

Common Name	Scientific Name	Observed Habitat*
Northern flicker	*Colaptes auratus*	T, WO, GP, P
Say's phoebe	*Sayornis saya*	T
Ash-throated flycatcher	*Myiarchus cinerascens*	T, WO
Western kingbird	*Tyrannus verticalis*	WO, GP, P, T
Cliff swallow	*Hirundo pyrrhonota*	WO, GP
Steller's jay	*Cyanocitta stelleri*	WO, T, P
Western scrub jay	*Aphelocoma coerulescens*	P, T, WO
Black-billed magpie	*Pica pica*	T, WO, GP, P
American crow	*Corvus brachyrhynchos*	GP
Common raven	*Corvus corax*	WO
Black-capped chickadee	*Parus atricapillus*	T
Mountain chickadee	*Parus gambeli*	P
White-breasted nuthatch	*Sitta carolinensis*	T
Rock wren	*Salpinctes obsoletus*	T
Ruby-crowned kinglet	*Regulus calendula*	T
Western bluebird	*Sialia mexicana*	WO, P
Mountain bluebird	*Sialia currucoides*	T
American robin	*Turdus migratorius*	WO, T
Northern mockingbird	*Mimus polyglottos*	WO, P
Loggerhead shrike	*Lanius ludovicianus*	GP
European starling	*Sturnus vulgaris*	WO, P
Warbling vireo	*Vireo gilvus*	WO, P
Yellow-rumped warbler	*Dendroica coronata*	WO
Western tanager	*Piranga ludoviciana*	WO, T
Spotted towhee	*Pipilo maculatus*	T
Lark sparrow	*Chondestes grammacus*	T, WO, P
Song sparrow	*Melospiza melodia*	WO
Golden-crowned sparrow	*Zonotrichia atricapilla*	T, WO, P
White-crowned sparrow	*Zonotrichia leucophrys*	WO
Dark-eyed junco	*Junco hyemalis*	P
Red-winged blackbird	*Agelaius phoeniceus*	WO
Tricolored blackbird	*Agelaius tricolor*	WO
Western meadowlark	*Sturnella neglecta*	WO, T, GP
Yellow-headed blackbird	*Xanthocephalus xanthocephalus*	WO

TABLE B-2
Wildlife Species Observed During Field Surveys of the Project Area

Common Name	Scientific Name	Observed Habitat*
Brewer's blackbird	*Euphagus cyanocephalus*	WO
Brown-headed cowbird	*Molothrus ater*	WO
Northern oriole	*Icterus galbula*	WO
House finch	*Carpodacus mexicanus*	GP, P, WO, T
Evening grosbeak	*Coccothraustes vespertinus*	WO, T
Mammals		
Pygmy rabbit	*Brachylagus idahoensis*	T
Nuttall's cottontail	*Sylvilagus nuttallii*	T, P, WO, GP
Black-tailed hare	*Lepus californicus*	WO, P
Least chipmunk	*Tamias minimus*.	T, P
Townsend's ground squirrel	*Spermophilus townsendii*	T, P, WO, GP
California ground squirrel	*Spermophilus beecheyi*	T, P, WO, GP
Golden-mantled ground squirrel	*Spermophilus lateralis*	T
Yellow-bellied marmot	*Marmota flaviventris*	WO, P, T
Northern pocket gopher	*Thomomys talpoides*	P
Ord's kangaroo rat	*Dipodomys ordii*	P
Dusky-footed woodrat	*Neotoma fuscipes*	P
Bushy-tailed woodrat	*Neotoma cinerea*	T
Coyote	*Canis latrans*	T, WO, GP, P
Badger	*Taxidea taxus*	T, WO, P
Mule deer	*Odocoileus hemionus*	WO, T, GP, P
Pronghorn	*Antilocapra americana*	T, P
Amphibians and Reptiles		
Western fence lizard	*Sceloporus occidentalis*	P, WO, GP, T
Sagebrush lizard	*Sceloporus graciosus*	P, WO, GP, T
Racer	*Coluber constrictor*	T
Garter snake	*Thamnophis elegans*	T
Bullfrog	*Rana catesbeiana*	WO

*Linear types in which species were observed during surveys.

WO = water pipeline supply route overland
GP = gas pipeline supply route
T = electric transmission line route
P = Facility site

APPENDIX C

Screening-Level Ecological Risk Assessment

Screening-Level Ecological Risk Assessment COB Energy Facility, Bonanza, Oregon

PREPARED FOR: Mark Bricker/CH2M HILL-PDX

PREPARED BY: Christine Arenal/SAC
Allen Tsao/CH2M HILL-SAC
Bradley Sample/CH2M HILL-SAC

DATE: October 2, 2003

1. Introduction

A screening-level ecological risk assessment (ERA) following U.S. Environmental Protection Agency (EPA) and Oregon Department of Environmental Quality (ODEQ) guidance was conducted to determine the potential risk to plants, soil invertebrates, and wildlife from air emissions at the COB Energy Facility, and the potential risk of using process wastewater to irrigate 31 acres of pasture and to improve grazing forage yield in areas currently without irrigation. Because there is an active bald eagle nesting area near McFall Reservoir, located approximately 6 miles south of the proposed facility location, the U.S. Fish and Wildlife Service (USFWS) has expressed concern about the potential impacts of the air emissions of the Energy Facility on bald eagles and their habitat. Two endangered fish species (shortnose sucker and Lost River sucker) that historically have been found in the Lost River, located 2 miles north of the Energy Facility, and one plant species (Applegate's milk-vetch) are of concern as well.

The screening-level ERA was conducted as part of the biological assessment (BA) to address the potential risk from air emissions (and subsequent deposition to surface water) to aquatic organisms and to the bald eagle (with exposure via food web transfer). Upland areas surrounding the Energy Facility site also were evaluated for possible risks to terrestrial plants, soil invertebrates, and terrestrial birds and mammals resulting from terrestrial deposition of air emissions and from reuse of the process wastewater for irrigation.

The procedures used in conducting the ERA are consistent with those described in the following ODEQ and EPA guidance documents:

- Guidance for Ecological Risk Assessment: Level II Screening Level Values (ODEQ, 2001)
- *Framework for Ecological Risk Assessment* (EPA, 1992a)
- *Final Guidelines for Ecological Risk Assessment* (EPA, 1998a)

Ecological risks were evaluated on the basis of conservative assumptions, maximum estimated media concentrations, and screening toxicity values. As is appropriate for a screening-level assessment, risk is not discussed in terms of the potential to cause risk, but in terms of passing or failure to pass the screening evaluation. This screening assessment was based on conservative assumptions such that constituents that passed the screen can be considered to pose no significant risk to ecological receptors. Failure to pass the screen, however, cannot be concluded to represent the presence of risk. Rather these results indicate that available data are insufficient to support a conclusion that ecological risks are absent. Constituents that failed the screen were reevaluated using more realistic assumptions.

This ERA is presented in four sections: problem formulation, exposure assessment, effects assessment, and risk characterization.

2. Problem Formulation

The problem formulation is the first and most critical component of any risk assessment. It involves identifying the problem and chemicals to be addressed, describing the affected site, selecting assessment and measurement endpoints, and developing a site conceptual model and data quality objectives. The problem formulation serves to provide direction and focus to the assessment process.

2.1 Site Description

This section summarizes the location and environmental setting of the Energy Facility (see Sections 2 and 4 of the BA for a more detailed discussion). Briefly, the Energy Facility site is located 3 miles south of Bonanza, Oregon, and 34 miles east of Klamath Falls, Oregon. The Lost River is located approximately 2 miles north of the Energy Facility site and Bryant Mountain is located approximately 1 mile south of the Energy Facility site. Various habitat types within the expected impact area of the Energy Facility include western juniper woodland, Ponderosa pine forest, sagebrush-steppe, ruderal areas, agricultural lands, and several riparian areas associated with the water resources in the area (e.g., Klamath River and tributaries).

2.2 Contaminants of Potential Ecological Concern

Contaminants of potential ecological concern (COPECs) are those chemicals that are present at the site in concentrations that may exceed toxicity thresholds for ecological receptors. This ERA evaluates estimated media concentrations modeled from the air emissions predicted from the natural gas combustion at the Energy Facility and estimated soil concentrations from land application of process wastewater. Because the primary deposition area for air emissions is outside the Energy Facility site (see Figure 1), the deposition from air emissions is not expected to overlap with the process wastewater application area. These two inputs, therefore, were considered separately and were not considered to be additive in soil. Methods used for estimating soil and water concentrations are described below.

2.2.1 Air Emissions

Predicted hazardous air pollutants (HAPs) and their estimated annual emissions are presented in Table 1 along with the estimated annual emissions of particulate matter under 10 microns (PM_{10}). Additionally, the distribution of ground-level air concentrations of PM_{10} was modeled for a radius of 6 miles around the Energy Facility. The area predicted to have the highest PM_{10} concentrations is depicted in Figure 1. Although organic constituents are estimated in the air emissions (see Table 1), all the organic HAPs are in the vapor phase (vapor phase fraction 100 percent; EPA, 1999), and thus are not expected to have significant deposition to soil or water in the Energy Facility area. Most of the polycyclic aromatic hydrocarbons (PAHs) also are in the vapor fraction (greater than 75 percent; EPA, 1999), and will not have significant deposition in the modeling domain. As a result, the organic HAPs are assumed to vaporize and are not evaluated in this ERA. Metals are of primary concern because of their potential for deposition and low, if any, loss rate from soil and water. These metals include arsenic, cadmium, chromium, cobalt, manganese, mercury, and nickel.

To determine air concentrations of the metals in soil and surface water, the concentration of PM_{10} was multiplied by the ratio of PM_{10} annual emission rate and annual emission rate of the metal. This approach was based on the assumption that all metals are a fraction of the PM_{10} air concentration. The estimated ground-level air concentration of each metal then was used to calculate soil and water concentrations using the following equation from the EPA combustion guidance (EPA, 1998b):

$$Cs = 100 * [(Dydw + Dyww)/(Zs*BD)]*tD$$

Where,

Cs = average soil or water concentration over exposure duration (mg/kg or mg/L),

100 = units conversion factor ($mg\text{-}m^2/kg\text{-}cm^2$),

Dydw = deposition rate of dry matter ($g/m^2\text{-}yr$),

Dyww = deposition rate of wet matter ($g/m^2\text{-}yr$),

Zs = soil or water mixing zone depth (cm) = 1 cm for soil, 609.6 cm for surface water in a generic reservoir, and 60.96 cm for surface water in a generic river,

BD = soil or water bulk density (g/cm^3) = 1.5 g/cm^3 for soil and 1 g/cm^3 for water,

tD = time over which deposition occurs (time period of combustion) (yr) = 30 yrs.

These calculations were based on the following conservative assumptions:

- A literature-derived deposition rate of 0.02 m/s (CAPCOA, 1993). This rate includes both dry and wet deposition and is highly conservative. In some cases, it has overestimated deposition by an order of magnitude (Howroyd, 1984).
- The value for "(Dydw + Dyww)" in the above equation was calculated by multiplying the predicted air concentration of the COPEC at ground level by the deposition rate. Although McFall Reservoir and Lost River are outside the area predicted to receive the highest concentration of PM_{10} (see Figure 1), the maximum predicted air concentration was used to estimate soil and surface water concentrations.
- No volatilization of metals occurs that results in 100 percent deposition of emissions. This is especially conservative for mercury because 100 percent of elemental mercury remains in the vapor fraction, and 85 percent of mercuric chloride is generally volatile (EPA, 1999).
- After deposition, no loss to processes, such as erosion, occurs.
- A mixing depth of 1 cm for soil was used as recommended in the combustion guidance (EPA, 1998b). For water bodies, a mixing depth of 20 feet (609.6 cm) for a generic

reservoir (surrogate for McFall Reservoir) and 2 feet (60.96 cm) for a generic river (surrogate for Lost River) were selected on the basis of best professional judgment given the latitude and elevation of areas surrounding the Energy Facility.

Table 2 presents summary statistics for predicted concentrations of each COPEC.

2.2.1 Process Wastewater Application

Maximum soil concentrations for the process wastewater application area were calculated from the predicted constituents in the process wastewater at 75 percent recovery (see Table 3). Aluminum, antimony, arsenic, barium, beryllium, cadmium, cobalt, copper, lead, mercury, molybdenum, nickel, selenium, silver, thallium, tin, and zinc were not detected in the aquifer source water; however, these metals are common in groundwater and likely exist at concentrations below the method reporting limits (MRLs). Therefore, as a conservative assumption, the MRLs for these metals were assumed to represent their concentration in the aquifer source water. Concentrations of these metals were predicted in the process wastewater by multiplying the MRL by a factor (1.954) based on the ratio of raw aquifer water concentration to predicted reject water concentration for metals with detected values (see Table 3). Maximum soil concentrations (MSC) were determined using the following equation:

$$\text{MSC} = \frac{(PWC * AWP * L)}{(AA * MD * BD)}$$

Where,

MSC = maximum soil concentration (mg/kg)

PWC = predicted wastewater concentration of constituent (mg/L),

AWP = annual wastewater production (24.3 million gallons or 1,985,500 L),

L = life-span of the energy plant (30 years),

AA = wastewater application area (31 acres or 125,452 m^2),

MD = soil mixing depth for agricultural lands (20 cm or 0.2 m; EPA, 1998b),

BD = bulk density for soil (literature-derived value of 1,500 kg/m^3; EPA, 1998b).

This calculation assumes that constituents accumulate during the 30-year life span of the Energy Facility with no loss from biodegradation, erosion, leaching, or other biotic or abiotic loss mechanisms (see Table 3 for estimated MSCs).

2.2.3 Background Soil Concentrations

Soil concentrations derived from air emissions or process wastewater application represent incremental exposure. Plants, soil invertebrates, and wildlife also are exposed to back-ground concentrations of many of the COPECs. Therefore, background values alone were also compared to screening benchmarks to determine the contribution of background to the total risk estimate. For this ERA, background values for Klamath County as reported by the U.S. Geological Service (USGS) (Boerngen and Shacklette, 1981) were used, as were

Washington statewide background values (San Juan, 1994) when USGS values were lacking. These values are presented in the risk characterization.

2.3 Assessment Endpoints and Measures of Exposure and Effects

Assessment endpoints are the ecological resources (e.g., potential receptors) that are present at a site and are to be protected. Measures of exposure and effects are the measures evaluated to provide an indication of whether assessment endpoints are sufficiently exposed such that adverse effects may have occurred or are likely to occur.

The areas surrounding the Energy Facility contain a variety of habitats, including riverine systems that support shortnose suckers, Lost River suckers, and bald eagles, which are all federally listed threatened or endangered species. Maintenance of resident aquatic resources is important to the success of these species. Moreover, maintenance of resident terrestrial habitats also is important to bald eagles, which use upland areas during the winter months when lakes and rivers are frozen (Brown and Amadon, 1968). Although Applegate's milk-vetch has been identified as a federally threatened or endangered species endemic to the area, this plant has not been observed in the area of major air emission deposition or in the process wastewater application area. EPA (1992a) identifies four criteria to consider when selecting assessment endpoints. The following is a summary of these criteria and their relationship to the assessment endpoints for the Energy Facility:

- Societal value: Threatened and endangered species (e.g., shortnose sucker, Lost River sucker, and bald eagle) are valued by society as evidenced by special protective legislation.
- Environmental policy goals: Threatened and endangered species (e.g., shortnose sucker, Lost River sucker, and bald eagle) are protected at the individual level.
- Ecological relevance: Aquatic organisms (aquatic plants, invertebrates, and fish) are integral components of the riverine ecosystem present in the Energy Facility area and plants, soil invertebrates, and terrestrial birds and mammals are integral components of the terrestrial ecosystem present in the Energy Facility area.
- Susceptibility to the stressor: Research has shown that aquatic organisms, plants, soil invertebrates, birds, and mammals may be adversely affected by exposure to the COPECs.

Aquatic organisms, terrestrial plants, soil invertebrates, birds, and mammals are potentially sensitive to contaminants and are considered ecologically important. Complete definitions of an assessment endpoint have three components (Suter et al., 2000): the entity, the attribute, and a level of effect. Table 4 summarizes the appropriate assessment endpoints and measures of exposure and effects.

Aquatic organisms, including fish, and bald eagles were evaluated for the aquatic pathways associated with air emissions. Terrestrial pathways for both air emissions deposition and irrigated reuse of process wastewater were evaluated using terrestrial plants, soil invertebrates, and terrestrial birds and mammals as receptors. Specific bird and mammal receptors included the western meadowlark and the deer mouse for the terrestrial assessment and the bald eagle for the aquatic assessment. Western meadowlarks and deer mice have foraging behaviors that are closely associated with the soil and, therefore, are likely to be highly exposed to COPECs in soil. Table 5 outlines life-history parameters for these species.

2.4 Conceptual Site Model

The conceptual site model (CSM) is a description of predicted relationships between ecological receptors and the COPEC to which they might be exposed.

An exposure pathway can be described as the physical course that a COPEC takes from the point of release to a receptor. An exposure pathway is complete (i.e., there is exposure) if there is a way for the receptor to take in chemicals through ingestion, inhalation, or dermal absorption. To be complete, an exposure pathway must have all the following components:

- Chemical source
- Mechanism for chemical release
- Environmental transport medium
- Exposure point
- Feasible route of intake

In the absence of any of these components, an exposure pathway is considered incomplete, and, by definition, there can be no risk associated with that particular exposure pathway. Exposure can occur when chemicals migrate from their source to an exposure point (i.e., a location where receptors can come into contact with the chemicals) or when a receptor moves into direct contact with chemicals or contaminated media.

2.4.1 Air Emissions

For purposes of this ERA, the air emissions from natural gas combustion at the Energy Facility are considered the primary source of the COPECs. These COPECs may deposit from air to the soil and surface water within the areas surrounding the Energy Facility. Significant transport of COPECs from the deposition area is not expected. Soil and surface water are the affected media and both aquatic and terrestrial routes of exposure to the COPECs are evaluated in this ERA. Receptors are potentially exposed by way of root or foliar uptake, dermal contact, inhalation, direct ingestion, and ingestion of prey items.

A wide variety of wildlife is supported by the Klamath Basin mix of habitats, and both terrestrial and aquatic routes of exposure to COPECs exist. Contaminants in water may be directly bioaccumulated by aquatic organisms resident in water bodies located in the vicinity of the Energy Facility, and contaminants in soil may be directly bioaccumulated by terrestrial plants or soil invertebrates. Both aquatic and terrestrial wildlife may be exposed directly to contaminants in soil or surface water by direct ingestion, by dermal contact, or by the inhalation of wind-borne particles. Little information is available on foliar uptake and inhalation routes, and exposure via these routes is expected to be minimal; therefore, these pathways will not be evaluated. Although the dermal contact route of exposure exists for many birds and mammals, dermal exposure is likely to be low because of the presence of protective dermal layers (e.g., feathers, fur, scales). Wildlife also may receive contaminant exposure through food-web transfer of chemicals from lower trophic levels (e.g., plants to herbivores, plants and prey animals to omnivores) and this is expected to be the primary exposure route for wildlife.

2.4.2 Process Wastewater Application

For purposes of this ERA, the process wastewater from the Energy Facility is considered the primary source of the COPECs. These COPECs are transferred to soil in the 31-acre pasture area. Process wastewater will only be applied 8 months of the year and will not be applied during the winter. Soil is the affected medium and only terrestrial routes of exposure to the COPECs are evaluated in this ERA. No aquatic routes of exposure are expected. Receptors are potentially exposed via root and/or foliar uptake, dermal contact, inhalation, direct ingestion, and ingestion of prey items.

Contaminants in soil may be directly bioaccumulated by terrestrial plants or soil invertebrates. Terrestrial birds and mammals may be exposed directly to contaminants in soil or surface water by direct ingestion, by dermal contact, or by the inhalation of wind-borne particles. Little information is available on foliar uptake and inhalation routes and exposure via these routes is expected to be minimal; therefore, these pathways will not be evaluated. Although the dermal contact route of exposure exists for many birds and mammals, dermal exposure is likely to be low because of the presence of protective dermal layers (e.g., feathers, fur, scales). Wildlife also may receive contaminant exposure through food-web transfer of chemicals from lower trophic levels (e.g., plants to herbivores, plants and prey animals to omnivores) and this is expected to be the primary exposure route for wildlife.

3. Exposure Assessment

3.1 Aquatic Organisms

Aquatic organisms (aquatic plants, invertebrates, fish) experience exposure based on concentrations in water (i.e., exposure is water-mediated). Water-mediated exposure occurs as a consequence of living in a contaminated medium. Uptake of COPECs can be through the skin (dermal), through the gills, or through the diet, including ingestion of contaminated water and food. Water-mediated exposure to aquatic organisms is measured as a function of the concentration of contaminants in water (milligrams COPEC per liter water [mg/L]). Water-mediated exposure is used because most information on the effects of contaminants on aquatic organisms (described in Section 4.1) has been obtained from experiments where the exposure to contaminants was reported as a function of the concentrations of contaminants in water. To be conservative, the maximum estimated water concentration for each surface water type (i.e., generic reservoir and generic river) was selected as the suitable exposure point concentration.

3.2 Terrestrial Plants

Terrestrial plants experience exposure based on concentrations in soil (i.e., exposure is soil-mediated). Soil-mediated exposure occurs as a consequence of living in a contaminated medium. For plants, uptake of COPECs can be through roots. Soil-mediated exposure to plants is measured as a function of the concentration of contaminants in soil (milligrams lead per kilogram soil [mg/kg]). Soil-mediated exposure is used because most information on the effects of contaminants on plants (described in Section 4.2) has been obtained from experiments where the exposure to contaminants was reported as a function of the concentrations of contaminants in soil. Because plants are not mobile and to be highly conservative, the maximum estimated concentration was selected as the suitable exposure point concentration.

3.3 Soil Invertebrates

Like plants, soil invertebrates also experience soil-mediated exposure. Uptake of COPECs can be through the skin (dermal), or through the diet, including ingestion of contaminated soil and food. As with plants, most information on the effects of contaminants on soil invertebrates (described in Section 4.3) has been obtained from experiments where the exposure to contaminants was reported as a function of the concentrations of contaminants in soil. Therefore, the focus of the exposure characterization for soil-mediated exposures is the derivation of soil exposure point concentrations. Because mobility of terrestrial invertebrates is low, the maximum concentration was selected as the suitable exposure point concentration.

3.4 Birds and Mammals

Birds and mammals experience exposure through multiple pathways including ingestion of abiotic media (soil, sediment, and surface water) and biotic media (food) as well as inhalation and dermal contact. To address this multiple pathway exposure, modeling is required. Generally, the end product or exposure estimate for birds and mammals is a dosage (amount of chemical per kilogram receptor body weight per day [mg/kg/d]) rather than a media concentration as is the case for the other receptor groups (aquatic organisms, terrestrial plants, and soil invertebrates). This is a function of both the multiple pathway approach as well as the typical methods used in toxicity testing for mammals. However, ODEQ has developed soil screening-level values for birds and mammals and water screening-level values for birds for some contaminants based on conservative assumptions (ODEQ, 2001). These values are intended to be protective of terrestrial birds and mammals and aquatic birds, respectively, and were used as available. To be conservative, the maximum concentration was selected as the suitable exposure point concentration for comparison to the ODEQ screening values.

If no screening value was available for a COPEC, or a screening value was exceeded, receptor-specific exposure was calculated and compared to literature-derived toxicity values. Moreover, receptor-specific exposure was calculated for bald eagles because it is a special-status species. Summaries of total (i.e., sum over all pathways) and partial (pathway-specific) exposure estimates, as needed, are presented and compared to toxicity values in Section 5. The model used for estimating receptor-specific exposure and associated assumptions is described below.

Model

The general form of the model (Suter et al., 2000) used to estimate exposure of birds and mammals to COPECs in soil, surface water, and food items is as follows:

$$E_t = E_o + E_d + E_i$$

Where:

E_t = the total chemical exposure experienced by wildlife

E_o, E_d, and E_i = oral, dermal, and inhalation exposure, respectively

Oral exposure occurs through the consumption of contaminated food, water, or soil. Dermal exposure occurs when contaminants are absorbed directly through the skin. Inhalation exposure occurs when volatile compounds or fine particulates are inhaled into the lungs.

Although methods are available for assessing dermal exposure to humans (EPA, 1992b), data necessary to estimate dermal exposure generally are not available for wildlife (EPA, 1993). Similarly, methods and data necessary to estimate wildlife inhalation exposure are poorly developed or generally not available (EPA, 1993). Therefore, for the purposes of this ERA, both dermal and inhalation exposure are assumed to be negligible. As a consequence, most exposure must be attributed to the oral exposure pathway. There are no surface water sources on the 31-acre process wastewater application area and, given the arid environment, all water applied to soil is assumed to be rapidly absorbed; therefore, water ingestion is considered an incomplete or insignificant exposure pathway. In contrast, deposition from air emissions is likely to occur in surface waters; therefore, water ingestion is included in the exposure calculations for air emission deposition. By replacing E_o with a generalized exposure model modified from Suter et al. (2000), the previous equation was rewritten as follows:

$$E_j = \left[Water_j \times WIR\right] + \left[Soil_j \times P_s \times FIR\right] + \left[\sum_{i=1}^{N} B_{ij} \times P_i \times FIR\right]$$

Where:

E_j = total exposure (mg/kg/d)

$Water_j$ = concentration of chemical (j) in water (mg/L)

WIR = species-specific water ingestion rate (L water/kg body weight/d)

$Soil_j$ = concentration of chemical (j) in soil (mg/kg)

P_s = soil ingestion rate as proportion of diet

FIR = species-specific food ingestion rate (kg food/kg body weight/d)

B_{ij} = concentration of chemical (j) in biota type (i) (mg/kg)

P_i = proportion of biota type (i) in diet

Assumptions

To establish parameters for the exposure model, various assumptions were necessary. These assumptions are outlined below.

Exposure Point Concentrations. As with the comparisons to ODEQ screening values, a highly conservative approach was taken and the maximum estimated concentration was incorporated into the exposure model as the exposure point concentrations for soil and surface water. Because there is primary concern for bald eagles utilizing the McFall Reservoir, the generic reservoir surface water values (maximum concentrations) were used as exposure point concentrations for bald eagles.

Life History Parameters. The specific life-history parameters required to estimate exposure of birds and mammals to COPECs include body weight, ingestion rate of food, ingestion rate of water (for air emissions analysis only), dietary components and percentage of the overall diet represented by each major food type, and approximate amount of soil that may be incidentally ingested based on feeding habits. These parameters, as well as home range information, were obtained from the literature and are presented in Table 5.

Bioaccumulation Values. Measurements of concentrations of COPECs in wildlife foods are a critical component for the estimation of oral exposure in birds and mammals. Although the preferred data are direct measurements of concentrations in samples collected from the site, such data were not available in the vicinity of the Energy Facility. Therefore, literature-reported bioaccumulation factors (BAFs), regressions, or Kow-based models for terrestrial food items (foliage and insects) and literature-reported bioconcentration factors (BCFs) for aquatic food items were used.

BAFs or regressions were available for foliage (Bechtel-Jacobs, 1998; CH2M HILL, 2002), and insects (CH2M HILL, 2002) for the inorganics, models (K_{ow}-based) from EPA (2000) were used to estimate bioaccumulation factors (BAFs) for phenol in foliage and earthworms. The earthworm model was used as a surrogate for insects. To be conservative, the fraction of organic carbon required for the earthworm bioaccumulation model was assumed to be 1 percent. No foliage BAFs were available for cyanide, silver, thallium, or tin and no insect BAFs were available for cyanide, or tin; therefore, a BAF of one was assumed for these COPECs. BCFs were available for fish (Sample et al., 1997) for all COPECs, except cobalt and manganese. A BCF of one was assumed for these two COPECs. Table 6 summarizes the BAFs and BCFs used in the ERA.

4. Characterization of Ecological Effects

4.1 Aquatic Organisms

Screening-level toxicity values for aquatic organisms are provided by ODEQ guidance (ODEQ, 2001) and are shown in Table 7. For most cases, these values are the same as the National Ambient Water Quality Criteria (EPA, 2002) or chronic values developed at the Oak Ridge National Laboratory (ORNL) (Suter and Tsao, 1996). These values are intended to protect 95 percent of aquatic species, 95 percent of the time. Screening values are only shown for the COPECs associated with air emissions. An aquatic pathway is not complete for the process wastewater application.

4.2 Terrestrial Plants

Screening-level toxicity values for terrestrial plants are provided by ODEQ guidance (ODEQ, 2001) and are shown in Table 7. Most of these screening values are from the ORNL plant benchmarks report (Efroymson et al., 1997a). The protection of terrestrial plant communities from a 20 percent reduction in growth, reproduction, or survival is an assessment endpoint in this ERA. Therefore, benchmarks used to determine risk to this receptor group must be based on adverse effects related to these endpoints. The ORNL plant benchmarks were developed from studies that demonstrated at least a 20 percent reduction in the growth or yield of test plant species, which is consistent with the goals of the ERA.

Additionally, growth and yield are important to plant populations and to the ability of the vegetation to support higher trophic levels; therefore, these are ecologically significant responses (Efroymson et al., 1997a).

4.3 Soil Invertebrates

Single-chemical screening-level toxicity values for soil invertebrates are provided by ODEQ guidance (ODEQ, 2001) and are shown in Table 7. Most of these screening values are from the ORNL soil invertebrate benchmarks report (Efroymson et al., 1997b) and are represented primarily by earthworms. The protection of terrestrial invertebrate communities from a 20 percent reduction in growth, reproduction, or survival is an assessment endpoint this assessment. Therefore, benchmarks used to determine risk to this receptor group must be based on adverse effects related to these endpoints. The ORNL soil invertebrate benchmarks were developed from studies that demonstrated at least a 20 percent reduction in the growth or survival of test invertebrate species, which is consistent with the goals of the ERA.

4.4 Birds and Mammals

Screening-level values for birds and mammals provided by ODEQ (ODEQ, 2001) were used as available in the ERA and are presented in Table 7. For birds, cobalt, iron, silver, thallium, and tin were lacking ODEQ screening values, but studies from which benchmarks could be developed for these metals were available. Similarly, iron, silver, tin, cyanide, and phenol benchmarks were developed for mammals from other sources. No data for birds were available for development of benchmarks for cyanide or phenol. Unlike the ODEQ screening values, which are presented as mg constituent per kg soil, these benchmarks are presented as a dose (mg constituent/kg body weight/day) to the receptor and were selected as described below.

Single-chemical toxicity data for birds and mammals consist of no observable adverse effect levels (NOAEL) or lowest observable adverse effect levels (LOAEL) derived from toxicity studies reported in the literature. The benchmarks for birds and mammals were obtained from several sources, including wildlife toxicity reviews, literature searches, wildlife benchmarks developed at ORNL (Sample et al., 1996), the EPA Region IX Biological Technical Assistance Group (BTAG) toxicity reference values (TRV) developed for the U.S. Navy (EFA West, 1998), and a Review of the Navy-EPA Region IX BTAG TRVs for Wildlife (CH2M HILL, 2000). Appropriate studies were selected based on the following criteria:

- Studies were of chronic exposures or exposures during a critical life-stage (i.e., reproduction).
- Exposure was oral through food, to ensure data were representative of oral exposures expected for wildlife in the field.
- Emphasis was placed on studies of reproductive impacts, to ensure relevancy to population-level effects.
- Studies presented adequate information to evaluate and determine the magnitude of exposure and effects (or no effects concentrations).

Multiple toxicity studies were available for birds and mammals for several analytes. Toxicity studies were selected to serve as the primary toxicity value if exposure was chronic or during reproduction, the dosing regime was sufficient to identify both a NOAEL and a LOAEL, and the study considered ecologically relevant effects (i.e., reproduction, mortality, growth). If multiple studies for a given COPEC met these criteria, the study generating the lowest reliable toxicity value was selected to be the primary toxicity value. Primary toxicity values were used for all initial evaluations of the exposure estimates and are highlighted in Table 8. Information concerning assumptions made as part of the extraction of data from each study is presented in the one attachment to this memorandum.

NOAELs and LOAELs for avian and mammalian receptors were estimated from literature data using allometric scaling methods presented in Sample et al. (1996) and Sample and Arenal (1999). Using the following equation, NOAEL or LOAEL for wildlife ($NOAEL_w$ or $LOAEL_w$) were determined for each species:

$$NOAEL_w = NOAEL_t \left(\frac{BW_t}{BW_w} \right)^{1-b} \text{ or } LOAEL_w = LOAEL_t \left(\frac{BW_t}{BW_w} \right)^{1-b}$$

where:

$NOAEL_t$	=	the NOAEL for a test species (obtained from the literature),
$LOAEL_t$	=	the NOAEL for a test species (obtained from the literature),
BW_t and BW_w	=	the body weights (in kg) for the test and wildlife species, respectively, and
b	=	the class-specific allometric scaling factor.

Scaling factors of 0.94 and 1.2 were applied for mammals and birds, respectively (Sample and Arenal, 1999). Table 9 presents these receptor-specific NOAELs and LOAELs.

5. Risk Characterization

In the risk characterization, exposure and effects data are combined to draw conclusions concerning the presence, nature, and magnitude of effects that may exist at the site. For all receptors (i.e., aquatic organisms, terrestrial plants, soil invertebrates, and birds and mammals), only literature-derived benchmarks were available. These were compared to maximum soil or water concentrations or dose based on maximum soil or water concentration to determine hazard quotients (HQs = exposure measure/effects measure) for each COPEC. Screening-level benchmarks are conservative; therefore, COPECs that are below these thresholds pass the screen and are not considered in future evaluations. However, HQs greater than one indicate a failure to pass the screen. Failure to pass the screen, however, cannot be concluded to represent the presence of risk. Rather, these results indicate that available data are insufficient to support a conclusion that ecological risks are absent. Constituents that failed the screen were reevaluated using more realistic assumptions.

Results of the screening evaluations for deposition from air emissions and process wastewater application are discussed below. Uncertainties that may influence these screening-level results are summarized in Section 5.3.

5.1 Air Emissions

Screening results for incremental, background, and total soil concentrations and incremental surface water concentrations (generic reservoir and generic river) against ODEQ screening values are presented in Tables 10 and 11, respectively. Table 12 presents bird and mammal screening evaluations based on receptor-specific parameters for COPECs that failed the ODEQ screen (chromium for birds), for COPECs lacking ODEQ screening values (cobalt for birds), and for bald eagles.

For terrestrial receptors (i.e., plants, soil invertebrates, and birds and mammals), chromium, manganese, and nickel failed to pass the screening evaluation when total (incremental + background) concentrations were evaluated (Table 10). Chromium exceeded the ODEQ screening values for plants, soil invertebrates, and birds; manganese exceeded the screening value for plants and soil invertebrates, and nickel exceeded the screening value for plants. However, in all cases, these exceedances were driven by background concentrations and no HQs greater than one were observed based on incremental concentrations. Because total chromium concentrations exceeded the ODEQ benchmark (HQ = 11.25) for birds and because no ODEQ avian screening value was available for cobalt, these COPECs were further evaluated using receptor-specific parameters to calculate exposure to western meadowlarks (see Table 11). In this evaluation, estimated oral exposure to chromium and cobalt was less than literature-derived benchmarks for these COPECs (see Table 11). Therefore, potential risks from chromium, manganese and nickel to plants, soil invertebrates, and birds are considered to be negligible.

Estimated maximum concentrations of all COPECs under both the generic reservoir and generic river scenarios were below ODEQ benchmarks for aquatic biota and aquatic birds (see Table 11). Therefore, no risk is expected from any of these COPECs. Because no ODEQ aquatic bird screening value was available for cobalt, this COPEC was further evaluated using receptor-specific parameters to calculate exposure (see Table 11). Additionally, exposure calculations using receptor-specific parameters were performed for bald eagles because it is a special-status species that is of special concern within the deposition area of air emissions from the Energy Facility (see Table 11). None of the COPECs evaluated further exceeded oral exposure benchmarks for birds (i.e., all HQs were less than one) (see Table 11). Thus, deposition of metals from air emissions is considered to present no risk to aquatic organisms or bald eagles using reservoirs in the vicinity of the Energy Facility. Moreover, no risk to aquatic organisms, including the shortnose sucker and Lost River sucker, or birds using the riverine habitats in the vicinity of the Energy Facility is expected.

5.2 Process Wastewater Application

Screening results for incremental, background, and total soil concentrations against ODEQ screening values are presented in Table 13. Bird and mammal screening evaluations for COPECs lacking ODEQ values are presented in Table 14.

As indicated in Table 13, several process wastewater constituents (aluminum, barium, boron, chromium III, copper, fluoride, iron, manganese, molybdenum, and nickel) failed to pass the screening evaluation (i.e., HQs greater than one for any receptor) when total (incremental + background) concentrations were evaluated. However, the exceedances of all but boron and molybdenum were driven by background concentrations. It is notable that the ODEQ plant screening value for iron is not a soil concentration, but in fact, represents the screening value for iron in solution. Because it is not applicable to soil, this benchmark was considered inappropriate for use in the screening evaluation. Although risk to plants from iron exposure is uncertain, no incremental risk was found for soil invertebrates, birds, and mammals.

Additionally, incremental exposure to iron is only 0.02 percent of the background exposure and is likely insignificant compared to background. Of the constituents evaluated separately for birds and mammals (dose calculations), only iron exceeded the NOAELs with HQs of 17 and 3,139 for meadowlarks and deer mice, respectively (see Table 14). As with the evaluation in Table 13, these exceedances were driven by background iron concentrations with no exceedances of the toxicity reference values based on wastewater discharge alone. HQs for incremental exposure to iron were 0.003 and 0.504 for meadowlarks and deer mice, respectively. Therefore, the incremental exposure to plants, soil invertebrates, birds, and mammals from the process wastewater application is expected to be minor for all constituents, except for boron and molybdenum exposures to plants and boron exposures to invertebrates. Constituents for which toxicity benchmarks are lacking were not evaluated and remain an uncertainty. Additionally, salts and total dissolved solids (TDS) were evaluated elsewhere in the BA.

Estimated maximum incremental boron concentrations in soil were 93 times the screening value of 0.5 mg/kg. However, the screening value represents the toxicity level for highly sensitive plant species. For boron-tolerant species (e.g., alfalfa), toxicity thresholds are approximately 2 to 4 mg/kg (Brown et al., 1983). This reduces the HQ from 53.4 to approximately 23.3 to 11.7 for the boron-tolerant species selected for planting in the application area. Moreover, less than 5 percent of the total boron in soil is available for uptake to plants (Eisler, 2000), reducing the estimated incremental exposure from 26.7 mg/kg to 1.33 mg/kg and the total exposure from 46.7 to 2.33 mg/kg. Though these concentrations still exceed the screening level derived for sensitive plants species, they are below concentrations associated with toxic effects to boron-tolerant plants when considering boron bioavailability. Boron concentrations adjusted for bioavailability are also below the screening level for invertebrates.

Molybdenum is an essential micronutrient that is not highly toxic to plants, but bioaccumulates in plant tissue and is generally of concern to higher trophic organisms (Eisler, 2000). Ruminants (e.g., cattle and sheep) in particular can be sensitive to molybdenum exposure in forage because excess molybdenum may result in a copper deficiency (Eisler, 2000). However, the maximum estimated total molybdenum concentration in soil did not exceed the screening benchmarks for birds and mammals and is therefore unlikely to pose risk to these receptors.

Although the molybdenum benchmark for plants was exceeded, risk to terrestrial plants from molybdenum exposure is considered low because of the low exceedance of the screening value (HQ = 2.7 for total molybdenum). Additionally, the highly conservative assumptions applied to the risk estimation likely result in an overestimation of molybdenum exposure. First, molybdenum was not measured in the raw aquifer water and was therefore estimated using the minimum reporting limit. Moreover, the maximum soil concentration of molybdenum was estimated assuming a wastewater output of 24.3 million gallons based on a 72 percent capacity factor for the Energy Facility. The actual capacity of the Facility will likely be closer to 40 percent, resulting in the creation of 13.5 million gallons of wastewater. At 40 percent capacity, the estimated soil concentration of molybdenum from wastewater application would be reduced from 2.41 to 1.34 mg/kg, a value below the screening benchmark for plants. Finally, the calculation used to estimate soil concentrations from wastewater application assume that there is no loss due to abiotic or biotic factors. As a consequence, the calculated molybdenum concentration likely represents an overestimate of exposure to organisms.

5.3 Uncertainty Analysis

Uncertainties are inherent in all risk assessments. The nature and magnitude of uncertainties depend on the amount and quality of data available, the degree of knowledge concerning site conditions, and the assumptions made to perform the assessment. The following is a qualitative evaluation of the major uncertainties associated with this assessment, in no particular order of importance:

- Concentrations of COPECs in soil and surface water were wholly estimated on the basis of predicted concentrations of COPECs in air emissions and process wastewater from the Energy Facility. Although this uncertainty may result in underestimation of exposure (and risk), the conservative assumptions applied to air emission and process wastewater predictions, as well as the conservative assumptions used to convert these concentrations to soil and water concentrations, likely result in an overestimation of risk.

- Literature-derived values for bulk density of soil, soil and water mixing depths, and deposition rate of air emissions were used to calculate soil and water concentrations. The suitability of these literature values is unknown, although these are conservative values. Therefore, risk may be underestimated, but is likely overestimated.

- Based on best professional judgment, mixing depths of 20 feet for reservoirs and 2 feet for rivers were selected for estimating surface water concentrations from air emissions deposition. The suitability of these values is unknown. Consequently, risk may be over- or underestimated.

- Constituents in wastewater were estimated assuming a 72 percent capacity factor for the Energy Facility. It is more likely that the Facility will be operated at approximately 40 percent capacity. Therefore, wastewater concentrations and resulting risk are likely overestimated.

- Molybdenum, copper, and sulfur have complex interactions in soil that can result in increased or decreased toxicity to foraging animals. For example, excess molybdenum can cause a copper deficiency, though adequate molybdenum can decrease toxicity associated with excess copper. Because of the uncertainties in the risk estimation (e.g., copper and molybdenum were not detected in the raw aquifer water) and the complex nature of these constituents, it is uncertain whether risk was over- or underestimated for copper and molybdenum, although effort was made to overestimate risk through the conservative set of assumptions.

- Data concerning soil ingestion rates for bird and mammal receptors were not available. As a consequence, the soil ingestion rates were estimated on the basis of assumed similarities to other species for which data were available. The suitability of these assumptions is unknown. Although this uncertainty may result in underestimation of exposure (and risk), it is more likely that exposure and risk are overestimated.
- No life history data specific to the COB Energy Facility area were available; therefore, exposure parameters were either modeled on the basis of allometric relationships (e.g., food ingestion rates) or were based on data from the same species in other portions of its range. Because diet composition as well as food, water, and soil ingestion rates can differ among individuals and locations, published parameter values may not accurately reflect individuals present at the site. As a consequence, risk may be either overestimated or underestimated.
- No site-specific data on COPEC concentrations in fish, terrestrial plants, and soil invertebrates were available for wildlife exposure estimate calculations. Therefore, concentrations in these prey items were estimated from literature-reported bioaccumulation models (BCFs, 90^{th} Percentile BAFs, regressions, or Kow-based). The suitability of these bioaccumulation models is unknown. As a consequence, concentrations of COPECs in prey items of wildlife may be either greater than or less than data used in this assessment.
- Literature-derived toxicity data based on laboratory studies were used to evaluate risk to all receptor groups. It was assumed that effects observed in laboratory species were indicative of effects that would occur in wild species. The suitability of this assumption is unknown. Consequently, risk may be either overestimated or underestimated.
- Literature-derived toxicity data are not available for western meadowlarks, bald eagles, or deer mice. Therefore, laboratory studies on the effects of COPECs on test species (e.g., quail, chicken, mallard, rat, mouse, rabbit) were used to evaluate risks to these receptors. It was assumed that effects observed in these test species were indicative of effects that would occur in the receptor. However, sensitivity to COPECs can vary between species, and this variation may be even more varied between taxonomic groups (i.e., galliforms versus raptors). Consequently, risk may be either overestimated or underestimated.
- Toxicity data are not available for all COPECs considered in this ERA. As a consequence, COPECs for which toxicity data are unavailable were not evaluated. Exclusion of COPECs from evaluation underestimates aggregate risk.
- Bioavailability in the toxicity studies used for screening is generally high because many toxicity tests are performed using soluble salts of inorganic chemicals. Therefore, risk based solely on literature-derived toxicity values may be overestimated.
- Because toxicity data are not available for individual bird and mammal receptors, it was necessary to extrapolate toxicity values from test species to site receptor species. Although improved class-specific scaling factors were employed (Sample and Arenal,

1999), these factors are not chemical-specific and are based on acute toxicity data. As a consequence, risk may be either overestimated or underestimated.

- In this assessment, risks from COPECs each were considered independently (i.e., no ambient media toxicity data were available). Because chemicals may interact in an additive, antagonistic, or synergistic manner, evaluation of single-chemical risk may either underestimate or overestimate risks associated with chemical mixtures.

6. Conclusions

6.1 Air Emissions

For terrestrial receptors (i.e., plants, soil invertebrates, birds, and mammals), chromium, manganese, and nickel failed to pass the screening evaluation when total (incremental + background) concentrations were evaluated. However, in all cases, these exceedances were driven by background concentrations. Receptor-specific evaluation of chromium and cobalt exposure to birds resulted in no exceedances of literature-based toxicity thresholds. Therefore, exposure to arsenic, cadmium, cobalt, and mercury associated with air emissions from the Energy Facility poses no risk to plants, soil invertebrates, birds, and mammals, whereas potential risks to plants, soil invertebrates, and birds from exposure to chromium, manganese, and nickel are considered to be negligible.

None of the COPECs exceeded benchmarks for aquatic receptors; therefore, deposition of air emissions from the Energy Facility to surface water poses no risk to aquatic organisms, such as the shortnose sucker, Lost River sucker, and bald eagle.

6.2 Process Wastewater Application

Process wastewater constituents evaluated, except aluminum, barium, boron, chromium III, copper, fluoride, iron, manganese, molybdenum, and nickel, passed the screening evaluation and are considered to present no risk to ecological receptors. After further evaluation, background concentrations were found to be the primary driver for screening failures of aluminum, barium, chromium III, copper, fluoride, iron, manganese, and nickel, with negligible incremental contributions of these constituents to the risk estimation. Considering the bioavailability of boron to plants (less than 5 percent of total boron) substantially reduced the risk estimation for boron. Although both incremental and total (incremental + background) boron concentrations continued to exceed screening levels for sensitive plant species, incremental and total exposures were below toxicity thresholds for invertebrates and for boron-tolerant plant species when adjusted for boron bioavailability. Estimated maximum concentrations of molybdenum exceeded the soil benchmark for plants; however, risk to terrestrial plants from molybdenum exposure is considered low owing to the low exceedance of the screening value and the highly conservative assumptions applied to the risk estimation. Thus, none of the constituents evaluated are considered to present significant risk to ecological receptors.

References

Bechtel-Jacobs Company. 1998. Empirical Models for the Uptake of Inorganic Chemicals from Soil by Plants. BJC/OR-133. U.S. Department of Energy, Oak Ridge, Tennessee.

Beyer, W.N., E. Conner, and S. Gerould. 1994. Estimates of Soil Ingestion by Wildlife. *J. Wildl. Manage*. 58:375-382.

Boerngen, J. G. and H. T. Shacklette. 1981. Chemical Analyses of Soils and Other Surficial Materials of the Conterminous United States. U.S. Geological Survey, Open-File Report 81-197.

Brown, L., and D. Amadon. 1968. *Eagles, Hawks, and Falcons of the World, Vol. 1*. New York, New York: McGraw-Hill.

Brown, K. W., G. B. Evans, Jr., B. D. Frentrup. 1983. Hazardous Waste Land Treatment. Butterworth Publishers, Boston, Massachusetts.

Brylski, P. 1990. Deer Mouse. *Peromyscus maniculatus*. In *California Wildlife. Vol. III. Mammals* (D.C. Zeiner, W.F. Laudenslayer, Jr., K.E. Mayer, and M. White, eds.). California Department of Fish and Game. 226-227.

Cain, B.W., and E.A. Pafford. 1981. Effects of Dietary Nickel on Survival and Growth of Mallard Ducklings. *Arch. Environm. Contam. Toxicol*. 10:737-745.

Cain, B.W., L. Sileo, J.C. Franson, and J. Moore. 1983. Effects of Dietary Cadmium on Mallard Ducklings. *Environ. Res.* 32: 286-297.

Calder, W. A., and E. J. Braun. 1983. Scaling of Osmotic Regulation in Mammals and Birds. *Am. J. Physiol*. 224: R601-R606.

California Air Pollution Control Officers Association (CAPCOA). 1993. *Air Toxics "Hot Spots" Program – Revised 1992 Risk Assessment Guidelines*. October 1993.

CH2M HILL. 2000. Review of the Navy – EPA Region 9 BTAG Toxicity Reference Values for Wildlife. Prepared for : U.S. Army Biological Technical Assistance Group (BTAG) and U.S. Army Corps of Engineers. March.

CH2M HILL. 2002. *Development of Terrestrial Exposure and Bioaccumulation Information for the Army Risk Assessment Modeling System (ARAMS)*. Prepared for: U.S. Army Center for health Promotion and Preventive Medicine, Toxicology Directorate, Health Effects Research Program. December.

Diaz G.J., R.J. Julian, and E.J. Squires. 1994. Lesions in Broiler Chickens Following Experimental Intoxication with Cobalt. *Avian Disease*. 38 (2): 308-316.

EFA West (Engineering Field Activity, West). 1998. *Development of Toxicity Reference Values as Part of a Regional Approach for Conducting Ecological Risk Assessments at Naval Facilities in California*. Interim Final. EFA West, Naval Facilities Engineering Command. United States Navy. San Bruno, California.

Efroymson, R.A., M.E. Will, and G. W. Suter II. 1997b. *Toxicological Benchmarks for Screening Contaminants of Potential Concern for Effects on Soil and Litter Invertebrates and Heterotrophic*

Process: 1997 Revision, ES/ER/TM-126/R2. Oak Ridge National Laboratory, Oak Ridge, Tennessee.

Efroymson, R.A., M.E. Will, G.W. Suter II, and A.C. Wooten. 1997a. *Toxicological Benchmarks for Screening Contaminants of Potential Concern for Effects on Terrestrial Plants*: 1997 Revision, ES/ER/TM-85/R3. Oak Ridge National Laboratory, Oak Ridge, Tennessee.

Eisler, R. 2000. Handbook of Chemical Risk Assessment: Health Hazards to Humans, Plants, and Animals. Volume 3: Metalloids, Radiation, Cumulative Index to Chemicals and Species. Lewis Publishers, Boca Raton, Florida.

EPA (U.S. Environmental Protection Agency). 1988. *Recommendations for and Documentation of Biological Values for Use in Risk Assessment*. Environmental Criteria and Assessment Office, Cincinnati, Ohio. EPA/600/6-87/008.

EPA (U.S. Environmental Protection Agency). 1992a. *Framework for Ecological Risk Assessment*. EPA/630/R-92/001. Risk Assessment Forum, Washington, D.C.

EPA (U.S. Environmental Protection Agency). 1992b. *Dermal Exposure Assessment: Principles and Applications.* EPA/600/8-91-011B. Office of Health and Environmental Assessment, Washington, D.C.

EPA (U.S. Environmental Protection Agency). 1993. *Wildlife Exposure Factors Handbook. Volume I.* Office of Research and Development, Washington, DC. EPA/600/R-93/187a.

EPA (U.S. Environmental Protection Agency). 1995. *Great Lakes Water Quality Initiative Criteria Documents for the Protection of Wildlife.* Office of Water. Washington, D.C. EPA-820\b-95\008. March.

EPA (U.S. Environmental Protection Agency). 1997. Aquatic Toxicology Information Retrieval Database (AQUIRE). Office of Research and Development, National Health and Environmental Effects Research Laboratory, Mid-Continent Ecology Division. January.

EPA (U.S. Environmental Protection Agency). 1998a. Final Guidelines for Ecological Risk Assessment, Risk Assessment Forum, EPA, Washington, D.C., EPA/630/R-95/002F. April.

EPA (U.S. Environmental Protection Agency). 1998b. Human Health Risk Assessment Protocol for Hazardous Waste Combustion Facilities. EPA530-D-98-001A. Washington, DC. Office of Solid Waste and Emergency Response.

EPA (U.S. Environmental Protection Agency). 1999. Screening Level Ecological Risk Assessment Protocol for Hazardous Waste Combustion Facilities. Peer Review Draft. November.

EPA (U.S. Environmental Protection Agency). 2000. Ecological Soil Screening Level Guidance Draft. June.

EPA (U.S. Environmental Protection Agency). 2002. National Recommended Water Quality Criteria: 2002. EPA-822-R-02-047. Office of Water and Office of Science and Technology. Washington, DC.

Haseltine, S.D., L. Sileo, D.J. Hoffman, and B.D. Mulhern. 1985. Effects of Chromium on Reproduction and Growth in Black Ducks.

Heinz, G. H. 1976. Methylmercury: Second-year Feeding Effects on Mallard Reproduction and Duckling Behavior. *J Wildl Manage*. 4: 82-90.

Heinz, G. H., and D. J. Hoffman. 1998. Methylmercury Chloride and Selenomethionine Interactions on Health and Reproduction in Mallards. *Environ Toxicol Chem* 17: 139-145.

Heinz, G. H., D. J. Hoffman, and L. G. Gold. 1989. Impaired Reproduction of Mallards Fed an Organic Form of Selenium. *J Wildl Manage*. 53: 418-428.

Howroyd, G.C. 1984. *Technical Guide for Estimating Fugitive Dust Impacts from Coal Handing Operations*. Prepared by Dames and Moore for U.S. Department of Energy. DOE/RG/10312-1 (vol. 2) (DE85010939). September.

Imler, R. H., and E. R. Kalmbach. 1955. *The Bald Eagle and its Economic Status*. U.S. Fish Wildl. Ser. Circ. 30.

Kendeigh, S. C. 1941. Birds of a Prairie Community. *Condor*. 43:165-174.

Lanyon, W. E. 1994. Western Meadowlark (*Sturnella neglecta*). The Birds of North America, No. 104. A Poole and F. Gill, eds. Philadelphia, Pennsylvania: The Academy of Natural Sciences, and Washington, D.C.: The American Ornithologists' Union.

Laskey, J.W., and F.W. Edens. 1985. Effects of Chronic High-level Manganese Exposure on Male Behavior in the Japanese Quail (*Cotirnix coturnix japonica*). *Poult. Sci*. 64:579-584.

Mahaffy, M. S., and L. D. Frenzel. 1987. Territorial Responses of Northern Bald Eagles Near Active Nests. *J. Wildl. Manage*. 51:551-554.

NRC. 1980. Mineral Tolerance of Domestic Animals. National Academy of Sciences – National Research Council, Washington, D.C. *In* McDowell, L.R. 1992. *Minerals in Animal and Human Nutrition*. Academic Press, San Diego, California.

ODEQ (Oregon Department of Environmental Quality). 2001. Guidance for Ecological Risk Assessment Level II – Screening Level Values. Last accessed: Aug 13, 2003. Available from http://www.deq.state.or.us/ wmc/documents/eco-2slv.pdf

Ofelt, C. H. 1975. Food Habits of Nesting Bald Eagles in Southeast Alaska." *Condor*. 77:337-338.

Richardson, M.E. and M.R. Spivey Fox. 1974. Dietary Cadmium and Enteropathy in the Japanese Quail. *Laboratory Investigation*. 31:722-731.

Sample, B.E., and C.A. Arenal. 1999. Allometric Models for Inter-species Extrapolation of Wildlife Toxicity Data. *Bull Environ Contam Toxicol*. 62:653-663.

Sample, B.E., D.M. Opresko and G.W. Suter II. 1996. *Toxicological Benchmarks for Wildlife: 1996 Revision*. ES/ER/TM-86/R3. Oak Ridge National Laboratory, Oak Ridge, Tennessee.

Sample, B. E., M. S. Aplin, R. A. Efroymson, G. W. Sutter II, and C. J. E. Welsh. 1997. *Methods and Tools for Estimation of the Exposure of Terrestrial Wildlife to Contaminants*. ORNL/TM-13391. Oak Ridge National Laboratory, Oak Ridge, Tennessee.

San Juan, C. 1994. *Natural Background Soil Metals Concentrations in Washington State*. Toxics Cleanup Program. Publication No. 94-115. Olympia, Washington.

Schaeff, C., and J. Picman. 1988. Destruction of Eggs by Western Meadowlarks. *Condor*. Vol. 90. Pp. 935-937.

Schafer, E.W. 1972. The Acute Oral Toxicity of 369 Pesticidal, Pharmaceutical and Other Chemicals to Wild Birds. *Toxicological and Applied Pharmacology*. 21:315-330.

Schlatterer, B., T.M.M. Coenen, E. Ebert, R. Grau, V. Hilbig, and R. Munk. 1993. Effects of Bis(tri-n-butyltin) Oxide in Japanese Quail Exposed During Egg Laying Period: An Interlaboratory Comparison Study. *Arch. Environ. Contam. Toxicol*. 24:440-448.

Silva, M., and J. A. Downing. 1995. CRC Handbook of Mammalian Body Masses. CRC Press, Boca Raton, Florida.

Stalmaster, M. V., and J. A. Gessaman. 1984. Ecological Energetics and Foraging Behavior of Overwintering Bald Eagles." *Ecol. Monogr*. Vol. 54. Pp. 407-428

Stanley, T.R. Jr., J.W. Spann, G.J. Smith, and R. Rosscoe. 1994. Main and Interactive Effects of Arsenic and Selenium on Mallard Reproduction and Duckling Growth and Survival. *Arch. Environ. Contam. Toxicol.* 26:444-451.

Suter, G. W. II, R. A. Efroymson, B. E. Sample, and D. S. Jones. 2000. *Ecological Risk Assessment for Contaminated Sites*. Lewis Publishers, Boca Raton, Florida. 438 pp.

Suter, G. W., II, and C. L. Tsao. 1996. *Toxicological Benchmarks for Screening of Potential Contaminants of Concern for Effects on Aquatic Biota on Oak Ridge Reservation*: 1996 Revision. Oak Ridge National Laboratory, Oak Ridge, Tennessee. 104 pp, ES/ER/ TM-96/R2.

USFWS (U. S. Fish and Wildlife Service). 1964. *Pesticide-wildlife Studies, 1963: A Review of Fish and Wildlife Service Investigations During the Calendar Year*. FWS Circular 199.

Weber, C.W., and B.L. Reid. 1968. Nickel Toxicity in Growing Chicks. *J. Nutrition.* 95:612-616.

Wiens, J. A., and G. S. Innes. 1974. Estimation of Energy Flow in Bird Communities: A Population Energetics Model. *Ecology*. 55: 730-746.

White, D. H. and M. T. Finley. 1978. Uptake and Retention of Dietary Cadmium in Mallard Ducks. *Environ. Res.*17: 53-59.

Attachment

Descriptions of Studies Used to Calculate NOAELs and LOAELs

Study descriptions for no observed adverse effect levels (NOAELs) and lowest observable adverse effect levels (LOAELs) developed by EFA West (1998) are presented in that document and are not shown below. Additionally, acute studies (e.g., silver and thallium for birds and polyacrylate for mammals) are not described below as these studies are self-descriptive.

Compound: Arsenic

Form: Sodium arsenate

Reference: Stanley et al., 1994

Test Species: mallard
Body weight: 1 kg (Heinz et al., 1989)
Food Consumption: 0.1 kg/d (Heinz et al., 1989)

Exposure Duration: 4 wks prior to breeding, through nesting, incubation, and hatch, to 14 d post hatch (> 10 week and during critical lifestage=chronic)

Endpoint: reproduction

Exposure Route: oral in diet

Dosage: 4 dose levels (As concentrations measured in food)
0.26, 22, 93, and 403 mg/kg

Calculations:

$$\left(\frac{0.26\,mg\ As}{kg\ \ food}\,x\,\frac{100\,g\ \ food}{day}\,x\,\frac{1\,kg}{1000\,g}\right)/1\,kg\ BW = 0.026\,mg\,/\,kg\,/\,d$$

$$\left(\frac{22\,mg\ As}{kg\ \ food}\,x\,\frac{100\,g\ \ food}{day}\,x\,\frac{1\,kg}{1000\,g}\right)/1\,kg\ BW = 2.2\,mg\,/\,kg\,/\,d$$

$$\left(\frac{93\,mg\ As}{kg\ \ food}\,x\,\frac{100\,g\ \ food}{day}\,x\,\frac{1\,kg}{1000\,g}\right)/1\,kg\ BW = 9.3\,mg\,/\,kg\,/\,d$$

$$\left(\frac{403\,mg\ As}{kg\ \ food}\,x\,\frac{100\,g\ \ food}{day}\,x\,\frac{1\,kg}{1000\,g}\right)/1\,kg\ BW = 40.3\,mg\,/\,kg\,/\,d$$

Comments: Although As did not increase duckling mortality, As at 40.3 mg/kg/d significantly reduced duckling production. No reductions in duckling production or other adverse effects were observed at the other dose levels. Because the study considered exposure over 10 weeks and through reproduction, the 40.3 mg/kg/d dose was considered to be a chronic LOAEL.

Final NOAEL: 9.3 mg/kg/d

Final LOAEL: 40.3 mg/kg/d

Compound: Arsenic

Form: Sodium arsenite (51.35% As^{+3})

Reference: USFWS 1964

Test Species: Mallard ducks

Body weight: 1 kg (Heinz et al. 1989)

Food Consumption: 0.100 kg/d (Heinz et al. 1989)

Exposure Duration: 128 d (> 10 wk=chronic)

Endpoint: mortality

Exposure Route: oral in diet

Dosage: four dose levels (nominal):

100, 250, 500, and 1000 ppm Sodium Arsenite;

NOAEL = 100 ppm

mg/kg As^{+3} = 0.5135 x 100 mg/kg = 51.35 mg/kg

Calculations:

$$\left(\frac{51.3\,mg\ As^{+3}}{kg\ \ food} x \frac{100\,g\ \ food}{day} x \frac{1\,kg}{1000\,g}\right)/1\,kg\ BW = 5.135\,mg/kg/d$$

$$\left(\frac{128.375\,mg\ As^{+3}}{kg\ \ food} x \frac{100\,g\ \ food}{day} x \frac{1\,kg}{1000\,g}\right)/1\,kg\ BW = 12.837\,mg/kg/d$$

$$\left(\frac{256.75\,mg\ As^{+3}}{kg\ \ food} x \frac{100\,g\ \ food}{day} x \frac{1\,kg}{1000\,g}\right)/1\,kg\ BW = 25.675\,mg/kg/d$$

$$\left(\frac{513.5\,mg\ As^{+3}}{kg\ \ food} x \frac{100\,g\ \ food}{day} x \frac{1\,kg}{1000\,g}\right)/1\,kg\ BW = 51.35\,mg/kg/d$$

Comments: Mallards in the 1000, 500, and 250 ppm groups experienced 92%, 60%, and 12% mortality, respectively. Because those in the 100 ppm group experienced 0% mortality, and the study considered exposure over 128 days, the 100 ppm Sodium Arsenite (51.35 mg/kg As^{+3}) dose was considered to be a chronic NOAEL. The 250 ppm Sodium Arsenite (128.375 mg/kg As^{+3}) dose was considered to be a chronic LOAEL.

Final NOAEL: 5.14 mg/kg/d

Final LOAEL: 12.84 mg/kg/d

Compound: Cadmium

Form: Cadmium Chloride

Reference: White and Finley 1978

Test Species: Mallard Ducks

Body weight: 1.153 kg (from study)

Food Consumption: 0.110 kg/d (from study)

Study Duration: 90 d (> 10 wk and during a critical lifestage =chronic)

Endpoint: reproduction

Exposure Route: oral in diet
Dosage: 4 dose level:
0.08, 1.6, 15.2, and 210 ppm Cd
NOAEL = 15.2 ppm
Calculations:

$$\left(\frac{15.2\, mg\ Cd}{kg\ \ food}\, x\, \frac{0.110\, kg\ \ food}{day}\right) / 1.153\, kg\ BW = 1.45\, mg / kg / d$$

$$\left(\frac{210\, mg\ Cd}{kg\ \ food}\, x\, \frac{0.110\, kg\ \ food}{day}\right) / 1.153\, kg\ BW = 20\, mg / kg / d$$

Comments: Mallards in the 210 ppm group produced significantly fewer eggs than those in the other groups. Because the study considered exposure over 90 days, the 15.2 ppm Cd dose was considered to be a chronic NOAEL and the 210 ppm does was considered to be a chronic LOAEL.
Final NOAEL: 1.45 mg/kg/d
Final LOAEL: 20 mg/kg/d

Compound: Chromium
Form: Cr^{+3} as $CrK(SO_4)_2$
Reference: Haseltine et al. 1985
Test Species: Black duck
Body weight: 1.25 kg ($mean_{male+female}$; Dunning 1993)
Food Consumption: Congeneric Mallard ducks, weighing 1 kg consume 100 g food/d (Heinz et al.1989). Therefore, it was assumed that a 1.25 kg black duck would consume 125 g food/d.
Study Duration: 10 mo. (>10 weeks and during a critical lifestage = chronic)
Endpoint: reproduction
Exposure Route: oral in diet
Dosage: two dose levels:
10 and 50 ppm Cr^{+3} in diet; NOAEL = 10 ppm

$$\left(\frac{10\, mg\ Cr^{+3}}{kg\ \ food}\, x\, \frac{125\, g\ \ food}{day}\, x\, \frac{1\, kg}{1000\, g}\right) / 1.25\, kg\ BW = 1\, mg / kg / d$$

$$\left(\frac{50\, mg\ Cr^{+3}}{kg\ \ food}\, x\, \frac{125\, g\ \ food}{day}\, x\, \frac{1\, kg}{1000\, g}\right) / 1.25\, kg\ BW = 5\, mg / kg / d$$

Comments: While duckling survival was reduced at the 50 ppm dose level, no significant differences were observed at the 10 ppm Cr^{+3} dose level. Because the study considered exposure throughout a critical lifestage (reproduction), the dose 50 ppm dose was considered to be a chronic LOAEL and the dose 10 ppm dose was considered to be a chronic NOAEL.
Final NOAEL: 1 mg/kg/d
Final LOAEL: 5 mg/kg/d

Compound: Cyanide
Form: Potassium Cyanide
Reference: Tewe and Maner 1981
Test Species: Rat
Body weight: 0.273 kg (from study)
Food Consumption: 0.0375 kg/d (from study)
Study Duration: gestation and lactation (during a critical lifestage = chronic)
Endpoint: reproduction
Exposure Route: oral in diet
Dosage: one dose level:
500 ppm CN = NOAEL
Calculations:

$$\left(\frac{500\,mg\;CN}{kg\;\;food}\,x\,\frac{37.5\,g\;\;food}{day}\,x\,\frac{1\,kg}{1000\,g}\right)/\,0.273\,kg\;BW = 68.7\,mg\,/\,kg\,/\,d$$

Comments: Consumption of 500 ppm CN significantly reduced offspring growth and food consumption, however values for treated individuals were only marginally less than controls (reductions were 7% or less). While the effects of 500 ppm CN in the diet were statistically significant, they were not considered to be biologically significant. Because the study considered exposure throughout a critical lifestage (reproduction), this dose was considered to be a chronic NOAEL.

Final NOAEL:68.7 mg/kg/d

Compound: Iron
Form: Fe
Reference: NRC 1980 in McDowell 1992
Test Species: poultry
Body weight: 1.5 kg (EPA 1988)
Food Consumption: 0.106 kg/d (calculated using allometric equation from EPA 1988)
Study Duration: chronic
Endpoint: maximum tolerable level
Exposure Route: oral in diet
Dosage: McDowell (1992) reports the maximum tolerable level of 1000 ppm Fe in diet for poultry.
Calculations:

$$\left(\frac{1000\,mg\;Fe}{kg\;\;food}\,x\,\frac{106\,g\;\;food}{day}\,x\,\frac{1\,kg}{1000\,g}\right)/1.5\,kg\;BW = 70.5\,mg\,/\,kg\,/\,d$$

Comments: The maximum tolerable level reported for poultry (1000 ppm Fe in diet) was assumed to be the chronic NOAEL. Body weight and food consumption rate are those for white leghorn chickens and are derived from EPA (1988).

Final NOAEL: 70.5 mg/kg/d

Compound: Manganese

Form: Manganese oxide (Mn_3O_4)

Reference: Laskey and Edens 1985

Test Species: Japanese Quail (males only, starting at 1 day old)
Body weight: 0.072 kg (for 3 wk-old male quail; Shellenberger 1978)

Study Duration: 75 d (>10 weeks = chronic)

Endpoint: growth, aggressive behavior

Exposure Route: oral in diet

Dosage: one dose level:
5000 ppm supplemented Mn + 56 ppm Mn in base diet = NOAEL

Calculations: NA

Comments: While no reduction in growth was observed, aggressive behavior was 25% to 50% reduced relative to controls. Daily Mn consumption was reported to range from 575 mg/kg/day for adults at the end of the study and 977 mg/kg/d for 20 d-old birds. Because the study was >10 weeks in duration, the 977 mg/kg/d dose was considered to be a chronic NOAEL based on a growth endpoint and a chronic LOAEL based on a behavior endpoint. A chronic behavior NOAEL was estimated by applying an LOAEL-NOAEL UF of 0.1

Final $NOAEL_{growth}$: 977 mg/kg/d

Final $NOAEL_{behavior}$: 98 mg/kg/d

Final $LOAEL_{behavior}$: 977 mg/kg/d

Compound: Mercury

Form: methyl mercury chloride/dicyandiamide

Reference: Heinz (1976) and Heinz and Hoffman (1998)

Test Species: mallard
Body weight: 1 kg (Heinz et al. 1989)
Food Consumption: 0.128 kg/d (from Heinz 1979)

Study Duration: 2 generations (lowest doses), 2.5 months (highest dose) (during a critical lifestage = chronic).

Endpoint: reproduction

Exposure Route: oral in diet

Dosage: four dose levels:

0, 0.53, 2.88, and 9.2 ppm Hg

Calculations:

$$\left(\frac{0.53\,mg\ Hg}{kg\ \ food}\ x\ \frac{0.128\ kg\ \ food}{day}\right) /\ 1\,kg\ \ BW = 0.068\ mg/kg/d$$

$$\left(\frac{2.88\,mg\ Hg}{kg\ \ food}\ x\ \frac{0.128\ kg\ \ food}{day}\right) /\ 1\,kg\ \ BW = 0.37\ mg/kg/d$$

$$\left(\frac{9.2\ mg\ Hg}{kg\ \ food}\ x\ \frac{0.128\ kg\ \ food}{day}\right) /\ 1\ kg\ \ BW = 1.18\ mg/kg/d$$

Comments: Although duckling survival at 7 days was significantly reduced at the two highest dose levels, no significant difference was observed at the 0.068 mg/kg/d dose. Because exposure occurred during reproduction, the 0.37 mg/kg/d dose was considered to be a chronic LOAEL.

Final NOAEL: 0.068 mg/kg/d
Final LOAEL: 0.37 mg/kg/d

Compound: Nickel
Form: Nickel Sulfate
Reference: Cain and Pafford 1981
Test Species: Mallard Duckling
Body weight: 0.782 kg ($mean_{control\ male+female}$ at 28 and 60 days; from study)
Food Consumption: Adult Mallard ducks, weighing 1 kg consume 100 g food/d (Heinz et al. 1989). Therefore, it was assumed that a 0.782 kg mallard duckling would consume 78.2 g food/d.
Study Duration: 90 d (>10 week = chronic)
Endpoint: mortality, growth, behavior
Exposure Route: oral in diet
Dosage: three dose levels:
176, 774, and 1069 ppm Ni;
NOAEL = 176 ppm
Calculations:

$$NOAEL: \left(\frac{176\,mg\ Ni}{kg\ \ food}\times\frac{78.2\,g\ \ food}{day}\times\frac{1kg}{1000\,g}\right)/\,0.782\,kg\ BW\ = 17.6\ mg\,/\,kg\,/\,d$$

$$LOAEL: \left(\frac{774\,mg\ Ni}{kg\ \ food}\times\frac{78.2\,g\ \ food}{day}\times\frac{1kg}{1000\,g}\right)/\,0.782\,kg\ BW\ = 77.4\ mg\,/\,kg\,/\,d$$

Comments: While consumption of up to 774 ppm Ni in diet resulted in a significant increase in tremors and joint edema, 176 ppm did not. Because the study considered exposure over 90 days, the 176 ppm dose was considered to be a chronic NOAEL and the 774 ppm dose was considered to be a chronic LOAEL. To estimate daily Ni intake throughout the 90 day study period, food consumption of 45-day-old ducklings was calculated. While this value will over- and underestimate food consumption by younger and older ducklings, it was assumed to approximate food consumption throughout the entire 90-day study.

Final NOAEL: 17.6 mg/kg/d
Final LOAEL: 77.4 mg/kg/d

Compound: Nickel
Form: Nickel sulfate and nickel acetate
Reference: Weber and Reid 1968

Test Species: Chicks
Body weight: 0.45 kg (EPA 1988)
Food Consumption: 0.038 kg/d (calculated using allometric equation from EPA 1988)
Study Duration: 4 weeks
Endpoint: growth, metabolism
Exposure Route: oral in diet
Dosage: 8 dose levels:
0, 100, 300, 500, 700, 900, 1100, 1300 mg Ni/kg
Calculations:

Doses (mg/kg/d) estimated based on data presented by authors								
Ni in diet	0	100	300	500	700	900	1100	1300
Sulfate	0	5.8	16.9	31.0	39.1	57.3	74.0	95.4
Acetate	0	5.9	16.5	28.3	40.7	56.4	67.4	93.7

Comments: No significant differences were obtained in growth at doses below 500 ppm. Significant differences in growth were noticed in doses starting at 500 ppm. This dose is considered a subchronic LOAEL, the 300 ppm dose is a subchronic NOAEL.
Final NOAEL: 25.3 mg/kg/d
Final LOAEL: 42.2 mg/kg/d

Compound: Silver
Form: $AgNO_3$ (63.5% Ag)
Reference: Rungby and Danscher 1984
Test Species: mouse
Body weight-0.03 kg (EPA 1988)
Exposure duration: 125 days
Endpoint: activity
Exposure route: oral in water
Dosage: one dose level (concentration is in $AgNO_3$)
0.015% $AgNO_3$ = 150 mg/L $AgNO_3$=95.25 mg/L Ag
Calculations:

$$\left(\frac{95.25\,\text{mg Ag}}{\text{L}}\text{x}\frac{0.0075\,\text{ml}}{.\text{day}}\right)/0.03\,kg = 23.8\,\text{mg Ag/kg/day}$$

Comments: A significant reduction in activity was observed among treated mice. Because the study was performed over 125 days, the 23.8 mg/kg/d dose was considered a chronic LOAEL. A chronic NOAEL was estimated by multiplying the LOAEL by a LOAEL-NOAEL uncertainty factor of 0.1.
Final NOAEL: 2.38 mg/kg/day
Final LOAEL: 23.8 mg/kg/day

Compound: Phenol
Form: not applicable
Reference: Bishop et al. 1997
Test Species: Mouse

Exposure Duration: 347 days (during critical lifestage = chronic)
Endpoint: reproduction
Exposure Route: intraperitoneal
Dosage: one dose level:
350 mg/kg (1 ip injection prior to each of 17 breeding cycles)
Calculations: normalized 17 doses of 350 mg/kg over 347 days
17.1 mg/kg/d

Comments: No effects on reproductive performance were observed. Because injections were given at critical lifestage periods, a dose of 17.1 mg/kg/d was considered to be the chronic NOAEL.

Final NOAEL: 17.1 mg/kg/d

Compound: Tin
Form: bis (Tributyltin) oxide (TBTO)
Reference: Davis et al. 1987
Test Species: mouse
Body weight: 0.03 kg (EPA 1988a)
Study Duration: days 6-15 of gestation (during a critical lifestage = chronic)
Endpoint: reproduction
Exposure Route: oral intubation
Dosage: six dose levels:
1.2, 3.5, 5.8, 11.7, 23.4, and 35 mg/kg/d;
NOAEL= 23.4 mg/kg/d
Calculations: not applicable

Comments: Mice dosed with 35 mg/kg/d TBTO displayed reduced fetal weight and fetal survival and increased frequency of litter resorption. Adverse effects were not observed at lower dose levels. Because the study considered exposure during gestation, the 23.4 and 35 mg/kg/d dose levels were considered to be chronic NOAELs and LOAELs, respectively.

Final NOAEL: 23.4 mg/kg/d
Final LOAEL: 35 mg/kg/d

Compound: Tin
Form: bis (Tributyltin) oxide (TBTO)
Reference: Schlatterer et al. (1993)
Test Species: Japanese Quail
Body weight: 0.15 kg (Vos et al. 1971)
Food consumption: 0.0169 kg/d (calculated using allometric equation of Nagy 1987)
Study Duration: 6 wks (during a reproduction = chronic)
Endpoint: reproduction
Exposure Route: oral in diet
Dosage: four dose levels:
24, 60, 150, and 375 mg/kg in diet;
NOAEL= 60 mg/kg

Calculations:

$$NOAEL:\left(\frac{60\,mg\,TBTO}{kg\ food}\times\frac{16.9\,g\ food}{day}\times\frac{1\,kg}{1000\,g}\right)/\,0.15\,kg\,BW\ = 6.76\ mg\,/\,kg\,/\,d$$

$$LOAEL:\left(\frac{150\,mg\,TBTO}{kg\ food}\times\frac{16.9\,g\ food}{day}\times\frac{1\,kg}{1000\,g}\right)/\,0.15\,kg\,BW\ = 16.9\ mg\,/\,kg\,/\,d$$

Comments: While egg weight and hatchability were reduced among quail consuming diets containing 150 mg TBTO/kg, no consistent adverse effects were observed among the 60 mg/kg groups. Because the study considered exposure during reproduction, the 60 and 150 mg/kg dose levels were considered to be chronic NOAELs and LOAELs, respectively.

Final NOAEL: 6.8 mg/kg/d

Final LOAEL: 16.9 mg/kg/d

APPENDIX D

Literature Research on Potential Noise Impacts to Wildlife

APPENDIX D TO THE BIOLOGICAL ASSESSMENT

Literature and Research on Potential Noise Impacts to Wildlife

Introduction

The proposed COB Energy Facility would be a combined-cycle electric generating facility fired solely on natural gas. The biological assessment (BA) contains a detailed description of the Energy Facility and its associated related and supporting facilities, collectively referred to as the Facility. This attachment describes available literature and research conducted on potential noise impacts to wildlife.

Conclusion

Construction of the Facility would result in sporadic noise at a level approximately similar to the noise resulting from existing farm operations, but Facility noise would be more frequent during the construction period. Construction noise may result in some reduced wildlife use of habitat areas directly around the Energy Facility site, but this reduced use would be limited in scope and temporary.

During operations, noise levels are predicted to be 40 decibels on an A-weighted scale (dBA) or lower at the closest wildlife habitat area to the Energy Facility and the project proponent's proposed mitigation area. This level would be well below the levels documented to have adverse affects on wildlife (Bowles, 1995; CDT et al., 1995). It is expected that wildlife would habituate to the continuous, relatively low operational noise levels and that operational noise would not appreciably reduce the quality of habitat areas surrounding the Facility.

Results of Prior Research

Most of the research that addresses behavioral effects of noise on wildlife has focused on the effects of loud, sudden, intermittent noises from airplanes, helicopters, military exercises, and off-road vehicles in laboratory experiments. Specific effects of noise on wildlife are highly dependent on the particular characteristics of the noise and whether a visual stimulus is associated with it. Data indicate that human activity results in wildlife responding through one of three adaptation mechanisms: (1) avoidance, (2) habituation, or (3) attraction (Knight and Temple, 1995). Avoidance of the area may result in (1) no measurable effect, (2) reduced fitness, potentially decreasing over winter survival, or (3) decreased reproduction (i.e., individual animals may not reproduce or reproduction may be unsuccessful because of decreased available resources or abandonment of offspring to escape disturbance).

Impulse or intermittent noise is defined as a high-intensity, short duration, and sporadic or unpredictable sound, such as pile driving, dump trucks, gunshot, explosion, low-elevation airplanes, or a collision. There is evidence that such impulse noises can result in adverse physical, physiological, and behavioral effects on wildlife (Larkin, 1996).

On the other hand, continuous noise is less likely to result in adverse effects to wildlife, as many animals become habituated to the presence of the elevated noise levels (Conomy et al., 1998; Weisenberger et al., 1996). For example, domestic pigs showed no change in behavior when subject to a constant noise level exceeding 80 dBA, but demonstrated significant aversion to the same noise level played intermittently (Talling et al., 1998). Habituation is defined as "the elimination of the organism's response to often recurring, biologically irrelevant stimuli without impairment of its reaction to others" (Lorenz,1965). Thus, habituation to increased noise levels should not interfere with mating, distress, or warning calls. This phenomenon has been demonstrated in laboratory studies in which hooded rats exposed to background noise of 70 dB sound pressure level (SPL) showed the same startle response to a range of sounds as rats which were not exposed to the background noise (Blaszczyk and Tajchert, 1997).

In some instances, long-term exposure to continuous noise may help protect animals from adverse effects of more extreme impulse noises through sound conditioning (McFadden et al., 2000). It is therefore possible that increased background noise from the Energy Facility would help minimize the effects of noise spikes from farm equipment in the proposed Facility area.

Existing Conditions at the Facility Site

Habituation has been found to be highly variable among species (Conomy et al., 1998). However, it is likely that the species currently occupying the sage scrub habitats near the Energy Facility site have developed some habituation based on the present ambient noise levels from farm equipment and noise from existing electric transmission lines.

The primary source of background noise at the Energy Facility site is farm equipment on West Langell Valley Road and in adjacent fields. Measurements of ambient noise levels indicate the current ambient noise level is approximately 20 to 30 dBA with peaks exceeding 70 dBA near farm equipment (see Exhibit X). Levels may be greater along the road. Modeled estimates of plant operational noise indicate that the ambient noise at the edge of the Energy Facility site would be a continuous level of approximately 60 dBA. Noise during operations would dissipate with distance to approximately 30 dBA within 4,000 to 6,000 feet of the Energy Facility (see Figure 5-2 in the BA). Topographic buffering from surrounding hills would reduce the effective noise from the Energy Facility.

Analysis of Potential Impacts from Construction Noise

During construction, temporary and intermittent noise levels from typical construction equipment at 50 feet are expected to be 73 to 88 dBA. The noise levels at 3,000 feet are expected at 37 to 52 dBA.

Both mammals and birds can suffer temporary hearing impairment from 24-hour exposure to noise levels of 80 to 110 dB (CDT et al., 1995). While many species acclimate to elevated noise levels resulting from human activities, excessive, intermittent noise levels can be detrimental to wildlife. High levels of noise can cause hearing loss and other adverse physiological affects to wildlife, as well as behavioral modification such as moving to areas outside their home range. Activities that generally involve high levels of intermittent or impulse noise such as loud construction noise, low flying aircraft , military training activities, or off-road vehicles that stress wildlife into an avoidance response, have adverse effects on wildlife (Maier et al., 1998; Larkin, 1996).

Sporadic noise associated with heavy construction equipment and related construction activities may cause many species to either abandon areas directly adjacent to construction, alter use patterns to access habitat when construction is not occurring, or cause increased stress. For example, evidence suggests that terrestrial wildlife stratify themselves from roads based on the distance they can detect vehicle noise (Knight and Temple, 1995).

Accordingly, it is expected that the temporary construction noise from the Energy Facility site would cause some wildlife species to reduce their use of nearby habitats during the construction period. Major earthwork activity for the Energy Facility closest to wildlife habitat areas are expected to occur during a short period of 6 months out of the 23-month construction time frame. Similarly, piling driving for the Energy Facility would occur during a short, approximately 4-month period.

The extent of these indirect disturbances would depend on the particular tolerances of species. Because of the location of the proposed Energy Facility site in a low area (relative to surrounding topography) and the short duration of the loudest construction activity, noise impacts to nearby habitat areas is likely to be minimized.

Construction noise is not likely to result in direct physiological impacts to wildlife. Some species, such as nesting birds, deer, and others, may modify their behavior when construction noise is present by moving foraging and nesting locations slightly. However, most noise-related nest abandonments last for less than 5 minutes (Knight and Temple, 1995). Vertebrate species often habituate or adapt behaviorally and physiologically to repeated exposure to noise either through sensitization or avoidance (Bowles, 1995). Individual animals may reoccupy habitats once they become habituated. This does not mean that wildlife would continue to use the area as they did before the noise, but that their avoidance distance is expected to decline as they habituate to the disturbance.

Operations Noise

Operational noise disturbances would be substantially lower compared to construction noise. Noise levels decrease with distance and, as shown on Figure 5-2 in the BA noise levels are predicted to be 50 dBA at a distance of approximately 1,000 feet from the Energy Facility. Noise levels are predicted to be 40 dBA at a distance of approximately 2,500 feet from the Energy Facility, where habitats may be used by wildlife.

In addition, animals are more likely to habituate to a relatively constant noise level during operations than to impulse or sporadic noise during construction. In fact, constant natural noise is part of every environment and wildlife have developed adaptations to noise long before the advent of modern technology. In some instances natural ambient sounds along with diverse vegetation structure can reduce the direct effects of human noises on wildlife. Natural waterfalls can have continuous noise levels of 76 dBA, and many species of wildlife occupy areas with waterfalls. White-tailed deer were shown to habituate to snowmobile noise after some years of exposure. However, in areas with no previous exposure, deer might increase the area in which they home range in an effort to avoid snowmobile trails, potentially causing deer to expend more energy (stress) and endangering their health during the winter season (Radle, undated).

Continuous sound pressure levels at 70dB are considered a safe limit to wildlife (Bowles, 1995). The nearest wildlife habitat area is approximately 2,500 feet from the Energy Facility and the predicted noise level during operations at this distance is 40 dBA (see Figure 5-2 in the BA). This same general area is where the project proponent proposes to mitigate for permanently disturbed habitat by restoring, enhancing, and protecting habitat in accordance with ODFW habitat mitigation goals and pursuant to the revegetation plan described in Attachment P-1. Based on Figure 5-2 in the BA, operations noise levels are predicted to be 40 dBA or lower at the mitigation area. This level would be well below the reported levels (80 to 100 dB SPL) known to be detrimental to wildlife.

Biological surveys around the Energy Facility site found no evidence of wildlife species that would be uniquely sensitive to sound. Given the background noise levels from farm equipment, it is more than likely that the species currently inhabiting the area around the Energy Facility site can become habituated to a slight increase in continuous noise levels. Based on the best available information, the existing sound levels, and the estimated noise increases, it is not expected that operation of the Energy Facility would result in adverse effects on the wildlife inhabiting area around the Energy Facility site.

References

Blaszczyk J.W. and K. Tajchert. 1997. "Effect of acoustic stimulus characteristics on the startle response in hooded rats." ACTA Neurobiologicae Expermentalis 57(4): 315-321.

Bowles, A.E. In press, 1995. "Responses of Wildlife to Noise." In: Knight, R.L. and Gutzwoulder, K.J. (Eds.), *Wildlife and Recreationists*, *Coexistence through Management and Research* (pp. 109-156). Washington, D.C.: Island Press.

CDT (California Department of Transportation), U.S. Department of Transportation, and Federal Highway Administration. 1995. *Devil's Slide Supplemental Draft Environmental Impact Statement/Environmental Impact Report*. State Clearing House No. 83051706 4-SM-1 PM 34.0/41.0 (KP 54.7/66.0) 4210-112371.

Conomy, J.T., J.A. Dubovsky, J.A. Collazo and J.W. Fleming. 1998. "Do black ducks and wood ducks habituate to aircraft disturbance?" Journal of Wildlife Management 62(3): 1135-1142.

Dwyer N.C. and G.W. Tanner. 1992. "Nesting success in Florida sandhill cranes." Wilson Bulletin. 104: 22-31.

Knight, R.L. and S.A. Temple. 1995. "Origin of Wildlife Responses to Recreationists." Pages 81-91. In R.L. Knight and K.J. Gutzwoulder (Editors). *Wildlife and Recreationists Coexistence Through Management and Research*. Island Press, Inc., Washington, DC.

Larkin, R.P. 1996. *Effects of Military noise on wildlife: a literature review*. USACERL Technical Report 92/21. Center for wildlife Ecology, Champaign, Illinois.

Lorenz, K. 1965. *Evolution and Modification of Behavior*. University of Chicago Press, Chicago, Illinois. 121 p.

Maier, J.A.K., S.M. Murphy, P.G. White and M.D. Smith. 1998. "Response of caribou to overflights of low-altitude jet aircraft." Journal of Wildlife Management 62(2): 752-766.

McFadden, S.L., X.Y. Zheng and D.L. Ding. 2000. "Conditioning induced protection from impulse noise in female and male chinchillas." Journal of the Acoustical Society of America. 10(4) 2162-2168.

Radle, A.L. Undated. *The effect of noise on wildlife: a literature review*. World Forum for Acoustic Ecology. University of Oregon, Eugene.

Reijnen, R., R. Foppen and V. Greesje. 1997. "Disturbance by traffic on birds. Evaluation of the effects and considerations in planning and management." Biodiversity and Conservation 6(4):567-581.

Talling, J.C., N.K. Waron, C.M. Wathers and J.A. Lines. 1998. "Sound avoidance by domestic pigs depends upon characteristics of the signal." Applied Animal Behavior Science 58(4): 315-321.

Weisenberger, M.E., P.R. Krasuman, M.C. Wallace and O.E. Maughan. 1996. "Effects of simulated jet aircraft noise on heart rate and behavior of ungulates." Journal of Wildlife Management. 60(1): 52-61.

APPENDIX E

Avian Collision Monitoring Plan

Report

Avian Collision Monitoring Plan

Prepared for

U.S. Fish and Wildlife Service

October 2003

COB Energy Facility, LLC

Prepared by

CH2MHILL

Printed on
Recycled and
Recyclable
Paper

Contents

1. Introduction

This section provides an overview of the project, a description of the electric transmission line and power stacks, and a summary of the proposed mitigation measures.

Project Description and Background

This monitoring plan describes how the site certificate applicant or "project proponent" (COB Energy Facility, LLP) would monitor for bird impacts, if any.

The electric transmission line route would cross natural habitats west of Bryant Mountain, including sagebrush-steppe, juniper sage, and ponderosa pine habitats. These habitats provide upland forage habitat for bald eagle and other birds in the area. The bald eagle is a federally-threatened species that nests within 3 miles of the Energy Facility where the stacks would be located and the electric transmission line route would pass within 2 miles of the nests. The nests are located around McFall Reservoir as shown in Figure E-1.

Other raptors in the project area include Northern goshawk, red-tailed hawk, Northern harrier, white-tailed kite, Swainson's hawk, and turkey vulture. Additional bird species known to occur within the project area include tri-colored blackbird, greater sage-grouse, black tern, olive-sided flycatcher, yellow rail, willow flycatcher, yellow-breasted chat, western least bittern, mountain quail, American white pelican, and Lewis' woodpecker.

Electric Transmission Line and Stack Descriptions

The COB Energy Facility would deliver electric power to the regional power grid by a new electric transmission line, approximately 7.2 miles in length, from the Energy Facility site to the Bonneville Power Administration (BPA) Captain Jack Substation. Approximately 38 transmission towers would be required. Typical transmission towers would range in height from 100 to 165 feet, with most towers in the 105- to 110-foot range. On average, the towers would be spaced approximately 990 feet apart, with a range from 380 to 1,500 feet. Two parallel groundwires would be strung on top of the transmission towers for protection from lightening. Groundwires typically would be thinner in diameter than conductor wires. Groundwires would not conduct electricity.

The electric transmission line would run cross-country in a north-south direction west of Bryant Mountain (Figure 2-2 in the Biological Assessment [BA]). Access for travel by wheeled vehicles would be required for construction and to access the new electric transmission line for maintenance during operation. Access would occur through approximately 6.6 miles of new access roads and the use of approximately 4.9 miles of existing roads. Figure 2-2 in the BA shows the route of the electric transmission line.

The proposed stacks are 150 to 200 feet tall with a diameter of 18 feet each. The stacks would be located within the security fence of the Energy Facility. They would be positioned approximately 200 feet apart and would be constructed of steel. Carbon dioxide, water, nitrogen, and air are the primary gases exhausted by the stacks along with oxides of nitrogen, carbon monoxide, and fine particulates.

Mitigation Measures

Mitigation measures are being developed for the project through consultation with the United State Fish and Wildlife Service (USFWS) under Section 7 of the Endangered Species Act (ESA). In addition, BPA, Oregon Department of Fish and Wildlife (ODFW), and the United States Bureau of Land Management (BLM) were consulted for appropriate measures that would minimize impacts to bald eagles (and other birds) from collisions and electrocutions. The resulting mitigation measures include:

- Locate the new electric transmission line route to avoid areas of dense bald eagle populations.
- Locate the new electric transmission line away from the three existing transmission line to avoid creating a cluster of electric transmission lines or a “net effect” that would pose additional obstacles to flight.
- Install colored bird flight diverters (BFDs) or swan flight diverters (SFDs) to allow better avian visualization of the thin groundwires during fog and rain events (Figure E-1).
- Design the conductor wires for spacing greater than the wing spans of large birds (24 feet on the vertical and 25 feet on the diagonal) to prevent electrocutions (Figure E-1).
- Conduct annual monitoring of the new electric transmission line.

2. Monitoring Plan Objectives

This section summarizes plan objectives based on the federal Endangered Species Act and the Migratory Bird Treaty Act.

Federal Endangered Species Act

Projects subject to the federal ESA require consultation with USFWS on impacts to federally-listed species. During informal consultation with USFWS, the project proponent anticipated that special-status birds could be incidentally taken as a result of implementing the proposed project.

The special-status bird species anticipated to be in the project area include bald eagle, peregrine falcon, greater sandhill crane, Aleutian Canada goose, and Swainson's hawk. These species are listed as threatened or endangered by USFWS or ODFW. The BA prepared for formal consultation under the ESA describes the potential significant impacts to federally-listed species and mitigation measures expected to avoid and/or minimize unavoidable impacts. To minimize impacts to bald eagles and other birds in the project area, the project proponent would install bird flight diverters and implement a monitoring program for bird collisions.

The USFWS Biological Opinion (BO) or authorizations would identify the amount or extent of incidental take allowed by the proposed project. Incidental take is defined in the Endangered Species Act as take (to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect a listed species) that is incidental to, and not the purpose of, the carrying out of an otherwise lawful activity. Incidental take of listed species could occur incidental of the COB Energy Facility project if bald eagle or other special-status birds collide with the new electric transmission line or the stacks at the Energy Facility.

The significance criteria used in this monitoring plan are the number of each listed bird species allowed by USFWS to be taken incidental to the project. The significance criteria (number of birds allowed) would be defined in the BO. Monitoring plan objectives include describing the methods that would be used to determine if the significance criteria are exceeded, and determining whether BFDs deflect the bald eagle, and other special-status bird species sufficiently to meet the USFWS incidental take restrictions.

Migratory Bird Treaty Act

In addition to the ESA, the Migratory Bird Treaty Act (MTBA) provides federal protection for migratory waterfowl and resident herons, egrets, ducks, and raptors. The MBTA prohibits the take, possession, import, export, transport, selling, purchase, barter, or offering for sale, purchase or barter, any migratory bird, their eggs, parts, and nests, except as authorized under a valid permit (50 CFR 21.11). The installation of BFDs on the electric transmission line along with the implementation of an avian collision monitoring program would minimize impacts to migratory bird species.

3. Methods

The methods described in this section would be used to determine whether (1) the significance criteria for bald eagles incidentally taken under Section 7 of the ESA by the proposed project are exceeded, (2) the incidental take of migratory bird species protected under the MBTA by the proposed project area exceed the incidental take restrictions in the BO that would result from consultation with USFWS, and (3) BFDs deflect the bald eagle, waterfowl, and special-status bird species sufficiently to meet the USFWS incidental take restrictions under the ESA and MBTA.

Installing Bird Flight Diverters

BFDs and SFDs are 15-inch-long (38-centimeter-long) polyvinyl chloride (PVC) tubing coiled to a height of 7 inches (18 centimeters), and are typically spaced approximately 16 feet (5 meters) apart along the ground wires (Figure E-1). BFDs are especially effective at increasing visibility of wires during fog and rain events and have reduced avian collisions by 57 to 89 percent (Brown and Drewien, 1995). They would be staggered over the two groundwires so that each wire supports one-half of the markers, and are spun onto the groundwire after it is pulled into place and secured on the transmission towers. The BFDs come in gray or yellow with ultraviolet (UV) stabilizers for exposure to sunlight. Conductor wires are normally large enough in diameter to be seen by birds in flight and would not require marking with BFDs.

Monitoring for Bird Collisions

This monitoring plan is based on the studies described by the Avian Power Line Interaction Committee (APLIC) in "Mitigating Bird Collisions With Power Lines: The State of the Art in 1994." The plan includes dead bird searches along the new electric transmission line and around the stacks at the Energy Facility. These searches include studies to develop searcher and scavenger bias estimates that affect the total number of collisions expected to occur. The USFWS and ODFW would be notified if any bald eagles or other special-status birds are found dead from collisions during the dead bird searches.

Conducting Dead Bird Searches

Field searches for dead birds and feather spots (location where feathers are left after removal of carcass by predator or scavenger) would be conducted along the new electric transmission line and in the area around the stacks at the Energy Facility to determine if the project causes significant impacts to birds. Monitoring the new electric transmission line for avian collisions would begin after construction is complete and BFDs are installed. Monitoring of avian collisions with the stacks would occur after construction of the COB Energy Facility is complete.

The searchers would follow a zig-zag pattern through the search areas to allow observations of the entire area. Two to three people would simultaneously conduct the surveys on either side of the new electric transmission line.

If dead birds are found, the following information would be collected:

- Location of each dead bird
- Bird species, sex, age (adult or juvenile), approximate time of death, and physical condition (broken bones, burns, open wounds, gunshot wounds, discoloration, and damage by scavengers)

These data would be recorded on field data sheets in the field (Figure E-2). Necropsies in the lab would be conducted to determine probable cause of death. The USFWS and the ODFW would be notified if any bald eagles of other special-status birds are found dead from collisions.

Analysis of the winter and summer dead bird searches includes evaluation of the field search results, computation of bias estimates and estimated total collisions (see Section 4), and a comparison of observed collision mortality relative to the significance criteria.

Searchers

Qualified biologists familiar with the above-mentioned special-status birds would conduct the dead bird searches. Information would be obtained from Energy Facility personnel if they find dead birds during daily activities, especially around the portion of the new electric transmission line near the Energy Facility. This information would be included in the annual reports. A search bias would be calculated for each searcher (see Search Bias subsection in Section 4) and included in the estimate of total collisions.

Dogs would not be used to conduct searches because there are too many variables in their results (wind, temperature, vegetation height) and a search bias would have to be calculated for each dog, every search day. Search equipment includes binoculars, spotting scope, pin flags, and bird tags.

Search Area

Dead bird searches would be conducted along the entire route of the new electric transmission line. The width of the search area would be determined in relation to the height of the transmission poles (APLIC, 1994). The searches would be conducted in a corridor 164 feet from the outside conductor on either side of the new electric transmission line route (APLIC, 1994). Searches for dead birds around the stacks would be conducted in a 180-foot radius from the stacks, entirely within the security fenceline of the Energy Facility.

Monitoring Schedule

Bald eagles are expected to be in the project area year round (Isaacs, 2002). Surveys for dead bird searches along the new electric transmission line and the stacks would focus on the change of seasons, with two surveys scheduled during the fledging period for the bald eagle. Searches would be conducted once a month in February (winter), May (spring), June or July (summer and probable fledging time), and October (fall).

The dead bird searches would be conducted for the first 3 years after beginning commercial operation of the COB Energy Facility and the new electric transmission line. If monitoring shows insignificant impacts to bald eagles from the project at the end of 3 years, the monitoring frequency would be reduced or monitoring would be discontinued upon approval by USFWS. Annual monitoring reports would be submitted to the USFWS by December 31 of each monitoring year.

4. Data Analysis

Biases can occur in searches for dead and injured birds. Four biases are identified that could cause an underestimation of the number of birds that collide with the new electric transmission line or with the stacks at the Energy Facility: search bias, removal (or predator) bias, habitat bias, and crippling bias (APLIC, 1994). To compensate for the underestimation of avian collisions, these biases would be analyzed and included in the estimated total bird collisions for the project.

Search Bias (SB)

A search bias takes into consideration a searcher's ability and experience, terrain, and vegetation conditions. A bias is measured for each searcher. Dead birds are randomly placed in the search area and the searcher tries to locate as many of the planted birds as possible. A search bias would be calculated for each searcher for each season of the year to adjust for changes in vegetation heights. The proportion of "planted" birds not found determines the search bias. The formula for calculations is as follows:

$$SB = (TDBF/PBF) - TDBF,$$

Where SB = search bias, TDBF = total dead birds and feather spots found in the search area, and PBF = proportion of planted birds found during the recovery.

Example. If eight dead birds are found, including four out of five of the planted birds:
SB = (8/(4/5)) – 8 = 2 birds would not be found by this particular searcher.

Removal Bias (RB)

A removal bias is determined to consider the number of birds scavengers remove from the search area before a search. To measure a removal bias, a number of dead birds are marked and placed in the search area and the condition of the birds are monitored daily for 1 week. Removal bias is the percentage of missing birds with no trace remaining after 1 week. A removal bias would be calculated for each season of the year. The formula to determine removal bias is:

$$RB = (TDBF + SB)/PNR - (TDBF + SB),$$

Where RB = removal bias by scavengers, PNR = proportion of "planted birds not removed by scavengers," TDBF = total dead birds found, and SB = search bias.

Example. If eight dead birds are found and four out of five planted birds are recovered:
RB = (8 + 2)/(4/5) – (8 + 2) = 2.5 birds are expected to be removed by scavengers.

Habitat Bias (HB)

A habitat bias is used only when some portion of a search area is not accessible because of water or dense vegetation. The habitat bias estimates the percent of unsearchable habitat for each transmission line segment. Habitat bias should only be used in limited situations where unsearchable habitat is finely interspersed with searchable habitat and where searchers can demonstrate the number of birds found in searchable and unsearchable habitats are similar. Habitat bias should only be included in the calculation for estimate of total collisions if credible numbers are calculated onsite. The formula to determine habitat bias is:

$$HB = (TDBF + SB + RB)/PS - (TDBF + SB + RB),$$

Where HB = habitat bias, and PS = proportion of area that is searchable

Example. If 95 percent of the search area is searchable:
HB = (8 + 2 + 2)/(95/100) – (8 + 2 + 2) = 0.6 bird may not be found.

Crippling Bias (CB)

A crippling bias is determined to consider the number of birds that fall or move outside the search area. Crippling bias is difficult to obtain (time and effort are involved in monitoring flights and collisions) and estimates from other studies may be inappropriate or misleading. Crippling bias should only be used in the estimate of total collisions if credible numbers are obtained onsite. The formula to determine crippling bias is:

$$CB = (TDBF + SB + RB + HB)/PBK - (TDBF + SB + RB + HB),$$

Where CB = crippling bias and PBK = the proportion of observed collisions falling within the search area.

Example. If four out of five birds that collide with the lines land in the search area, then:
CB = (8 + 2 + 2 + 0.6)/(4/5) – (8 + 2 + 2 + 0.6) = 3.15 birds are expected to collide and go out of the search area.

Estimate of Total Collisions (ETC)

An estimate of total avian collisions can be calculated using the field search results and the above bias estimates. The ETC adds the total dead birds and feather spots found and each of the calculated biases. An ETC would be calculated for each special-status species found during the dead bird searches. The formula to determine ETC is:

$$ETC = TDBF + SB + RB + HB + CB,$$

Where ETC is the estimate of total avian collisions with the segment of electric transmission line studied.

Example: If eight birds are found during the search, then:
ETC = 8 + 2 + 2 + 0.6 + 3.15 = 15.75 birds are estimated to be killed from collisions with the wires in this segment.

Habitat bias and crippling bias should be eliminated if reliable calculations are not available.

An ETC would be determined for each special-status species and averaged over the first 3-year monitoring period. The ETC would be compared to the significance criteria set forth by the USFWS. If the results of the dead bird searches are above the significance criteria after the first 3 years of monitoring, the monitoring program would continue on an annual basis and remedial actions would likely be implemented. If monitoring results show a decrease in the number of special-status birds incidentally taken by the project during the first 3 years, or during the following 3 years, the frequency of monitoring would be reduced or monitoring would be discontinued upon approval by USFWS. If during the dead bird searches large numbers of migratory and/or special-status birds were to be recorded during the dead bird searches, the USFWS and ODFW would be notified immediately.

5. Remedial Actions

If the new electric transmission line or the stacks at the Energy Facility cause significant impacts to bald eagles protected under the ESA, or any special status bird species protected under the MBTA, remedial actions to decrease the incidental take at or below the significance criteria would be implemented.

Remedial actions may include:

- Increase the number of BFDs along the top groundwires.
- Decrease the spacing of BFDs along the top groundwires.
- Add BFDs to the conductor wires.
- Implement a study to determine the cause of excess avian collisions, then develop an appropriate remedial action plan.

The project proponent would reinitiate consultation with USFWS prior to implementing remedial actions.

6. References

Avian Power Line Interaction Committee (APLIC). 1994. "Mitigating Bird Collisions With Power Lines: The State of the Art in 1994."

Brown, W., and Drewien, R. 1995. "Evaluation of Two Power Line Markers to Reduce Crane and Waterfowl Collision Mortality." Wildlife Society Bulletin, 23(2): 217-227.

Isaacs, Frank B. 2002. Senior Faculty Research Assistant, Oregon State University. Personal communication on August 6, 2002.

SLIP SHEET FOR FIGURES E-1 AND E-2

E-1: Example of Bird Flight Diverter

E-2: Avian Collision Data Sheet

APPENDIX F

Worst-Case Analysis of COB Energy Facility Water Impacts

APPENDIX F TO THE BIOLOGICAL ASSESSMENT

Worst-Case Analysis of COB Energy Facility Water Impacts

The available evidence supports the conclusion that there is no hydraulic connection between the deep and shallow zones, which include the Lost River. However, if one were to assume that an extremely efficient hydraulic connection did in fact exist between the deep system and the Lost River, any impact on the Lost River from the proposed pumping would be imperceptible. To demonstrate this fact, COB Energy Facility, LLC (the project proponent) conducted this "worst-case" analysis. The analysis is not intended to describe an outcome that is likely or even plausible, but rather shows that even if one makes the most conservative assumptions at every step of the process, there still is no potential for a measurable impact on the Lost River.

Summary

The assumptions used in this analysis are sufficiently conservative that they do not actually represent the most probable outcome: no impact at all. This analysis is provided only to create a framework for understanding the magnitude of any potential impact, not to describe a physical mechanism for what might actually occur. The repeatedly conservative assumptions used in this analysis indicate that the maximum reduction in the lowest range of summer flows of the Lost River is roughly 0.00074 gpm as the river passes through the 2-mile reach closest to the Babson well. This reduction would represent a 0.000004 percent reduction in the lowest range of summer flows. This degree of connection is unlikely, and it is additionally unlikely that this impact would result in an impact to fish habitat or passage if it were to occur.

Aquifer Testing and Investigation

Previous borehole geophysics and aquifer testing at the Babson well identified the presence of two separate aquifer systems (see *Groundwater Development Potential and Hydrogeologic Assessment for the Lorella Pumped Storage Project, Klamath County, Oregon* [CH2M HILL, 1994]). The shallow aquifer system (above approximately 500 feet) is a heavily appropriated basalt aquifer that is in varying degrees of hydraulic connection with the Lost River and Bonanza Big Springs. The shallow system is used for irrigation and domestic water supply. The deep aquifer system produces water from water-bearing zones deeper than 1,500 feet below the ground surface (bgs). No data gathered from the monitoring well network during a pump test conducted in August and September 2002 at 6,800 gallons per minute (gpm) for 30 days indicate that the deep aquifer withdrawals would affect groundwater levels in the shallow aquifer, or flows at Bonanza Big Springs and the Lost River. The proposed maximum withdrawal rate of 308 gpm is unlikely to have any measurable effect in the deep zone, much less the shallow zone that lies 1,000 feet higher.

Worst-Case Analysis

The worst-case analysis consisted of the following steps:

1. Predict the worst-case drawdown beneath the Lost River from pumping at the Babson well.
2. Predict the worst-case change in flow of the Lost River resulting from the drawdown.
3. Compare that worst-case change in flow to the average summer flow of the Lost River.

Drawdown Beneath the Lost River

The Babson well investigation shows that the shallow basalt aquifer system at the well extends from approximately 60 to 430 feet bgs. Above the shallow basalt aquifer system lie the typically low-permeability sediments of the Yonna formation. The Babson well lies approximately 0.75 mile west of the Lost River at its closest point. The log for observation well MW-1 shows that the Yonna formation sediments thicken substantially between the Babson well and the Lost River—from 60 feet at the Babson well to 285 feet at MW-1. The progressively deeper bedrock in the center of the valley is expected, and is consistent with the fault-block extension of this basin and range setting.

For this analysis, a conservative assumption was made that the depth of the Yonna formation sediments remains approximately 300 feet throughout the central portion of the valley in the Babson well vicinity, and the shallow basalt aquifer system lies roughly 300 feet below the base of the Lost River (it is likely to be much deeper).

There was a hydraulic response in the observation well network attributable to a leaking well packer during the August and September 2002 pump test (see *Water Supply Supplemental Data Report: Deep Aquifer Testing at the COB Energy Facility Water Supply Well* [CH2M HILL, November 2002]). This slight leak in the seal between the borehole wall and the packer seal resulted in drawdown in the Babson well immediately above the packer. Under worst-case conditions (i.e., the transmissivity of the shallow aquifer system is extremely high), approximately 625 gpm, or 9 percent of the total discharge, would have come from the shallow aquifer system to produce the observed response in the Babson borehole. In order for this analysis to be considered "worst case", a 10 percent contribution will be assumed.

The maximum production rate from the deep aquifer system would be limited to 300 gpm. A 10 percent connection between the shallow and the deep system would result in 30 gpm draining from the shallow basalt aquifer system to the deep aquifer system. Although the average production rate from the well would be substantially less than 300 gpm, this rate was used for the worst-case analysis.

The high shallow basalt aquifer system transmissivity used to speculate about the upper limit degree of possible hydraulic connection was roughly 2.5 million gallons per day per foot (gpd/ft). This value was used to estimate the amount of drawdown in the shallow aquifer system resulting from a 30 gpm withdrawal, 0.75 mile from the Babson well. This distance represents the Lost River's closest point, where drawdown would be at its greatest. The Jacob-Theis equation predicts the first response (defined here as 0.01 foot of head change) would occur approximately 53 hours after the onset of pumping. The drawdown in the shallow aquifer system 300 feet below the Lost River increases to 0.017 foot (0.21 inch), after approximately 1 year of pumping and to 0.021 foot (0.25 inch) after 30 years of pumping.

For the purpose of this worst-case analysis, a maximum theoretical drawdown in the basalt aquifer system 300 feet below the Lost River of 0.03 foot was assumed.

Change in Flow of the Lost River Resulting from Drawdown

The maximum 0.03 foot of drawdown in the shallow basalt aquifer system has to be transmitted vertically upward through the Yonna formation sediments before any potential impact to the Lost River occurs. The vertical hydraulic conductivity of the Yonna formation sediments is unknown. Based on the geologic log CH2M HILL produced for MW-1, the 285 feet of Yonna formation in the Babson well vicinity can be generalized as follows:

- Surface to 35 feet: silt and sand
- 35 feet to 150 feet: clay and diatomite (low-permeability sediments, commonly referred to as “chalk”)
- 150 to 250 feet: volcanic sand and gravel
- 255 to 270 feet: clay and diatomite
- 270 to 285 feet: volcanic sand and gravel

Hydraulic conductivity is a term that describes the ease with which a fluid (water) will move through a material (the aquifer). Effective *horizontal* hydraulic conductivity values are controlled by the high-permeability portions of the aquifer. That is, water tends to move preferentially through the higher-permeability potions of the aquifer. Effective *vertical* hydraulic conductivity is controlled primarily by the low-conductivity portions of the aquifer. That is, the low-permeability portions of the aquifer are the controlling factor limiting the vertical movement of water. To be conservative and predict a worst-case result, the higher-permeability portion of the Yonna formation sediments (volcanic sand and gravel) were ignored (they dampen the vertical movement of a change in head by supplying water horizontally), and the formation was assumed to consist of 130 feet of clay and diatomite.

The horizontal hydraulic conductivity of clay typically ranges from 10E-3 to 10E-5 gallons per day per feet squared (gal/day/ft^2) (Freeze and Cherry, 1979). For this analysis, the maximum value in this range, 0.01 gal/day/ft^2 was used. Vertical hydraulic conductivity is typically a factor of 10 lower than the horizontal hydraulic conductivity. To make this a worst-case analysis, this correction was ignored.

Darcy’s equation was used to estimate the flow through the Yonna formation sediments that would result from this change in head at the base of the sediments:

$$Q = KAi$$

Where:

Q = flux (or flow) in gal/d

K = the hydraulic conductivity (0.01 gal/day/ft2)

A = the area over which the flux is calculated

i = the hydraulic gradient (ft/ft)

The Lost River was assumed to be 50 feet across. The area for the flux calculation was a 1-foot-wide strip of Yonna formation sediments, 50 feet wide, or 50 ft^2. The hydraulic gradient was calculated as the 0.03 foot of maximum head change after 30 years divided by the thickness of the sediments (130 feet), or 0.0002 feet per foot (ft/ft).

Using these values, the volume of water flowing vertically downward through a 1-foot-wide strip of Yonna formation sediments would be 0.0001 gallon per day (gpd), or 0.00000007 gpm.

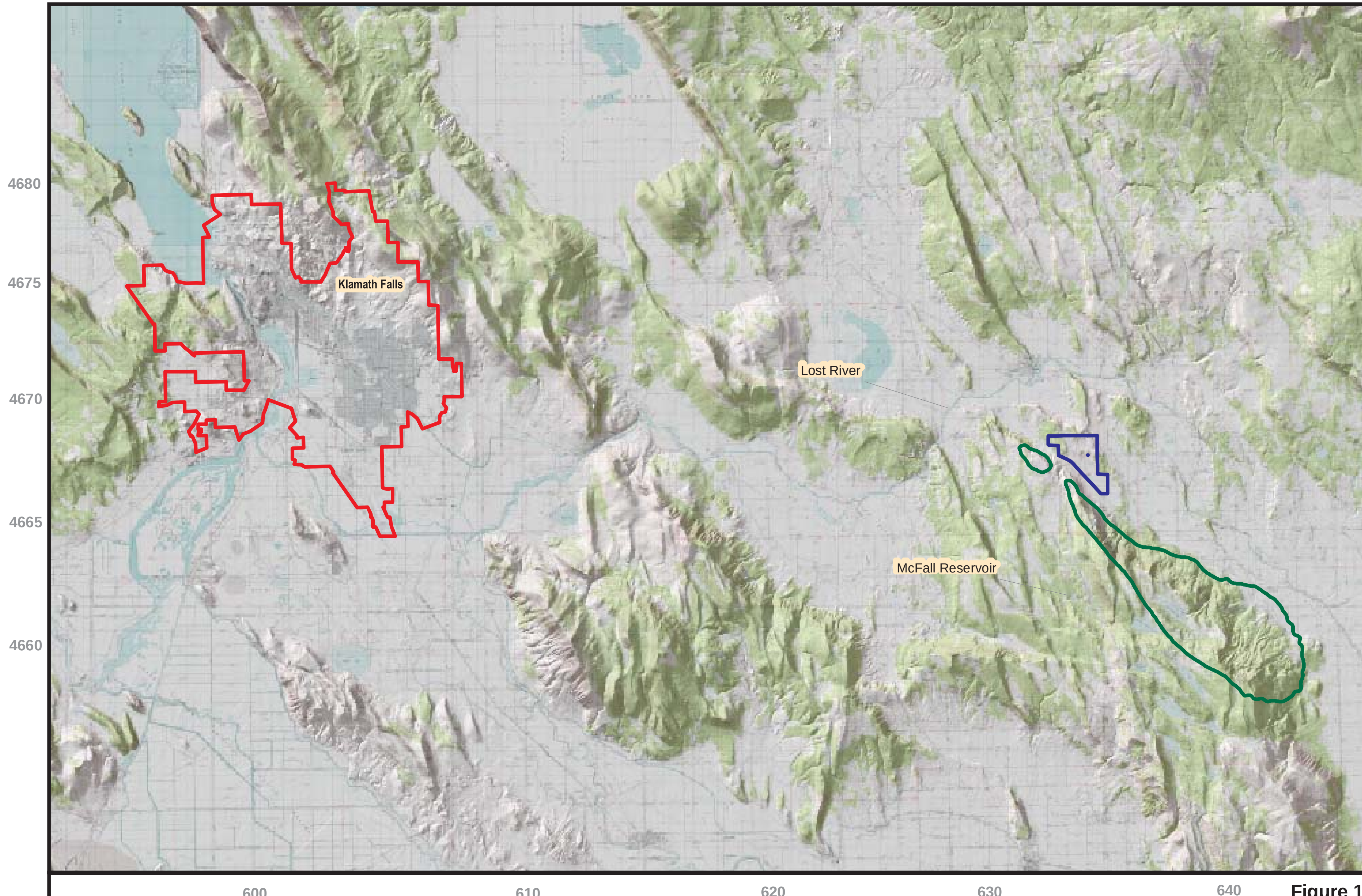
Change in Flow of the Lost River Compared to Average Summer Flow

The amount of drawdown diminishes with distance from the point of withdrawal. A well pumping 0.1 gpm from the low-permeability Yonna sediments (a rate more than 14,000 times higher than the worst-case predicted flux through 50 ft^2 of Yonna formation) for 30 years would extend a radius of influence of only 6,500 feet. For this analysis, the flux through the Yonna formation was assumed to affect a 2-mile length of the Lost River. To make this worst-case analysis even worse, the flux rate was assumed to remain constant at the peak calculated value along this length, when in fact it would diminish with distance from the well.

The worst-case flow through the 1-foot-by-50-foot strip of Yonna formation sediments was 0.00000007 gpm, and was assumed to be supplied entirely by the Lost River. Along a 2-mile length (10,600 feet), the worst-case change in flow in the Lost River would be 0.00074 gpm.

Summer flows in the Lost River between Keller Bridge and Bonanza typically range from 40 to 80 cubic feet per second (cfs) (Bruce McCoy, Horsefly Irrigation District, Personal Communication, July 2003). This is equivalent to 18,000 to 36,000 gpm. As of August 2003, flows exceed 80,000 cfs. To make this a worst-case analysis, summer flow in the Lost River was assumed to be the lower 18,000 gpm.

If the Lost River flows diminish 0.00074 gpm as the river passes through the 2-mile reach closest to the Babson well, a 0.000004 percent reduction in flow would occur. This reduction could not impact fish habitat or passage.



Contour 0.2 ug/m³ shows the significant impact area for annual PM^{10}

COB Energy Facility

Urban Growth Boundary

0 2 4 Miles

0 3 6 9 Kilometers

N

UTM in Kilometers

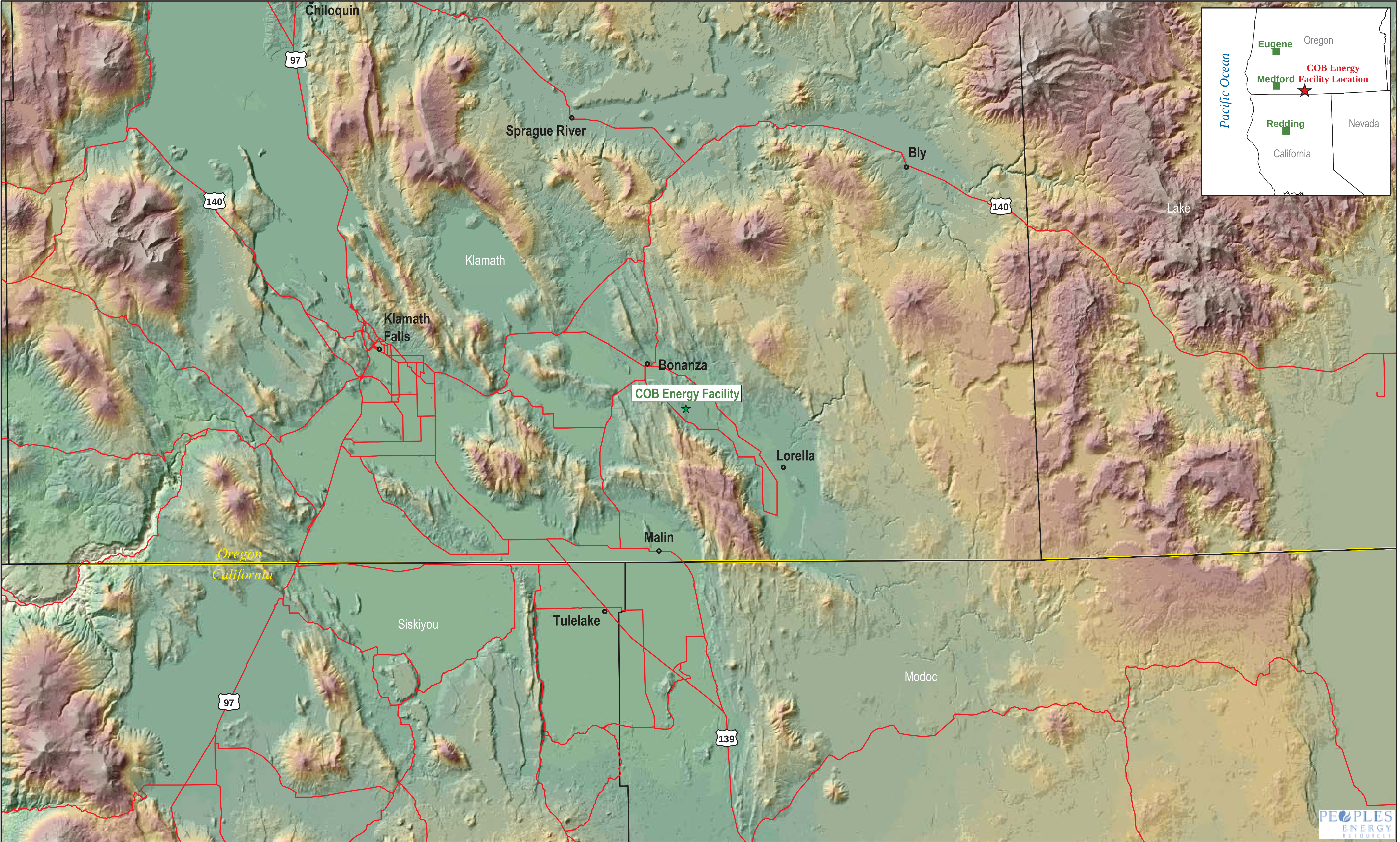
Figure 1

Significant Impact Area for Annual PM^{10}

COB Energy Facility

Bonanza, OR

PEOPLES ENERGY RESOURCES

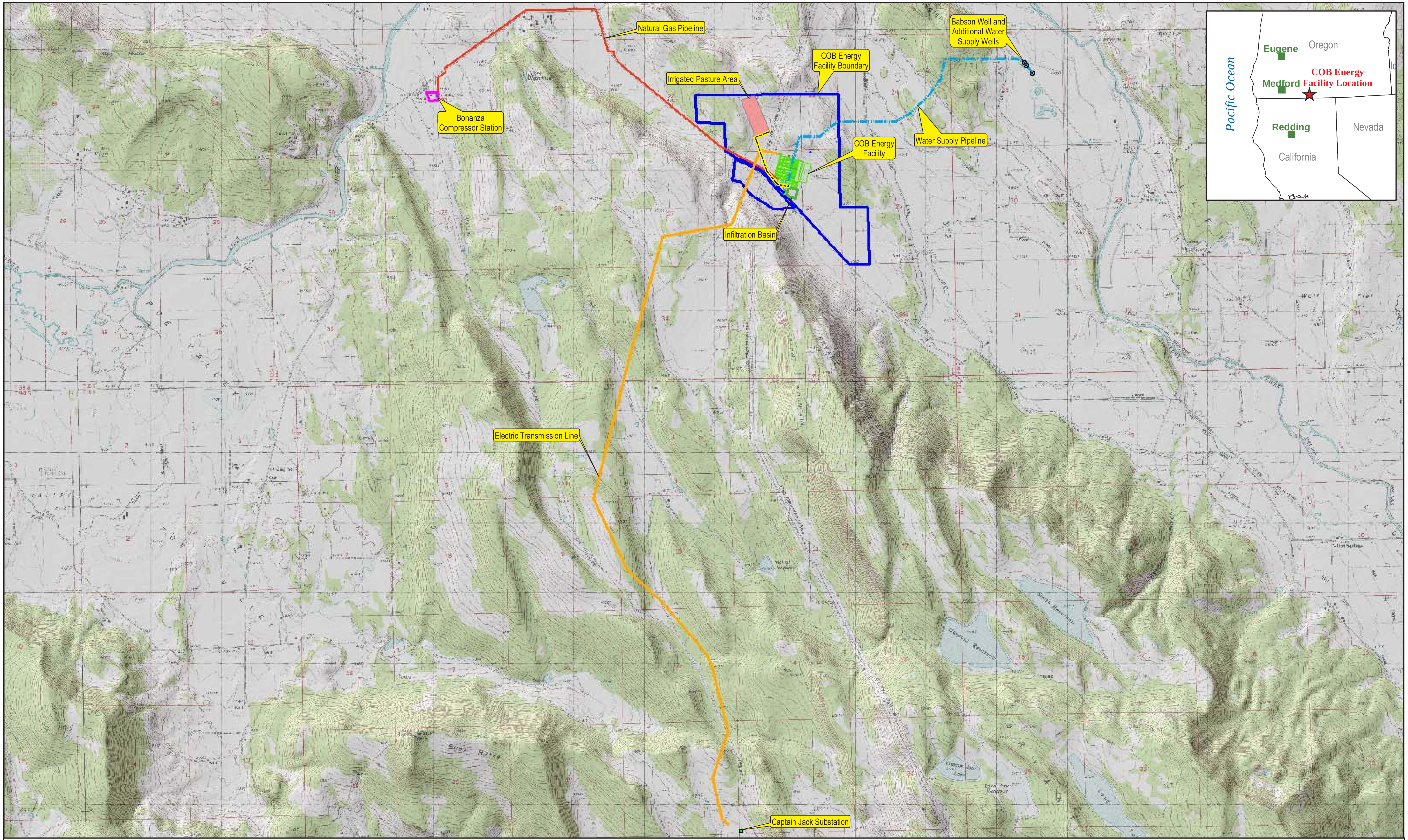


Legend
Roads
Counties
States

N
1 inch equals 6 miles
0 2 4 8 Miles

Figure 2-1
Site Map
Biological Assessment
COB Energy Facility
Bonanza, OR

File Path: P:\PERC\167426\Gis\EIS\mxds\EIS_8-7-03\2-1_site-map.mxd, Date: 08 07, 2003 7:37:25 AM



Legend

- Captain Jack Substation
- Babson Well and Additional Water Supply Wells
- COB Energy Facility Boundary
- Bonanza Compressor Station
- COB Energy Facility
- Electric Transmission Line
- Natural Gas Pipeline
- Water Supply Pipeline
- Irrigation Pipeline
- Infiltration Basin
- Irrigated Pasture Area

N

1 inch equals 4,000 feet

0 2,000 4,000 8,000 Feet

Figure 2-2
Facility Map
Biological Assessment
COB Energy Facility
Bonanza, OR

PEOPLES ENERGY

File Path: \\rosa\proj\PERC\167426\Gis\EIS\mxds\EIS_October_03\2-2_Facility_Map_ba.mxd, Date: November 11, 2003 10:23:23 AM

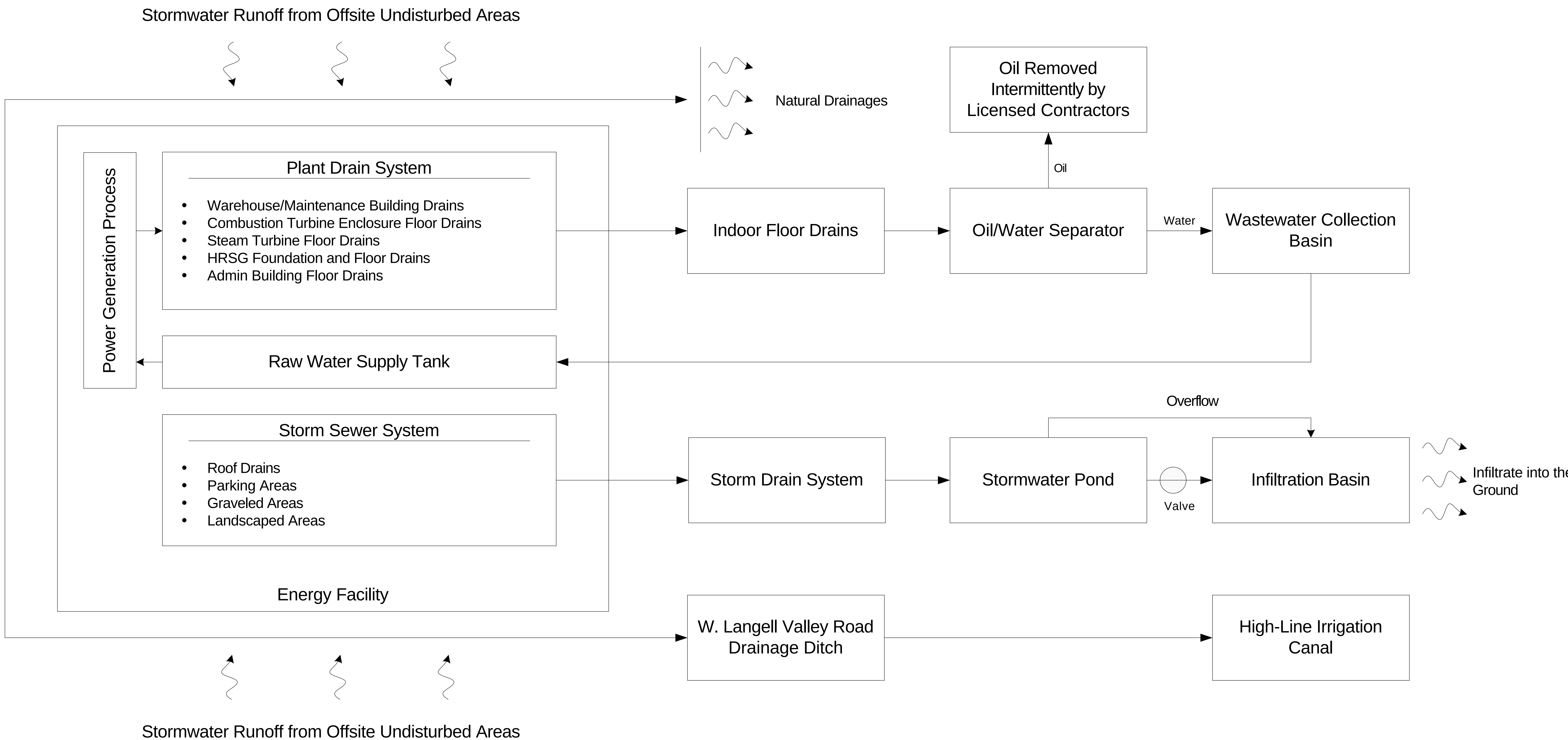
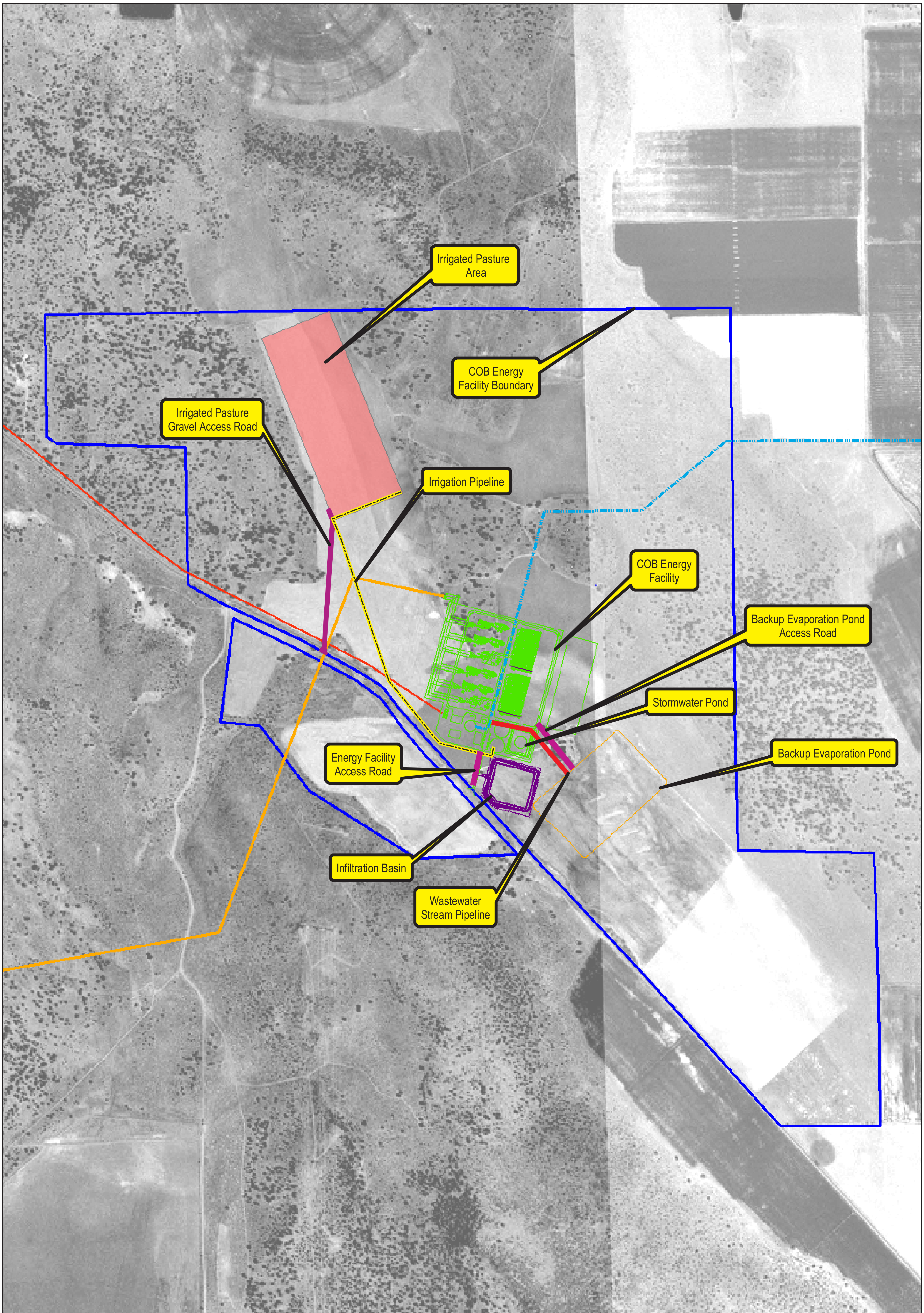


FIGURE 2-3
Stormwater Drainage Flow Schematic
Biological Assessment
COB Energy Facility
Bonanza, OR

PEOPLES ENERGY Resources

PDX/032950010.VSD



Legend

- COB Energy Facility
- Natural Gas Pipeline
- Water Supply Pipeline
- Wastewater Stream Pipeline
- Irrigation Pipeline
- Backup Evaporation Pond
- Infiltration Basin
- Access Roads
- Electric Transmission Line
- COB Energy Facility Boundary
- Irrigated Pasture Area

N

1 inch equals 850 feet

0 250 500 1,000 1,500 Feet

Figure 2-4
Energy Facility Site Layout
Biological Assessment
COB Energy Facility
Bonanza, OR

PEOPLES ENERGY RESOURCES

File Path: P:\PERC\167426\Gis\EIS\mxds\EIS_October_03\3.2-4_Facility_Layout.mxd, Date: October 27, 2003 4:46:43 PM

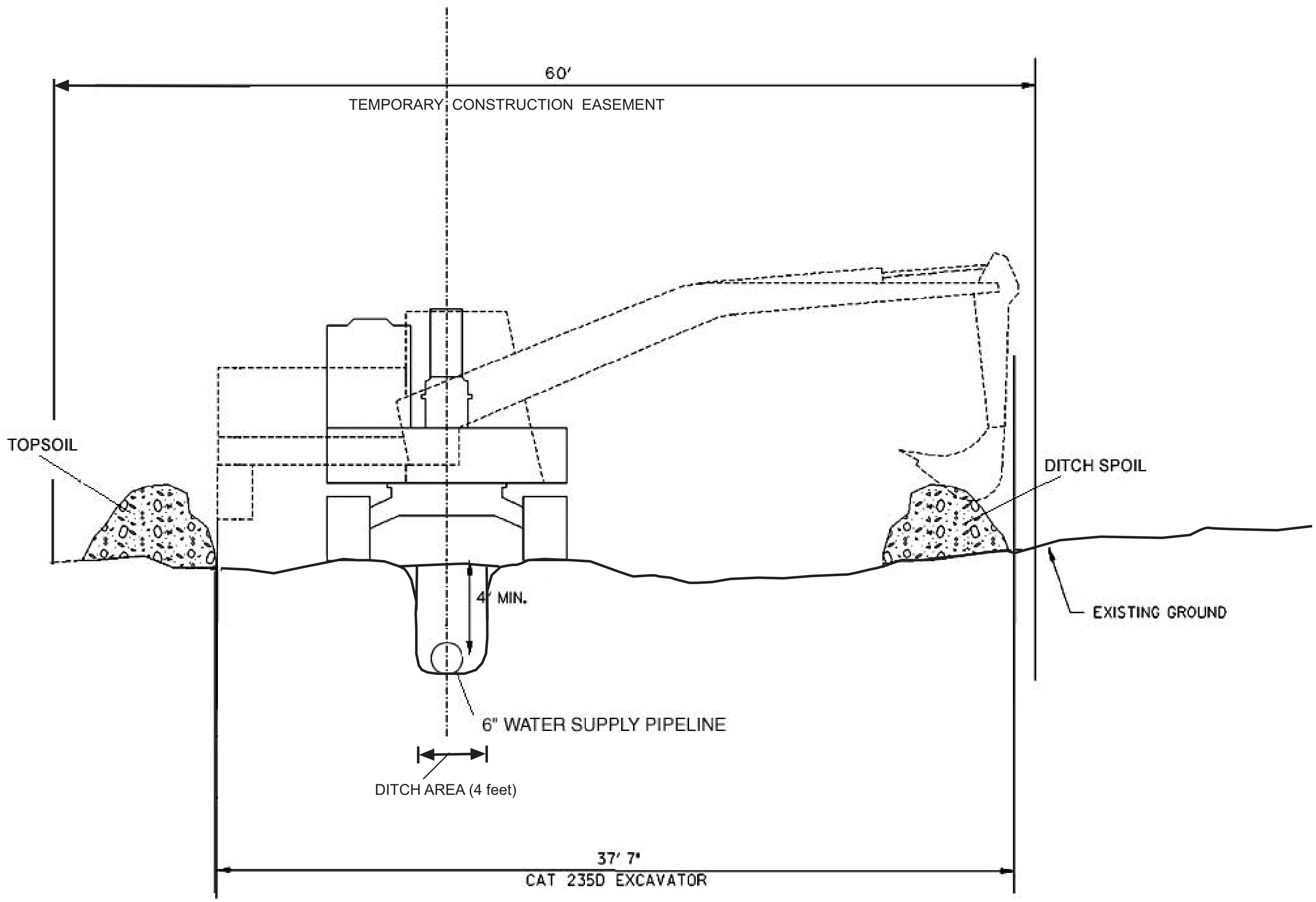
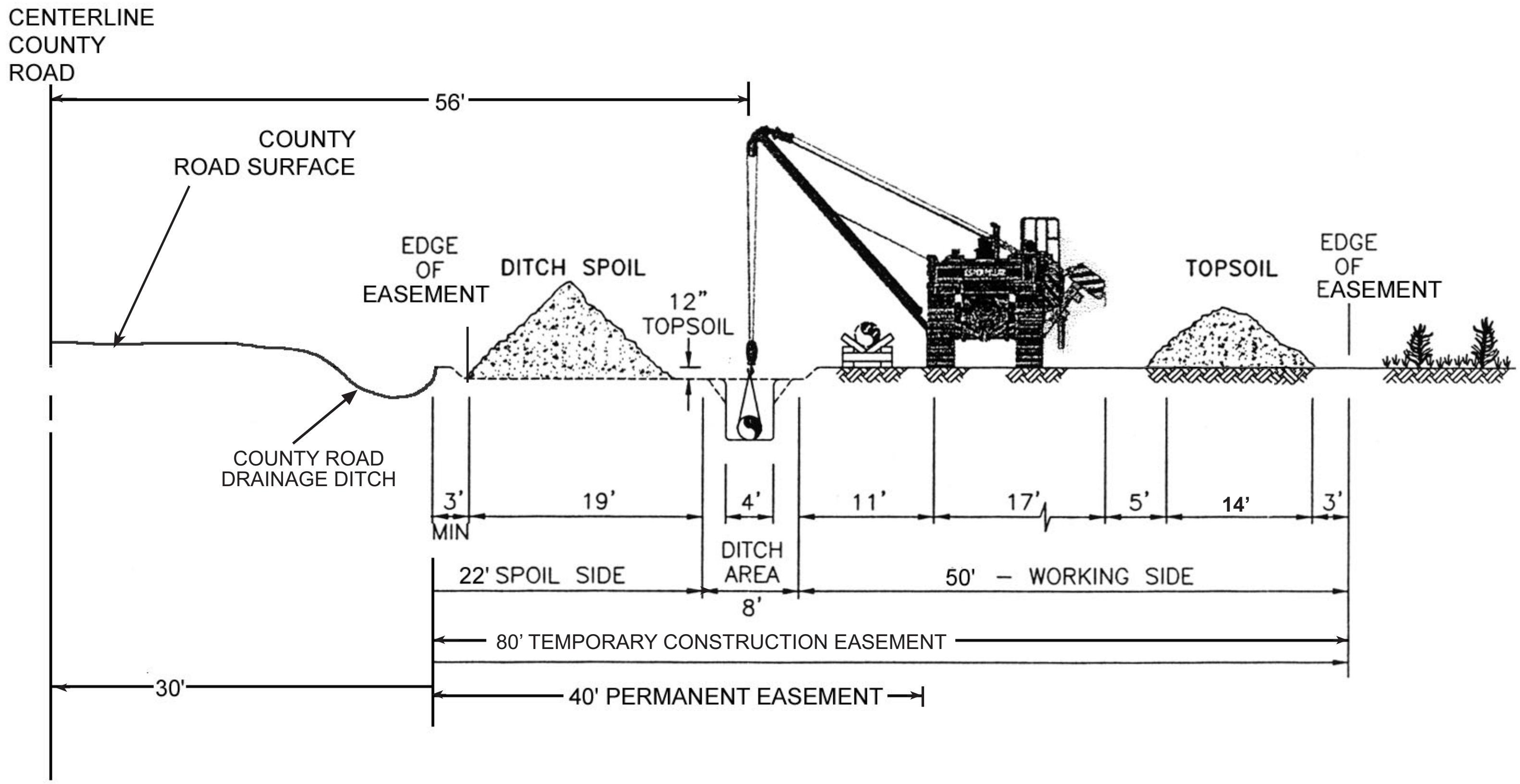


Figure 2-5
Typical Water Supply Pipeline Configuration
Biological Assessment
COB Energy Facility
Bonanza, OR

CH2MHILL

PEOPLES ENERGY Resources

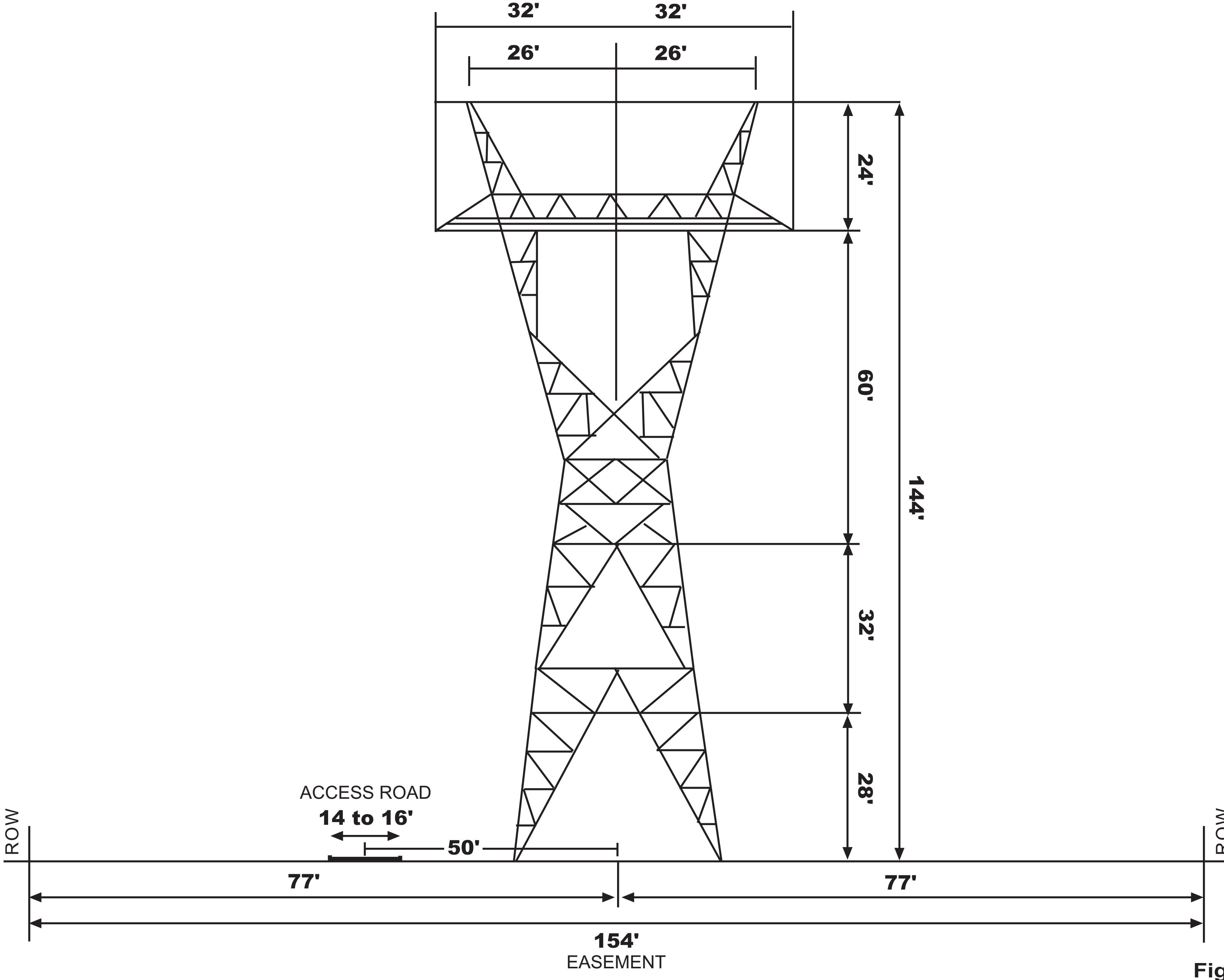


Source: (Adapted from *Temporary Right-of-Way With Requirements for Pipeline Construction.* Prepared for The INGAA Foundation, Inc., by Gulf Interstate Engineering. 1999.)

Figure 2-6
Typical Natural Gas Pipeline Configuration
Biological Assessment
COB Energy Facility
Bonanza, OR

CH2MHILL

PEOPLES ENERGY Resources



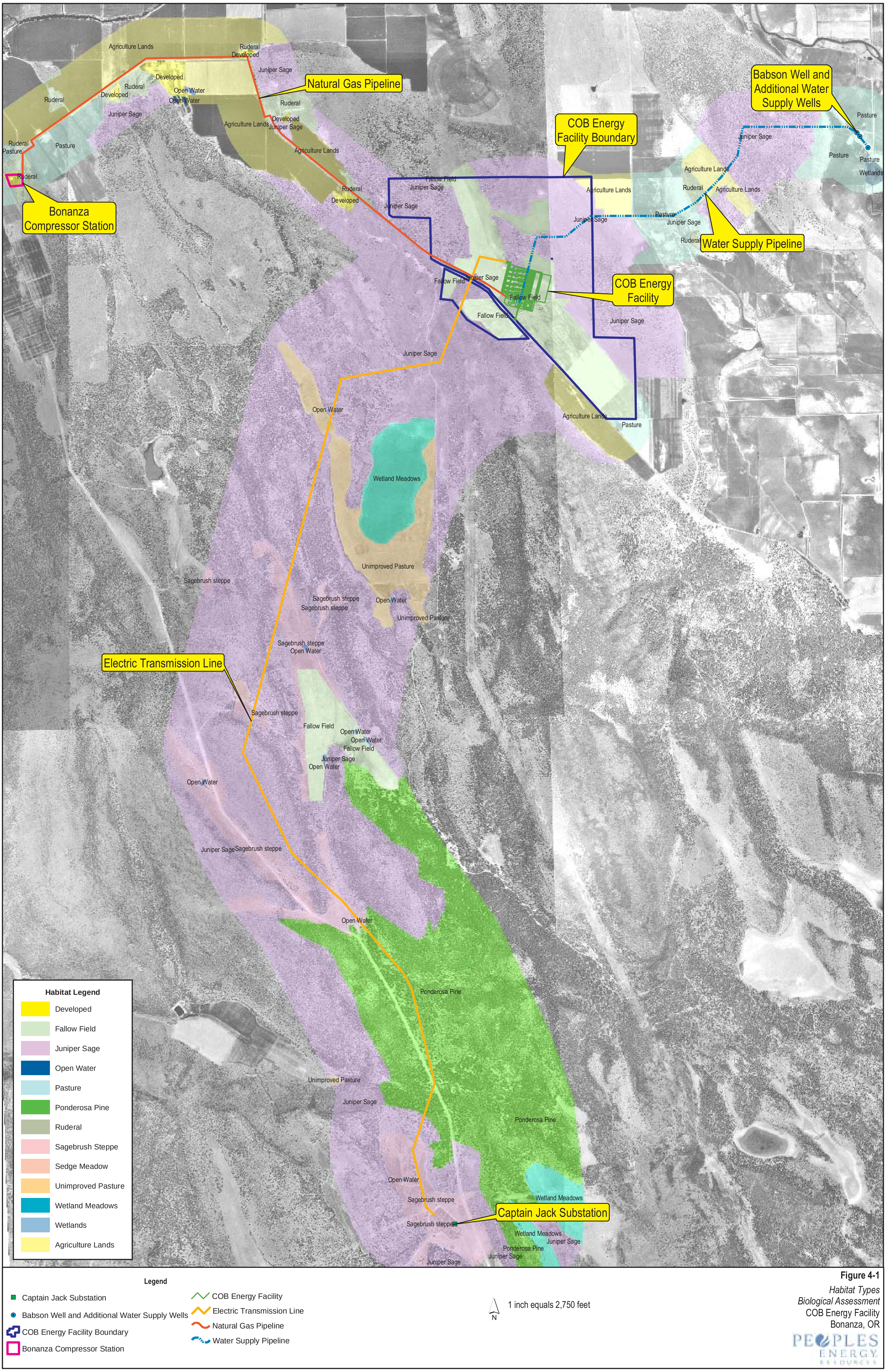
NOTES:

1. TRANSMISSION TOWER IS LATTICE.
2. CONDUCTORS COULD BE HORIZONTAL OR VERTICAL.
3. ACCESS ROAD MAXIMUM GRADE IS LESS THAN 15 PERCENT.

Figure 2-7
Typical Transmission Tower Structure
Biological Assessment
COB Energy Facility
Bonanza, OR

CH2MHILL

PEOPLES ENERGY Resources



File Path: P:\PERC\167426\Gis\EIS\mxds\BA_8_7_03\4-1_habitat-types.mxd, Date: 08 07, 2003 11:05:13 AM, User: THOFFBUH

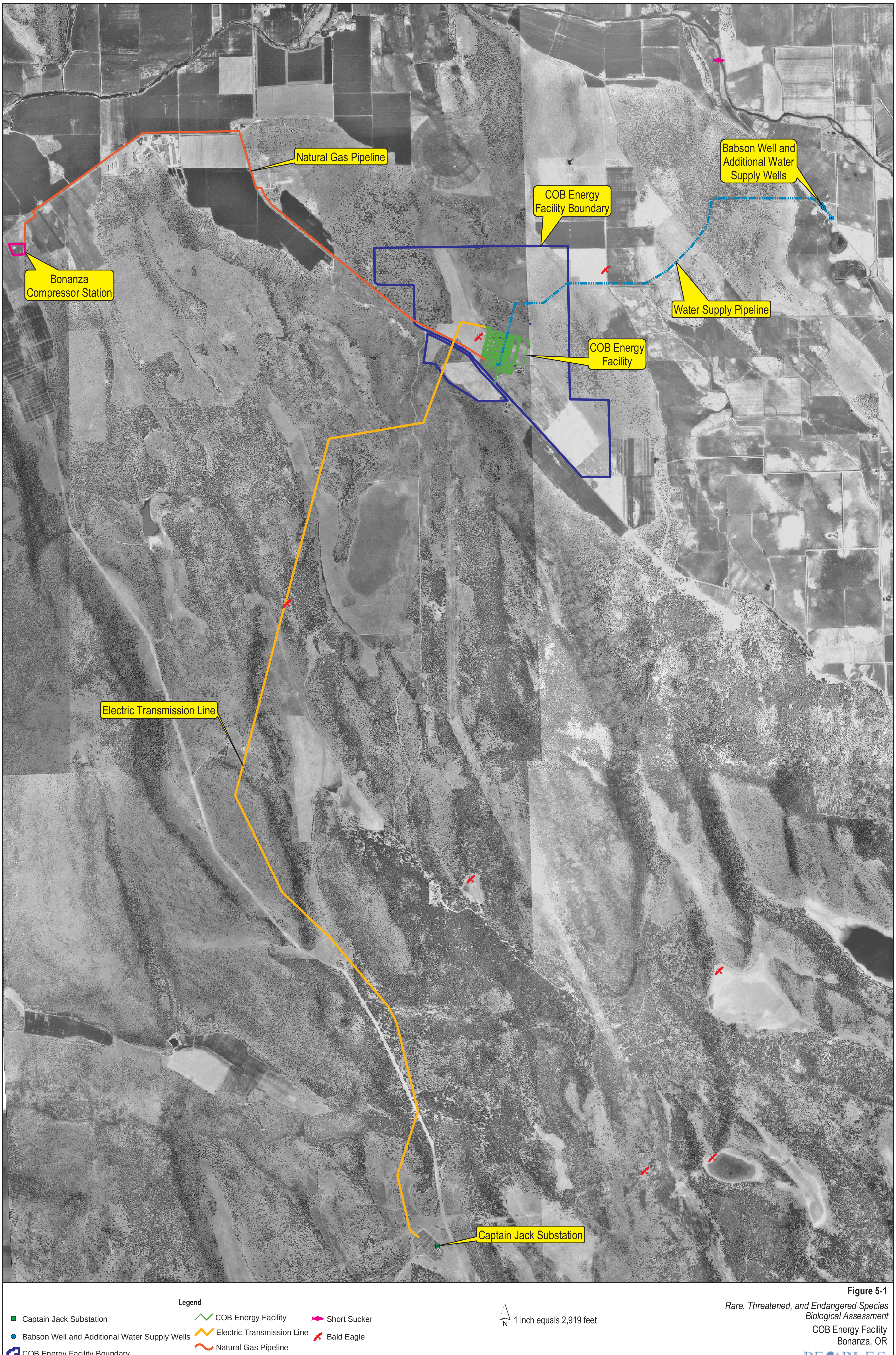


Figure 5-1

Rare, Threatened, and Endangered Species Biological Assessment

COB Energy Facility
Bonanza, OR

PEOPLES ENERGY RESOURCES

File Path: P:\PERC\167426\Gis\EIS\mxds\BA_8_7_03\3.4-4_rte.mxd, Date: 08 07, 2003 10:58:55 AM, User: THOFFBUH

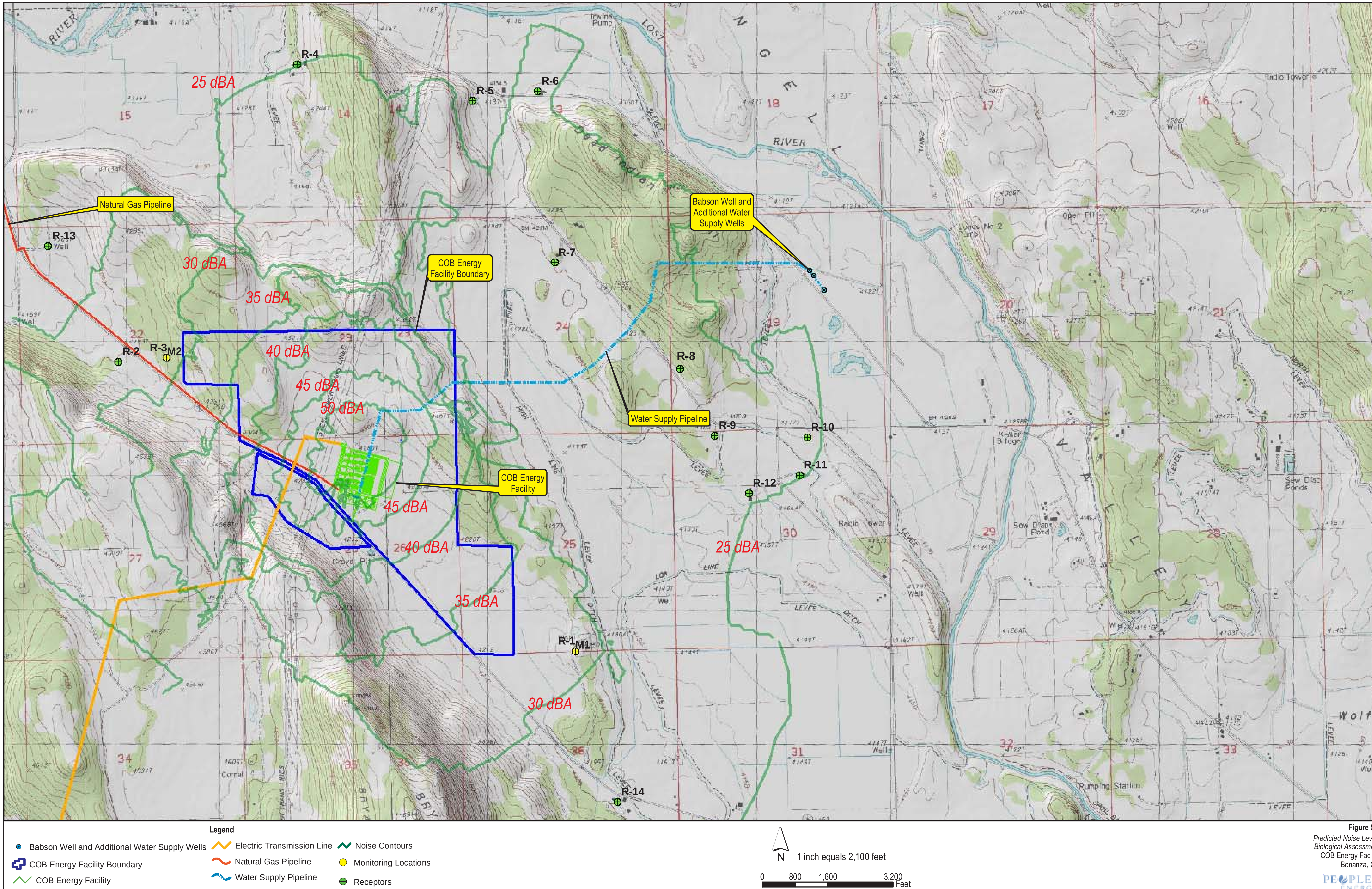
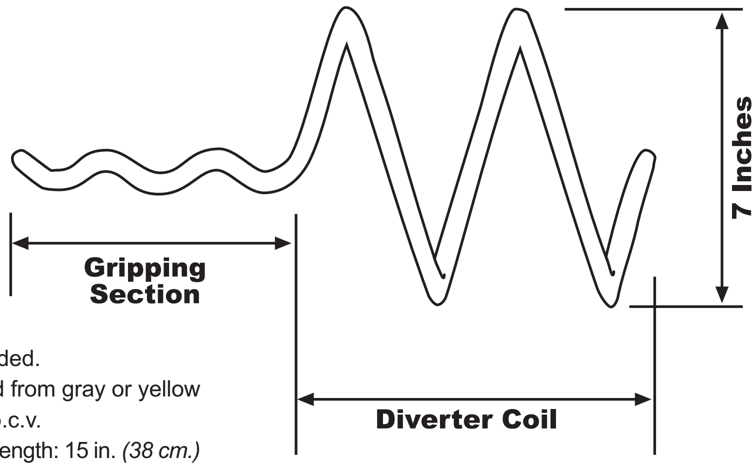


Figure 5-2

Predicted Noise Levels
Biological Assessment
COB Energy Facility
Bonanza, OR

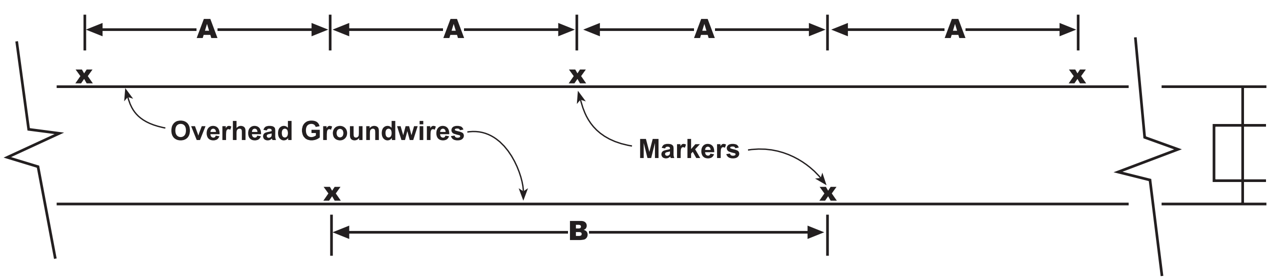
PEOPLES ENERGY

File Path: P:\PERC\167426\Gis\EIS\mxds\BA_8_7_03\5-2_predicted-noise.mxd, Date: 08 13, 2003 6:20:55 AM



Notes:
1. Ends are sanded.
2. Manufactured from gray or yellow high-impact p.c.v.
3. Approximate length: 15 in. *(38 cm.)*

Dulmison bird flight diverter (BFD-7)



Spacing	Dimensions	
	A	**B**
16 feet *(5 meters)*	16 feet	32 feet *(10 meters)*
32 feet *(10 meters)*	32 feet	66 feet *(20 meters)*
49 feet *(15 meters)*	49 feet	98 feet *(30 meters)*

Marker spacing diagram for overhead groundwires

Figure E-1
Example of Bird Flight Diverter and Suggested Spacing on Groundwires
Avian Collision Monitoring Plan
COB Energy Facility
Bonanza, OR

Figure E-2. Avian Collision Data Sheet

Project: Survey objective: Page_____of______

Date: Observer(s): Individual search bias:

T-line segment: Time start:

Equipment: Time end:

Weather conditions: Field conditions:

(wind direction/speed, precipitation, visibility, cloud cover, temperature) (vegetation height, habitat type, flooded)

Time	Location ID on Map	Species	Sex	Age	Approximate Time of Death	Physical Condition	Probable Cause of Death	Remarks

TABLE 1
Summary of Predicted Hazardous Air Pollutant (HAP) and Particulate Matter Less Than Ten Microns (PM_{10}) Emissions
Screening-Level Ecological Risk Assessment
COB Energy Facility, Klamath County, Oregon

	Facilitywide Emissions (tons/yr) *				
HAP	**CTGs and Duct Burners**	**Gas Heaters and Auxiliary Boilers**	**Fire Water Pump**	**Wellhead Emergency Generator**	**Total All Sources**
Benzene	1.7E-01	5.6E-04	5.0E-05	2.0E-05	0.17
Formaldehyde	3.0E+00	2.0E-02	6.3E-05	2.0E-06	2.98
Hexane	6.9E+00	4.8E-01			7.33
Naphthalene	2.0E-02	1.6E-04			0.02
Toluene	1.7E+00	9.1E-04	2.2E-05	7.2E-06	1.73
Acetaldehyde	5.3E-01		4.1E-05	6.5E-07	0.53
Acrolein	8.5E-02			2.0E-7	0.08
Ethylbenzene	4.2E-01				0.42
PAH	2.9E-02	1.4E-05	9.0E-06	5.4E-06	0.03
Xylenes (total)	8.5E-01		1.5E-05	5.0E-06	0.85
Dichlorobenzene	4.6E-03	3.2E-04			0.005
Arsenic	1.7E-03	5.3E-05			0.002
Cadmium	9.3E-03	2.9E-04			0.010
Chromium	1.2E-02	3.7E-04			0.012
Cobalt	7.1E-04	2.2E-05			0.001
Manganese	3.2E-03	1.0E-04			0.003
Mercury	2.2E-03	6.9E-05			0.002
Nickel	1.8E-02	5.6E-04			0.018
PM_{10}	2.5E+02	2.0E+00	1.7E-02	2.6E-03	247

* See Section 3.7.1.4 and Table 3.7.5 in the *COB Energy Facility Environmental Impact Statement* (BPA, 2003) for a summary of hazardous air pollutant (HAP) emissions.

CTG = combustion turbine generator

TABLE 2

Summary Statistics of Estimated Hazardous Air Pollutants (HAPs) and Particulate Matter Less Than Ten Microns (PM_{10}) Concentrations in Soil and Two Surface Water Sources (Generic Reservoir and Generic River) Over 30 Years

Screening-Level Ecological Risk Assessment

COB Energy Facility, Klamath County, Oregon

Analyte	Max	99% percentile	95% percentile	90% percentile	Mean	50% percentile (median)	Min
Soil (mg/kg) [a]							
Arsenic	0.012	8.4E-03	3.2E-03	1.8E-03	9.1E-04	4.9E-04	1.5E-05
Cadmium	0.061	0.042	0.016	9.1E-03	4.5E-03	2.4E-03	7.4E-05
Chromium	0.074	0.051	0.019	0.011	5.4E-03	2.9E-03	8.9E-05
Cobalt	6.1E-03	4.2E-03	1.6E-03	9.1E-04	4.5E-04	2.4E-04	7.4E-06
Manganese	0.018	0.013	4.8E-03	2.7E-03	1.4E-03	7.3E-04	2.2E-05
Mercury	0.012	8.4E-03	3.2E-03	1.8E-03	9.1E-04	4.9E-04	1.5E-05
Nickel	0.11	0.076	0.029	0.016	8.2E-03	4.4E-03	1.3E-04
PM_{10}	1500	1000	390	220	110	60	1.8
Surface Water - Generic Reservoir (mg/L) [b]							
Arsenic	3.0E-05	2.1E-05	7.8E-06	4.5E-06	2.2E-06	1.2E-06	3.7E-08
Cadmium	1.5E-04	1.0E-04	3.9E-05	2.2E-05	1.1E-05	6.0E-06	1.8E-07
Chromium	1.8E-04	1.2E-04	4.7E-05	2.7E-05	1.3E-05	7.2E-06	2.2E-07
Cobalt	1.5E-05	1.0E-05	3.9E-06	2.2E-06	1.1E-06	6.0E-07	1.8E-08
Manganese	4.5E-05	3.1E-05	1.2E-05	6.7E-06	3.3E-06	1.8E-06	5.5E-08
Mercury	3.0E-05	2.1E-05	7.8E-06	4.5E-06	2.2E-06	1.2E-06	3.7E-08
Nickel	2.7E-04	1.9E-04	7.0E-05	4.0E-05	2.0E-05	1.1E-05	3.3E-07
PM_{10}	3.72	2.55	0.96	0.55	0.27	0.15	0.00
Surface Water - Generic River (mg/L) [c]							
Arsenic	3.0E-04	2.1E-04	7.8E-05	4.5E-05	2.2E-06	1.2E-05	3.7E-07
Cadmium	1.5E-03	1.0E-03	3.9E-04	2.2E-04	1.1E-05	6.0E-05	1.8E-06
Chromium	1.8E-03	1.2E-03	4.7E-04	2.7E-04	1.3E-05	7.2E-05	2.2E-06
Cobalt	1.5E-04	1.0E-04	3.9E-05	2.2E-05	1.1E-06	6.0E-06	1.8E-07
Manganese	4.5E-04	3.1E-04	1.2E-04	6.7E-05	3.3E-06	1.8E-05	5.5E-07
Mercury	3.0E-04	2.1E-04	7.8E-05	4.5E-05	2.2E-06	1.2E-05	3.7E-07
Nickel	2.7E-03	1.9E-03	7.0E-04	4.0E-04	2.0E-05	1.1E-04	3.3E-06
PM_{10}	37.2	25.5	9.6	5.5	2.7	1.5	0.045

Notes:

[a] HAP and PM_{10} concentrations are calculated based on the entire air modeling domain with no abiotic or biotic loss of metals from wet and dry deposition. A 1-cm mixing depth and a soil density of 1.5 g/cm^3 were assumed (USEPA, 1998b).

[b] HAP and PM_{10} concentrations are calculated over a generic reservoir receiving the maximum wet and dry deposition of the entire modeling domain with no abiotic or biotic loss of metals from total and wet deposition. A 20-foot mixing depth and a water density of 1.0 g/cm^3 were assumed.

[c] HAP and PM_{10} concentrations are calculated over a generic river receiving the maximum wet and dry deposition of the entire modeling domain with no abiotic or biotic loss of metals from total and wet deposition. A 2-foot mixing depth and a water density of 1.0 g/cm^3 were assumed.

TABLE 3

Calculation of Maximum Soil Concentration from Wastewater Application to 31 Acres During the 30-Year Life of the Energy Facility

Screening-Level Ecological Risk Assessment

COB Energy Facility, Klamath County, Oregon

Parameter/Analyte		(From Aquifer) Raw Water Max Value	Units	Laboratory MRL [a]	Units		RO Reject (75% Recovery) Max Value	Units	Ratio Raw/Reject	RO Reject Estimated from Nondetects	Units	Wastewater Values for ERA [b]	Units	Maximum Estimated Soil Concentration [c] (mg/kg)
Flow Rate		208	gpm	--	--		49	gpm				49		
Inorganics														
Aluminum				100	ug/L					0.1954	mg/L	0.1954	mg/L	9.65
Ammonia as N				0.1	mg/L	<	0.00	mg/L		0.1954	mg/L	0.1954	mg/L	9.65
Antimony				2	ug/L					0.00391	mg/L	0.00391	mg/L	0.193
Arsenic				2	ug/L					0.00391	mg/L	0.00391	mg/L	0.193
Barium				25	ug/L					0.04885	mg/L	0.04885	mg/L	2.413
Beryllium				4	ug/L					0.00782	mg/L	0.00782	mg/L	0.386
Boron	<	0.275	mg/L	275	ug/L	<	0.54	mg/L	1.964			0.540	mg/L	26.68
Cadmium				0.5	ug/L					0.00098	mg/L	0.00098	mg/L	0.048
Calcium		14.8	mg/L	500	ug/L	<	28.92	mg/L	1.954			28.920	mg/L	1429
Chloride		2.12	mg/L	0.1	mg/L	<	4.14	mg/L	1.953			4.140	mg/L	204.5
Chromium III				1	ug/L					0.00195	mg/L	0.00195	mg/L	0.097
Chromium VI				2	ug/L					0.00391	mg/L	0.00391	mg/L	0.193
Cobalt				10	ug/L					0.01954	mg/L	0.01954	mg/L	0.965
Copper				10	ug/L	<	0.00	mg/L		0.01954	mg/L	0.01954	mg/L	0.965
Fluoride	<	0.1	mg/L	0.1	mg/L	<	0.20	mg/L	2.000			0.200	mg/L	9.88
Iron		0.0736	mg/L	100	ug/L	<	0.14	mg/L	1.902			0.140	mg/L	6.92
Lead				3	ug/L					0.00586	mg/L	0.00586	mg/L	0.290
Magnesium		6.01	mg/L	500	ug/L	<	11.74	mg/L	1.953			11.740	mg/L	580
Manganese	<	0.01	mg/L	10	ug/L	<	0.02	mg/L	2.000			0.020	mg/L	0.988
Mercury				0.1	ug/L					0.00020	mg/L	0.00020	mg/L	0.010
Molybdenum				25	ug/L					0.04885	mg/L	0.04885	mg/L	2.413
Nickel				20	ug/L					0.03908	mg/L	0.03908	mg/L	1.931
Nitrate as N		0.43	mg/L	0.01	mg/L	<	0.84	mg/L	1.953			0.840	mg/L	41.5
Nitrite as N	<	0.01	mg/L	0.01	mg/L	<	0.02	mg/L	2.000			0.020	mg/L	0.988
Phosphorous				0.05	mg/L	<	0.05	mg/L				0.050	mg/L	2.470
Potassium		2.16	mg/L	100	ug/L	<	4.22	mg/L	1.954			4.220	mg/L	208.5
Selenium				2	ug/L					0.00391	mg/L	0.00391	mg/L	0.193
Silver				0.5	ug/L					0.00098	mg/L	0.00098	mg/L	0.048
Sodium		10.3	mg/L	1000	ug/L	<	20.12	mg/L	1.953			20.120	mg/L	994
Strontium				100	ug/L					0.1954	mg/L	0.1954	mg/L	9.65
Sulfate		3.22	mg/L	0.1	mg/L		6.29	mg/L	1.953			6.290	mg/L	310.7
Sulfide				1	mg S^{2}/L					1.954	mg/L	1.954	mg/L	96.5
Sulfite				2	mg/L	<	1.00	mg/L		3.908	mg/L	1.00	mg/L	49.4
Thallium				2	ug/L					0.00391	mg/L	0.00391	mg/L	0.193
Tin				25	ug/L					0.04885	mg/L	0.04885	mg/L	2.413
Titanium				100	ug/L					0.1954	mg/L	0.1954	mg/L	9.65
Zinc				20	ug/L					0.03908	mg/L	0.03908	mg/L	1.931
Organics														
Cyanide, total				0.01	mg/L					0.01954	mg/L	0.01954	mg/L	0.965
Oil & Grease				5	mg/L	<	0.30	mg/L		9.77	mg/L	0.300	mg/L	14.82
Orthophosphate as P				0.01	mg/L	<	0.05	mg/L		0.01954	mg/L	0.05	mg/L	2.470
Phenol				0.005	mg/L					0.00977	mg/L	0.00977	mg/L	0.483
TDS		104	mg/L	5	mg/L	0	203	mg/L	1.952			203	mg/L	10028
TSS				2	mg/L	<	1.00	mg/L		3.908	mg/L	1	mg/L	49.4
Water Properties														
pH		8.4	std Units	--	--		7.5-9	std Units		--		7.5-9	std Units	--
Silica		36.4	mg/L	0.4	mg/L	<	71.120	mg/L	1.954			71.12	mg/L	9222

TABLE 3

Calculation of Maximum Soil Concentration from Wastewater Application to 31 Acres During the 30-Year Life of the Energy Facility

Screening-Level Ecological Risk Assessment

COB Energy Facility, Klamath County, Oregon

Parameter/Analyte	(From Aquifer) Raw Water Max Value	Units	Laboratory MRL [a]	Units	RO Reject (75% Recovery) Max Value	Units	Ratio Raw/Reject	RO Reject Estimated from Nondetects	Units	Wastewater Values for ERA [b]	Units	Maximum Estimated Soil Concentration [c] (mg/kg)
Total Alkalinity	84	mg/L as $CaCO_3$	5	mg/L as $CaCO_3$	164.120	mg/L as $CaCO_3$	1.954			164.12	mg/L as $CaCO_3$	21280
Total Organic Content (TOC)			0.5	mg/L	< 1.50	mg/L		0.977	mg/L	1.500	mg/L	194.5

Notes:

[a] Laboratory MRL = the method reporting limit provided by the analytical laboratory.

[b] Wastewater values used for the Ecological Risk Assessment (ERA) assume that nondetected constituents are present at some concentration below the detection limit. For these constituents, the method reporting limit was multiplied by 1.954 (raw/reject ratio for all other detected metals) to obtain the wastewater value for the ERA.

[c] The maximum soil concentration (MSC) (mg constituent/kg soil) was calculated using the following equation: MSC = (PWC * AWP * L)/(AA * MD * BD), where PWC = predicted wastewater values (mg/L); AWP = annual wastewater production (24.3 million gallons or 91,985,506 L); L = life span of the energy plant (30 years); AA = application area (46 acres or 186,200 m^2); MD = mixing depth for tilled agricultural land (20 cm or 0.2 m); and BD = literature-based bulk density of soil (1500 kg/m^3). This calculation assumes that all constituents accumulate during the 30 years and that nothing is lost to biodegradation, erosion, leaching, or other biotic or abiotic loss mechanisms.

TABLE 4

Assessment Endpoints and Measures of Exposure and Effects

Screening-Level Ecological Risk Assessment

COB Energy Facility, Klamath County, Oregon

Assessment Endpoints					
Entity	**Attribute**	**Effect Level**	**Receptor**	**Measures of Exposure**	**Measures of Effects**
Aquatic Organisms *	Growth, reproduction or survival	Reduction of attribute	NA	Estimated concentrations of COPECs in water.	Comparison of maximum estimated water concentrations to benchmark values for toxic effects that could affect growth, reproduction, or survival
Plants	Growth, reproduction or survival	20% reduction of attribute	NA	Estimated concentrations of COPECs in soil.	Comparison of maximum estimated soil concentrations to benchmark values for toxic effects that could affect growth, reproduction, or survival.
Soil Invertebrates	Growth, reproduction or survival	20% reduction of attribute	NA	Estimated concentrations of COPECs in soil.	Comparison of maximum estimated soil concentrations to benchmark values for toxic effects that could affect growth, reproduction, or survival.
Birds	Growth, reproduction or survival	20% reduction of attribute	Western Meadowlark	Estimated concentrations of COPECs in soil.	Comparison of exposure estimates (based on maximum estimated soil concentrations) to literature-derived benchmark values.
	Individual health and survival	No acceptable effect	Bald Eagle	Estimated concentrations of COPECs in water.	Comparison of exposure estimates (based on maximum estimated water concentrations) to literature-derived benchmark values.
Mammals	Growth, reproduction or survival	20% reduction of attribute	Deer Mouse	Estimated concentrations of COPECs in soil.	Comparison of exposure estimates (based on maximum estimated soil concentrations) to literature-derived benchmark values.

Note:

* Includes fish such as the shortnose sucker and the Lost River sucker.

COPEC = chemicals of potential ecological concern

NA = not available

TABLE 5

Exposure Parameters for Wildlife Receptors

Screening-Level Ecological Risk Assessment

COB Energy Facility, Klamath County, Oregon

	Exposure Factors								
	Body Weight			Ingestion rate - dry wt.			Ingestion rate - water		
Species	Mean (kg)	Notes	Reference	(kg/kg BW/d)	Notes	Reference	(L/kg BW/d)	Notes	Reference
Birds									
Western Meadowlark *Sturnella neglecta*	Mean: **0.110**	Data for Colorado	Wiens and Innis 1974	**0.04**	Daily food consumption for western meadowlarks estimated at 3 times the stomach capacity (3.9 g). Ingestion rate based on body weight of 0.110 kg.	Sample et al. 1997	**0.12**	Based on a minimum water consumption for weight maintenance of 66% of the ad libitum rate and a body weight of 0.1115 kg.	Sample et al. 1997
Bald Eagle Haliaeetus leucocephalus	Male: 4.014 Female: 5.089 Both: **4.552** Range: 3.524 - 5.756	Data for Alaska	Imler and Kalmbach 1955	**0.0163**	Average ingestion rate based on diet of chum salmon at temperatures of -10, 5, and 20^{o} C (14, 41, and 68^{o} F).	Stalmaster and Gessaman 1984	**0.036**	Estimated using allometric equation for birds and a body weight of 4.552 kg.	Calder and Braun 1983
Mammals									
Deer Mouse *Peromyscus maniculatus*	Male: 0.026 **Female: 0.023**	Means for values reported for California	Silva and Downing 1995	**0.45**	Maximum value reported. Represents lactating female.	EPA 1993	0.14	Estimated using allometric equation for mammals and a body weight of 0.026 kg.	Calder and Braun 1983

	Feeding Habits and Foraging Range													
	Biotic Dietary Items (% Diet)							Abiotic Media Ingestion (% diet)			Foraging Range			
Species	Plants	Terrestrial Invertebrates	Mammals and Birds	Fish	Notes	Major food items	Reference	Soil	Notes	Reference	Hectares	other (miles, km)	Reference	Notes
Birds														
Western Meadowlark *Sturnella neglecta*	**36.7**	**63.3**			Data for North America.	Western meadowlarks are ground foragers that consume both plant material (primarily seeds) and invertebrates.	Lanyon 1994	**2.08**	Data not available for western meadowlarks. Assumed to be similar to value derived for the American robin.	Sample et al. 1997	5.04		Lanyon 1994, Kendeigh 1941, and Schaef and Picman 1988	Median from 3 studies.
Bald Eagle Haliaeetus leucocephalus			24	66		Opportunistic feeder, primarily fish, waterfowl, and other animals. For this assessment assumed diet of **100 percent fish**.	Ofelt 1975	**0**	Data not available for bald eagle. Assumed to be negligible due to foraging behavior.			radius = 0.64 km	Mahaffy and Frenzel 1987	
Mammals														
Deer Mouse *Peromyscus maniculatus*	**50**	**50**			Approximate diet of mice in Colorado over all seasons.	Seeds and terrestrial invertebrates, mainly insects.	EPA 1993	**2**	assumed comparable to white-footed mouse	adapted from Beyer et al. 1994	0.1 - 0.2		Brylski 1990	

Note:

Bold values were used for the exposure calculations.

TABLE 6

Bioaccumulation Values and Models for Plants, Soil Invertebrates, and Aquatic Organisms for Calculation of Wildlife Exposure

Screening-Level Ecological Risk Assessment

COB Energy Facility, Klamath County, Oregon

Analytes	N	BAF	Regression Model Slope (B1)	Regression Model Intercept (B0)	Form	Transfer Type	Comments	Reference
Plants								
Antimony	17	0.1487				soil-plant	90th percentile value	CH2M HILL, 2002
Arsenic		--	0.564	-1.992	Len(plant) = B0+B1(Len[soil])	soil-plant	represents bioaccumulation into aboveground plant	Bechtel-Jacobs, 1998
Beryllium		--						
Cadmium		--	0.546	-0.476	Len(plant) = B0+B1(Len[soil])	soil-plant	represents bioaccumulation into aboveground plant	Bechtel-Jacobs, 1998
Chromium	28	0.041				soil-plant	median of 28 values	Bechtel-Jacobs, 1998
Cobalt	28	0.0075					median of 28 values	Bechtel-Jacobs, 1998
Cyanide		***1***					assumed value	
Iron	27	1				soil-seed	90th percentile value; seeds surrogate for plants	CH2M HILL, 2002
Magnesium	8	7.333					mean value (90th Percentile highly skewed)	CH2M HILL, 2002
Manganese	28	0.0792					median of 28 values	Bechtel-Jacobs, 1998
Mercury		--	0.544	-0.996	Len(plant) = B0+B1(Len[soil])	soil-plant	represents bioaccumulation into aboveground plant	Bechtel-Jacobs, 1998
Nickel		--	0.748	-2.224	Len(plant) = B0+B1(Len[soil])	soil-plant	represents bioaccumulation into aboveground plant	Bechtel-Jacobs, 1998
Phenol		5.5963			$BAF=10\wedge^{1.31-0.385(log10Kow)}$	soil-plant	calculated with log Cow of 1.46 using model from USEPA 2000	
Silver		***1***					assumed value	
Thallium		***1***					assumed value	
Tin		***1***					assumed value	
Arthropods								
Antimony	6	0.025				soil-insect	90th percentile value	CH2M HILL, 2002
Arsenic	44	0.1258				soil-insect	90th percentile value	CH2M HILL, 2002
Beryllium	24	0.0286				soil-insect	90th percentile value	CH2M HILL, 2002
Cadmium	210	4.078				soil-insect	90th percentile value	CH2M HILL, 2002
Chromium	28	0.546				soil-insect	90th percentile value	CH2M HILL, 2002
Cobalt	24	0.023				soil-insect	90th percentile value	CH2M HILL, 2002
Cyanide		***1***					assumed value	
Magnesium	26	1.5047				soil-insect	90th percentile value	CH2M HILL, 2002
Manganese	26	0.2267				soil-insect	90th percentile value	CH2M HILL, 2002
Mercury	24	2				soil-insect	90th percentile value	CH2M HILL, 2002
Nickel	28	0.5118				soil-insect	90th percentile value	CH2M HILL, 2002
Phenol		26.58			$BAF=10\wedge^{(logKow-0.6)/(foc*10\wedge(0.983*logKow+0.00028))}$	soil-earthworm	calculated with log Cow of 1.46 using model from Sample et al. 1997; foci assumed to be 0.01	
Silver	22	0.12				soil-insect	90th percentile value	CH2M HILL, 2002
Thallium	18	0.256				soil-insect	90th percentile value	CH2M HILL, 2002
Tin		***1***					assumed value	
Aquatic Organisms								
Arsenic		17	--	--	--	water-fish	BCF, trophic level 3 and 4 BAF	Sample et al, 1997
Cadmium		12400	--	--	--	water-fish	BCF, trophic level 3 and 4 BAF	Sample et al, 1997
Chromium		3	--	--	--	water-fish	Based on Chromium 6+	Sample et al, 1997
Cobalt		--	--	--	--			
Manganese		--	--	--	--			
Mercury		27900	--	--	--	water-fish	Trophic level 3 BAF	Sample et al, 1997
Nickel		106	--	--	--	water-fish	BCF, trophic level 3 and 4 BAF	Sample et al, 1997

Note:

All biological accumulation factors (BAFs) were assumed to be in dry weight.

TABLE 7

Screening-Level Benchmark Values for Soil and Water

Screening-Level Ecological Risk Assessment

COB Energy Facility, Klamath County, Oregon

	Oregon ODEQ Soil Screening Level Values (mg/kg) [a]				Oregon ODEQ Aquatic Screening Level Values (mg/L) [b]	
Analyte	**Plants**	**Invertebrates**	**Birds**	**Mammals**	**Aquatic Biota**	**Birds**
Inorganics						
Aluminum	50	600	450	107		
Antimony	5	--	--	15		
Arsenic	10	60	10	29	0.15	18
Barium	500	3000	85	638		
Beryllium	10	--	--	83		
Boron	0.5	20	120	3500		
Cadmium	4	20	6	125	0.0022	10
Chromium III	1	0.4	4	340000	0.011	7.2
Chromium VI	--	--	--	410		
Cobalt	20	1000		150	0.023	--
Copper	100	50	190	390		
Fluoride	200	30	32	2285		
Iron	10	200		--		
Lead	50	500	16	4000		
Manganese	500	100	4125	11000	0.12	7242
Mercury	0.3	0.1	1.5	73	0.00077	3.3
Molybdenum	2	200	15	14		
Nickel	30	200	320	625	0.052	562
Selenium	1	70	2	25		
Silver	2	50	--	--		
Strontium	--	--	--	32875		
Thallium	1	--	--	1		
Tin	50	2000	--	--		
Titanium	--	1000	--	--		
Zinc	50	200	60	20000		
Organics						
Phenol	70	30	--	--		

Notes:

[a] Screening values from the Oregon Department of Environmental Quality (ODEQ) *Guidance for Ecological Risk Assessment: Level II Screening Level Values* (ODEQ, 2001).

[b] Screening values from the ODEQ *Guidance for Ecological Risk Assessment: Level II Screening Level Values* (ODEQ, 2001). Only values required for screening of air emissions deposition in surface water presented. Wastewater application will not impact surface water.

-- not available

TABLE 8

Summary of Wildlife Toxicity Data for Analytes Lacking Oregon Department of Environmental Quality (ODEQ) Screening-Level Values or Requiring Further Evaluation

Screening-Level Ecological Risk Assessment

COB Energy Facility, Klamath County, Oregon

Analyte	Analyte/surrogate	Study	Test species	Body Weight (kg)	Endpoint	Endpoint 2	Duration	NOAEL (mg/kg/d)	LOAEL (mg/kg/d)	Notes
Birds										
Arsenic	Sodium arsenate	Stanley et al. 1994	mallard duck	1	reproduction	ducklings/successful nest	4 wks prior to pairing through 14 d post hatch (chronic)	9.3	40.3	CH2M HILL 2000 (ALT BTAG)
Arsenic	Sodium arsenate	Stanley et al., 1994	mallard duck	1	reproduction	ducklings/successful nest	4 wks prior to pairing through 14 d post hatch (chronic)	5.5	22.01	EFA West 1998 (BTAG)
Arsenic	Sodium arsenite	USFWS 1964	mallard duck	1	mortality	mortality	128 d (chronic)	5.14	12.84	
Cadmium	Cadmium Chloride	Cain et al., 1983	mallard duck	0.8	hematology	hematological effects	12 wks (chronic)	0.08	NA	EFA West 1998 (BTAG)
Cadmium	Cadmium Chloride	Richardson et al., 1974	Japanese quail	0.084	growth	body weight	6 wks (chronic)	NA	10.43	EFA West 1998 (BTAG)
Cadmium	Cadmium Chloride	White and Finley 1978	mallard duck	1.153	reproduction	eggs/hen	90 d (critical life-stage = chronic)	1.45	20.03	CH2M HILL 2000 (ALT BTAG)
Chromium	CrK(SO$_4$)^2	Haseltine et al., 1985	black duck	1.25	reproduction	duckling survival	10 mo (chronic)	1	5	
Cobalt		Diaz et al., 1994	broiler chicken	0.45	growth	weight	14 d (critical life-stage = chronic)	12.36	24.72	assumed BW for 120 day-old chicken
Iron		NRC 1980 in McDowell 1992	white leghorn chicken	1.5	NA	maximum tolerable level	chronic	70.5	NA	
Manganese	Manganese Oxide	Laskey and Edens 1985	Japanese quail	0.072	growth	growth	75 d (chronic)	977	NA	CH2M HILL 2000 (ALT BTAG)
Manganese	Manganese Oxide	Laskey and Edens 1985	Japanese quail	0.072	behavior	aggressive behavior	75 d (chronic)	98	977	
Manganese	Manganese oxide	Laskey and Edens, 1985	Japanese quail	0.072	growth, behavior	weight gain, aggressive behavior	75 d (chronic)	77.6	776	EFA West 1998 (BTAG)
Mercury	MeHg Dicyandiamide	USEPA, 1995	mallard duck	1	reproduction	number eggs and ducklings	3 gen (chronic)	0.039	0.18	EFA West 1998 (BTAG)
Mercury	MeHgCl	Heinz, 1976; Heinz and Hoffman, 1998	mallard duck	1	reproduction	duckling 7 day survival	2.5 mo - 2 gen (chronic)	0.068	0.37	CH2M HILL 2000 (ALT BTAG)
Nickel	Nickel sulfate	Cain and Pafford 1981	mallard	0.782	physiological	tremors, joint edema	90 d (chronic)	17.6	77.4	CH2M HILL 2000 (ALT BTAG)
Nickel	Nickel sulfate	Cain and Pafford, 1981	mallard	0.58	physiological	tremors, joint edema	90 d (chronic)	1.38	55.3	EFA West 1998 (BTAG)
Nickel	Nickel sulfate	Weber and Reid 1968	chicks	0.45	growth	growth	4 wks (chronic)	25.3	42.2	
Silver		USEPA 1997	mallard duck	1	NR	NA	14 days (acute)	17.8	NA	multiplied acute value (1780) by 0.01
Thallium		Schafer 1972	starling	0.82	survivorship	% survival	acute	0.053	NA	multiplied acute value (5.3) by 0.01
Tin	bis (Tributyltin) oxide (TBTO)	Schlatterer et al. 1993	Japanese quail	0.15	reproduction	reduced egg hatchability	6 wks (chronic)	6.8	16.9	
Mammals										
Iron		Sobotka et al., 1996	rat	0.35		subchronic NOAEL	subchronic	2.8	NA	multiplied subchronic value (28) by 0.1
Silver	AgNO3	Rungby and Dascher 1984	mouse	0.03	behavior	activity	125 d (chronic)	2.38	23.8	
Tin	bis (Tributyltin) oxide (TBTO)	Davis et al. 1987	mouse	0.03	reproduction	reduced fetal weight and survival	d 6-15 of gestation (chronic)	23.4	35	
Cyanide	Potassium cyanide	Tewe and Maner 1981	rat	0.35	reproduction	fetal growth	gestation and lactation (chronic)	68.7	NA	
Phenol		Bishop et al. 1997	Mouse	0.03	reproduction, body weight	reproduction, weight gain	6 mo (chronic)	17.1	NA	

Note:

Highlighted studies used in risk evaluation.

TABLE 9

Receptor-Specific NOAELs and LOAELs Estimated from Literature-Derived Data Using Allometric Scaling Methods Presented in Sample et al. (1996) and Sample and Arenal (1999)[a].

Screening-Level Ecological Risk Assessment

COB Energy Facility, Klamath County, Oregon

Receptor	Analyte	Study	Test species	Test Body Weight (kg)	Test NOAEL (mg/kg/d)	Test LOAEL[b] (mg/kg/d)	Scaling Factor	Receptor Body Weight (kg)	Receptor NOAEL	Receptor LOAEL[b]
Birds										
Western	Arsenic	Stanley et al. 1994	mallard duck	1	9.3	40.3	1.2	0.11	5.98	25.92
Meadowlark	Cadmium	White and Finley 1978	mallard duck	1.153	1.45	20.03	1.2	0.11	0.91	12.52
	Chromium III	Haseltine et., al., 1985	black duck	1.25	1	5	1.2	0.11	0.62	3.08
	Cobalt	Diaz et al., 1994	broiler chicken	0.45	12.36	24.72	1.2	0.11	9.33	18.65
	Iron	NRC 1980 in McDowell 1992	white leghorn chicken	1.5	70.5	NA	1.2	0.11	41.81	NA
	Manganese	Laskey and Edens 1985	Japanese quail	0.072	977	NA	1.2	0.11	1063.42	NA
	Mercury	Heinz, 1976; Heinz and Hoffman, 1998	mallard duck	1	0.068	0.37	1.2	0.11	0.04	0.24
	Nickel	Cain and Pafford 1981	mallard	0.782	17.6	77.4	1.2	0.11	11.89	52.29
	Silver	USEPA 1997	mallard duck	1	17.8	NA	1.2	0.11	11.45	NA
	Thallium	Schafer 1972	starling	0.82	0.053	NA	1.2	0.11	0.04	NA
	Tin	Schlatterer et al. 1993	Japanese quail	0.15	6.8	16.9	1.2	0.11	6.39	15.88
Mammals										
Deer Mouse	Iron	Sobotka et al., 1996	rat	0.35	2.8	NA	0.94	0.023	3.30	NA
	Silver	Rungby and Dascher 1984	mouse	0.03	2.38	23.8	0.94	0.023	2.42	24.18
	Tin	Davis et al. 1987	mouse	0.03	23.4	35	0.94	0.023	23.78	35.56
	Cyanide, total	Tewe and Maner 1981	rat	0.273	68.7	NA	0.94	0.023	79.69	NA
	Phenol	Bishop et al. 1997	Mouse	0.03	17.1	NA	0.94	0.023	17.37	NA

[a] Calculations are based on toxicity values and body weights for test species from Table 8 and body weights for receptors from Table 5. Scaling factors of 0.94 and 1.2 were applied for mammals and birds, respectively (Sample and Arenal, 1999). Allometric equation is in the form of $NOAEL_{receptor} = NOAEL_{test} (BW_{test}/BW_{receptor})^{(1\text{-scaling factor})}$.

[b] NA = Toxicity values for this analyte were not available.

References:

Bishop, J.B., R.W. Morris, J.C. Seely, L.A. Hughs, K.T. Kain, and W.M. Generoso. 1997. Alterations in the reproductive patterns of female mice exposed to xenobiotics."*Fundamental and Applied Toxicology* 40: 191-204.

Davis, A., R. Barale, G. Brun, et al. 1987. Evaluation of the genetic and embryotoxic effects of bis(tri-n-butyltin)oxide (TBTO), a broad-spectrum pesticide, in multiple in vivo and in vitro short-term tests *Muta. Res.* 188: 65-95.

Rungby, J., and G. Danscher. 1984. Hypoactivity in silver exposed mice. *Acta Pharmacol. Et. Toxicol.* 55:398-401.

Sobotka TJ, Whittaker P, Sobotka JM, Brodie RE, Quander DY, Robl M, Bryant M, Barton CN. 1996. Neurobehavioral dysfunctions associated with dietary iron overload. Physiol Behav. Feb. 59(2):213-9.

Tewe, O.O., and J.H. Maner. 1981. Long-term and carry-over effect of dietary inorganic cyanide (KCN) in the life cycle performance and metabolism of rats. *Toxicol. Appl. Pharmacol.* 58:1-7.

TABLE 10

Comparison of Oregon Department of Environmental Quality (ODEQ) Soil Screening Level Values to Estimated Soil Concentrations (Incremental, Background, and Total) From Air Emissions Deposition

Screening-Level Ecological Risk Assessment

COB Energy Facility, Klamath County, Oregon

	Maximum		Total (Incremental	Oregon Screening Level Values [b]				Hazard Quotients - Incremental [c]				Hazard Quotients - Background [c]				Hazard Quotients - Total [c]			
	Incremental	Background	+ Background)		Soil				Soil				Soil				Soil		
Analyte	(mg/kg)	(mg/kg) [a]	(mg/kg)	Plant	Invertebrate	Bird	Mammal	Plant	Invertebrate	Bird	Mammal	Plant	Invertebrate	Bird	Mammal	Plant	Invertebrate	Bird	Mammal
Arsenic	0.193	4.1	4.11	10	60	10	29	0.019	0.003	0.019	0.007	0.410	0.068	0.410	0.141	0.411	0.069	0.411	0.142
Cadmium	0.048	***1***	1.06	4	20	6	125	0.012	0.002	0.008	0.000	0.250	0.050	0.167	0.008	0.265	0.053	0.177	0.008
Chromium	0.097	45	45.07	1	0.4	4	340000	0.097	0.241	0.024	0.000	45.000	112.500	11.250	0.000	45.074	112.684	11.268	0.000
Cobalt	0.965	15	15.01	20	1000	--	150	0.048	0.001		0.006	0.750	0.015		0.100	0.750	0.015		0.100
Manganese	0.988	600	600.02	500	100	4125	1100	0.002	0.010	0.000	0.001	1.200	6.000	0.145	0.545	1.200	6.000	0.145	0.545
Mercury	0.010	0.06	0.07	0.3	0.1	1.5	73	0.032	0.097	0.006	0.000	0.200	0.600	0.040	0.001	0.241	0.723	0.048	0.001
Nickel	1.931	32.5	32.61	30	200	320	625	0.064	0.010	0.006	0.003	1.083	0.163	0.102	0.052	1.087	0.163	0.102	0.052

Notes:

[a] Background values are the mean of Klamath County background concentrations reported by USGS (Boerngen, J. G. and H. T. Shacklette, 1981. Chemical Analyses of Soils and Other Surficial Materials of the Conterminous United States. U.S. Geological Survey, Open-File Report 81-197.). Italicized and bold values are Washington Statewide Background levels (San Jaun, C. 1994. Natural Background Soil Metals Concentrations in Washington State. Toxics Cleanup Program, Washington State Department of Ecology. Publication # 94-115, October.) and were used when Klamath County values were not available.

[b] Screening values from the Oregon Department of Environmental Quality (Guidance for Ecological Risk Assessment: Level II Screening Level Values, December 2001).

[c] Hazard Quotient (HQ) = soil concentration (Incremental, Background, or Total)/Oregon screening level value. Incremental HQs represent risk estimate from wastewater only; background HQs represent risk estimate from background levels; and total HQs represent the combined incremental and background risk.

-- Not available

Highlighted values represent exceedance of the screening levels.

TABLE 11

Exposure and Hazard Quotient (HQ) Calculations for Air Emissions Constituents Lacking Oregon Department of Environmental Quality (ODEQ) Screening Values for Birds or for Analytes that Exceed ODEQ Screening Values and for Bald Eagles. [a]

Screening-Level Ecological Risk Assessment

COB Energy Facility, Klamath County, Oregon

			Bioaccumulation Values									Exposure Estimates [e]						Literature Benchmarks			
			Plants [b]			Invertebrates [c]			Fish [d]												
	Maximum Soil Concentration	Maximum Water Concentration		Regression Model			Regression Model													NOAEL	LOAEL
Analytes	(mg/kg)	(mg/L)	BAF	B1	B0	BAF	B1	B0	BCF	B1	B0	Plant	Invert	Fish	Soil	Water	Total	NOAEL	LOAEL	HQ	HQ
Western Meadowlark																					
Incremental																					
Chromium	0.290	0.000181	0.041			0.306			3	0.7338	-1.4599	0.0002	0.0022	0.0000	0.0002	0.0000	0.0027	0.615	3.075	0.004	0.001
Cobalt	0.965	0.000015	0.0075			0.122			--			0.0016	0.0265	NA	0.0087	0.0000	0.0368	1.413	14.129	0.026	0.003
Background																					
Chromium	45	0.000181	0.041			0.306			3	0.7338	-1.4599	0.0273	0.3470	0.0000	0.0374	0.0000	0.4118	0.615	3.075	0.670	0.134
Cobalt	15	0.000015	0.0075			0.122			1			0.0017	0.0461	NA	0.0125	0.0000	0.0603	9.325	18.650	0.006	0.003
Total																					
Chromium	45.290	0.000181	0.041			0.306			3	0.7338	-1.4599	0.0275	0.3492	0.0000	0.0377	0.0000	0.4144	0.615	3.075	0.674	0.135
Cobalt	15.965	0.000015	0.0075			0.122			1			0.0018	0.0491	NA	0.0133	0.0000	0.0641	9.325	18.650	0.007	0.003
Bald Eagle																					
Arsenic	0.012	0.000030		0.564	-1.992		0.706	-1.421	17			0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	12.593	54.569	0.000	0.000
Cadmium	0.061	0.000151		0.546	-0.476		0.795	2.114	12400			0.0000	0.0000	0.0306	0.0000	0.0000	0.0306	1.908	26.361	0.016	0.001
Chromium	0.074	0.000181	0.041			0.306			3	0.7338	-1.4599	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	1.295	6.475	0.000	0.000
Cobalt	0.006	0.000015	0.0075			0.122			1			0.0000	0.0000	NA	0.0000	0.0000	0.0000	19.634	39.269	0.000	0.000
Manganese	0.018	0.000045	0.0792				0.682	-0.809	1			0.0000	0.0000	NA	0.0000	0.0000	0.0000	2239.074	NA	0.000	NA
Mercury	0.012	0.000030		0.544	-0.996		0.118	-0.684	27900			0.0000	0.0000	0.0138	0.0000	0.0000	0.0138	0.092	0.501	0.149	0.027
Nickel	0.111	0.000272		0.748	-2.224	1.059			106	0.4658	-0.2462	0.0000	0.0000	0.0005	0.0000	0.0000	0.0005	25.033	110.088	0.000	0.000

Notes:

[a] Because bald eagles utilizing the McFall Reservoir are of concern, the maximum values for the generic reservoir (i.e., 20-ft mixing depth) were used in the exposure calculation

[b] Bioaccumulation values for plants from CH2M HILL (2002).

[c] Bioaccumulation values for invertebrates (arthropods) from CH2M HILL (2002).

[d] Bioaccumulation values for fish from Sample et al. 1997 for all analytes, except cobalt and manganese. No bioaccumulation values were available for these analytes; therefore a value of 1 was assumed.

[e] Exposure estimates calculated using the life-history parameters presented in Table 5.

NA = not available

TABLE 12

Comparison of Aquatic Screening Values to Maximum Estimated Surface Water Concentrations (Generic Reservoir and Generic River) From Air Emissions Deposition

Screening-Level Ecological Risk Assessment

COB Energy Facility, Klamath County, Oregon

Analyte	Maximum Concentration (mg/L)	Oregon DEQ Screening Level Values [a]		Hazard Quotients [b]	
		Aquatic Biota	Birds	Aquatic Biota	Birds
Generic Reservoir (20-ft mixing depth)					
Arsenic	0.0000302	0.15	18	0.000	0.000
Cadmium	0.0001512	0.0022	10	0.069	0.000
Chromium	0.0001814	0.011	7.2	0.016	0.000
Cobalt	0.0000151	0.023	--	0.001	
Manganese	0.0000454	0.12	7242	0.000	0.000
Mercury	0.0000302	0.00077	3.3	0.039	0.000
Nickel	0.0002721	0.052	562	0.005	0.000
Generic River (2-ft mixing depth)					
Arsenic	3.0E-04	0.15	18	0.002	0.000
Cadmium	1.5E-03	0.0022	10	0.687	0.000
Chromium	1.8E-03	0.011	7.2	0.165	0.000
Cobalt	1.5E-04	0.023	--	0.007	
Manganese	4.5E-04	0.12	7242	0.004	0.000
Mercury	3.0E-04	0.00077	3.3	0.393	0.000
Nickel	2.7E-03	0.052	562	0.052	0.000

Notes:

[a] Screening values from the Oregon Department of Environmental Quality (ODEQ) (Guidance for Ecological Risk Assessment: Level II Screening Level Values, December 2001).

[b] Hazard Quotient (HQ) = maximum water concentration/ODEQ or NAWQC values.

-- Not available

Highlighted values represent exceedance of the screening levels.

TABLE 13

Comparison of Oregon Department of Environmental Quality (DEQ) Soil Screening Level Values to Estimated Soil Concentrations (Incremental, Background, and Total) Assuming a 20-cm Mixing Depth for Tilled Agricultural Land

Screening-Level Ecological Risk Assessment

COB Energy Facility, Klamath County, Oregon

Analyte	Incremental Soil Concentration (mg/kg)	Background (mg/kg) [a]	Total (Incremental) + Background) (mg/kg)	Oregon DEQ Screening Level Values [b]				Hazard Quotients -Incremental [c]				Hazard Quotients - Background [c]				Hazard Quotients -Total [c]			
				Plants	Inverts	Birds	Mammals	Plants	Inverts	Birds	Mammals	Plants	Inverts	Birds	Mammals	Plants	Inverts	Birds	Mammals
Inorganics																			
Aluminum	9.653	100000	100009.65	50	600	450	107	0.193	0.016	0.021	0.090	**2000.000**	**166.667**	**222.222**	**934.579**	**2000.193**	**166.683**	**222.244**	**934.670**
Ammonia as N	9.653	--	9.65	--	--	--	--												
Antimony	0.193	0	0.19	5	--	--	15	0.039			0.013	0.000			0.000	0.039			0.013
Arsenic	0.193	4.05	4.24	10	60	10	29	0.019	0.003	0.019	0.007	0.405	0.068	0.405	0.140	0.424	0.071	0.424	0.146
Barium	2.413	700	702.41	500	3000	85	638	0.005	0.001	0.028	0.004	**1.400**	0.233	**8.235**	**1.097**	**1.405**	0.234	**8.264**	**1.101**
Beryllium	0.386	1	1.39	10	--	--	83	0.039			0.005	0.100			0.012	0.139			0.017
Boron	26.677	20	46.68	0.5	20	120	3500	**53.354**	**1.334**	0.222	0.008	**40.000**	**1.000**	0.167	0.006	**93.354**	**2.334**	0.389	0.013
Cadmium	0.048	**1**	1.05	4	20	6	125	0.012	0.002	0.008	0.000	0.250	0.050	0.167	0.008	0.262	0.052	0.175	0.008
Calcium	1428.7	38000	39428.69	--	--	--	--												
Chloride	204.52	--	204.52	--	--	--	--												
Chromium III	0.097	**41.9**	42.00	1	0.4	4	340000	0.097	0.241	0.024	0.000	**41.900**	**104.750**	**10.475**	0.000	**41.997**	**104.991**	**10.499**	0.000
Chromium VI	0.193	--	0.19	--	--	--	410				0.000								0.000
Cobalt	0.965	15	15.97	20	1000		150	0.048	0.001		0.006	0.750	0.015		0.100	0.798	0.016		0.106
Copper	0.965	70	70.97	100	50	190	390	0.010	0.019	0.005	0.002	0.700	**1.400**	0.368	0.179	0.710	**1.419**	0.374	0.182
Fluoride	9.880	200	209.88	200	30	32	2285	0.049	0.329	0.309	0.004	**1.000**	**6.667**	**6.250**	0.088	**1.049**	**6.996**	**6.559**	0.092
Iron	6.916	**43106**	43112.92	10	200		--	0.692	0.035			**4310.600**	**215.530**			**4311.292**	**215.565**		
Lead	0.290	10	10.29	50	500	16	4000	0.006	0.001	0.018	0.000	0.200	0.020	0.625	0.003	0.206	0.021	0.643	0.003
Magnesium	580.0	20000	20579.97	--	--	--	--												
Manganese	0.988	600	600.99	500	100	4125	11000	0.002	0.010	0.000	0.000	**1.200**	**6.000**	0.145	0.055	**1.202**	**6.010**	0.146	0.055
Mercury	0.010	0.06	0.07	0.3	0.1	1.5	73	0.032	0.097	0.006	0.000	0.200	0.600	0.040	0.001	0.232	0.697	0.046	0.001
Molybdenum	2.413	3	5.41	2	200	15	14	**1.207**	0.012	0.161	0.172	**1.500**	0.015	0.200	0.214	**2.707**	0.027	0.361	0.387
Nickel	1.931	32.5	34.43	30	200	320	625	0.064	0.010	0.006	0.003	**1.083**	0.163	0.102	0.052	**1.148**	0.172	0.108	0.055
Nitrate as N	41.497	--	41.50	--	--	--	--												
Nitrite as N	0.988	--	0.99	--	--	--	--												
Phosphorous	2.470	750	752.47	--	--	--	--												
Potassium	208.47	13500	13708.47	--	--	--	--												
Selenium	0.193	0.1	0.29	1	70	2	25	0.193	0.003	0.097	0.008	0.100	0.001	0.050	0.004	0.293	0.004	0.147	0.012
Silver	0.048	--	0.05	2	50	--	--	0.024	0.001							0.024	0.001		
Sodium	994.0	22500	23493.96	--	--	--	--												
Strontium	9.653	700	709.65	--	--	--	32875				0.000				0.021				0.022
Sulfate	310.74	--	310.74	--	--	--	--												
Sulfide	96.53	--	96.53	--	--	--	--												
Sulfite	49.401	--	49.40	--	--	--	--												
Thallium	0.193	0	0.19	1	--	--	1	0.193			0.193	0.000			0.000	0.193			0.193
Tin	2.413	--	2.41	50	2000	--	--	0.048	0.001							0.048	0.001		
Titanium	9.653	--	9.65	--	1000	--	--		0.010								0.010		
Zinc	1.931	45	46.93	50	200	60	20000	0.039	0.010	0.032	0.000	0.900	0.225	0.750	0.002	0.939	0.235	0.782	0.002
Organics and Other Constituents																			
Cyanide, total	0.965	--	0.96530	--	--	--	--												
Oil & Grease	14.820	--	14.82	--	--	--	--												
Orthophosphate as P	2.470	--	2.47	--	--	--	--												
Phenol	0.483	--	0.48265	70	30	--	--	0.007	0.016							0.007	0.016		
TDS	10028	--	10028.50	--	--	--	--												
TSS	49.40	--	49.40	--	--	--	--												

Notes:

[a] Background values are the mean of Klamath County background concentrations reported by USGS (Boerngen, J. G. and H. T. Shacklette, 1981. Chemical Analyses of Soils and Other Surficial Materials of the Conterminous United States. U.S. Geological Survey, Open-File Report 81-197.). Italicized and bold values are Washington Statewide Background levels (San Jaun, C. 1994. Natural Background Soil Metals Concentrations in Washington State. Toxics Cleanup Program, Washington State Department of Ecology. Publication # 94-115, October.) and were used when Klamath County values were not available.

[b] Screening values from the Oregon Department of Environmental Quality (Guidance for Ecological Risk Assessment: Level II Screening Level Values, December 2001).

[c] Hazard Quotient (HQ) = soil concentration (Incremental, Background, or Total)/Oregon screening level value. Incremental HQs represent risk estimate from wastewater only; background HQs represent risk estimate from background levels; and total HQs represent the combined incremental and background risk.

-- Not available

Highlighted values represent exceedance of the screening levels.

TABLE 14

Exposure and Hazard Quotient (HQ) Calculations for Wastewater Constituents Lacking Oregon Department of Environmental Quality (ODEQ) Screening Values for Birds and Mammals

Screening-Level Ecological Risk Assessment

COB Energy Facility, Klamath County, Oregon

		Bioaccumulation Values		Exposure Estimates [c]				Literature Benchmarks				
Analytes	Maximum Soil Concentration (mg/kg)	Plants [a]	Invertebrates [b]	Plant	Invert	Soil	Total	NOAEL (mg/kg/d)	LOAEL (mg/kg/d)	Source	NOAEL HQ	LOAEL HQ
Incremental												
Western Meadowlark												
Antimony	0.19	0.1487	0.025	0.0004	0.0001	0.0002	0.0007					
Beryllium	0.39		0.0286		0.0003	0.0003	0.0006					
Cobalt	0.97	0.55	0.023	0.0079	0.0006	0.0008	0.0092	9.325	18.650	Diaz et al. 1994	0.001	0.000
Iron	6.92	1	0.027	0.1024	0.0047	0.0058	0.1128	41.807	NA	NRC 1980 in McDowell 1992	0.003	NA
Magnesium	579.97	7.333	1.5047	62.9435	21.9917	0.4825	85.4178					
Silver	0.05	1	0.12	0.0007	0.0001	0.0000	0.0009	11.447	NA	USEPA 1997	0.000	NA
Strontium	9.65					0.0080	0.0080					
Thallium	0.19	1	0.256	0.0029	0.0012	0.0002	0.0043	0.035	NA	Schafer 1972	0.120	NA
Tin	2.41	1	1	0.0357	0.0608	0.0020	0.0985	6.391	15.884	Schlatterer et al. 1993	0.015	0.006
Titanium	9.65					0.0080	0.0080					
Cyanide, total	0.96530	1	1	0.0143	0.0243	0.0008	0.0394					
Oil & Grease	14.82					0.0123	0.0123					
Orthophosphate as P	2.47					0.0021	0.0021					
Phenol	0.48265	5.5963	26.58	0.0400	0.3233	0.0004	0.3637					
Deer Mouse												
Iron	6.92	1	0.027	1.5561	0.0420	0.0622	1.6604	3.297	NA	Sobotka et al. 1996	0.504	NA
Magnesium	579.97	7.333	1.5047	956.9121	196.3542	5.2198	1158.4860					
Silver	0.05	1	0.12	0.0109	0.0013	0.0004	0.0126	2.418	24.182	Rungby and Dascher 1984	0.005	0.001
Tin	2.41	1	1	0.5430	0.5430	0.0217	1.1077	23.776	35.562	Davis et al. 1987	0.047	0.031
Titanium	9.65					0.0869	0.0869					
Cyanide, total	0.96530	1	1	0.2172	0.2172	0.0087	0.4431	79.693	NA	Tewe and Maner 1981	0.006	NA
Oil & Grease	14.82					0.1334	0.1334					
Orthophosphate as P	2.47					0.0222	0.0222					
Phenol	0.48265	5.5963	26.58	0.6077	2.8865	0.0043	3.4986	17.375	NA	Bishop et al. 1997	0.201	NA
Background												
Western Meadowlark												
Antimony		0.1487	0.025	0.0000	0.0000	0.0000	0.0000					
Beryllium	1		0.0286		0.0007	0.0008	0.0016					
Cobalt	15	0.55	0.023	0.1221	0.0087	0.0125	0.1433	9.325	18.650	Diaz et al. 1994	0.015	0.008
Iron	43106	1	0.027	637.9688	29.3293	35.8642	703.1623	41.807	NA	NRC 1980 in McDowell 1992	16.819	NA
Magnesium	20000	7.333	1.5047	2170.5680	758.3688	16.6400	2945.5768					
Silver		1	0.12	0.0000	0.0000	0.0000	0.0000	11.447	NA	USEPA 1997	0.000	NA
Strontium	700					0.5824	0.5824					
Thallium	0	1	0.256	0.0000	0.0000	0.0000	0.0000	0.035	NA	Schafer 1972	0.000	NA
Tin		1	1	0.0000	0.0000	0.0000	0.0000	6.391	15.884	Schlatterer et al. 1993	0.000	0.000
Titanium						0.0000	0.0000					
Cyanide, total		1	1	0.0000	0.0000	0.0000	0.0000					
Oil & Grease						0.0000	0.0000					
Orthophosphate as P						0.0000	0.0000					
Phenol		5.5963	26.58	0.0000	0.0000	0.0000	0.0000					
Deer Mouse												
Iron	43106	1	0.027	9698.8500	261.8690	387.9540	10348.6730	3.297	NA	Sobotka et al. 1996	3138.963	NA
Magnesium	20000	7.333	1.5047	32998.5000	6771.1500	180.0000	39949.6500					
Silver		1	0.12	0.0000	0.0000	0.0000	0.0000	2.418	24.182	Rungby and Dascher 1984	0.000	0.000
Tin		1	1	0.0000	0.0000	0.0000	0.0000	23.776	35.562	Davis et al. 1987	0.000	0.000
Titanium						0.0000	0.0000					

TABLE 14

Exposure and Hazard Quotient (HQ) Calculations for Wastewater Constituents Lacking Oregon Department of Environmental Quality (ODEQ) Screening Values for Birds and Mammals

Screening-Level Ecological Risk Assessment

COB Energy Facility, Klamath County, Oregon

		Bioaccumulation Values		Exposure Estimates [c]				Literature Benchmarks				
Analytes	**Maximum Soil Concentration (mg/kg)**	**Plants [a]**	**Invertebrates [b]**	**Plant**	**Invert**	**Soil**	**Total**	**NOAEL (mg/kg/d)**	**LOAEL (mg/kg/d)**	**Source**	**NOAEL HQ**	**LOAEL HQ**
Cyanide, total		1	1	0.0000	0.0000	0.0000	0.0000	79.693	NA	Tewe and Maner 1981	0.000	NA
Oil & Grease						0.0000	0.0000					
Orthophosphate as P						0.0000	0.0000					
Phenol		5.5963	26.58	0.0000	0.0000	0.0000	0.0000	17.375	NA	Bishop et al. 1997	0.000	NA
Total												
Western Meadowlark												
Antimony	0.19	0.1487	0.025	0.0004	0.0001	0.0002	0.0007					
Beryllium	1.39		0.0286		0.0010	0.0012	0.0022					
Cobalt	15.97	0.55	0.023	0.1300	0.0093	0.0133	0.1525	9.325	18.650	Diaz et al. 1994	0.016	0.008
Iron	43112.92	1	0.027	638.0712	29.3340	35.8699	703.2751	41.807	NA	NRC 1980 in McDowell 1992	16.822	NA
Magnesium	20579.97	7.333	1.5047	2233.5115	780.3605	17.1225	3030.9946					
Silver	0.05	1	0.12	0.0007	0.0001	0.0000	0.0009	11.447	NA	USEPA 1997	0.000	NA
Strontium	709.65					0.5904	0.5904					
Thallium	0.19	1	0.256	0.0029	0.0012	0.0002	0.0043	0.035	NA	Schafer 1972	0.120	NA
Tin	2.41	1	1	0.0357	0.0608	0.0020	0.0985	6.391	15.884	Schlatterer et al. 1993	0.015	0.006
Titanium	9.65					0.0080	0.0080					
Cyanide, total	0.96530	1	1	0.0143	0.0243	0.0008	0.0394					
Oil & Grease	14.82					0.0123	0.0123					
Orthophosphate as P	2.47					0.0021	0.0021					
Phenol	0.48265	5.5963	26.58	0.0400	0.3233	0.0004	0.3637					
Deer Mouse												
Iron	43112.92	1	0.027	9700.4061	261.9110	388.0162	10350.3334	3.297	NA	Sobotka et al. 1996	3139.467	NA
Magnesium	20579.97	7.333	1.5047	33955.4121	6967.5042	185.2198	41108.1360					
Silver	0.05	1	0.12	0.0109	0.0013	0.0004	0.0126	2.418	24.182	Rungby and Dascher 1984	0.005	0.001
Tin	2.41	1	1	0.5430	0.5430	0.0217	1.1077	23.776	35.562	Davis et al. 1987	0.047	0.031
Titanium	9.65					0.0869	0.0869					
Cyanide, total	0.96530	1	1	0.2172	0.2172	0.0087	0.4431	79.693	NA	Tewe and Maner 1981	0.006	NA
Oil & Grease	14.82					0.1334	0.1334					
Orthophosphate as P	2.47					0.0222	0.0222					
Phenol	0.48265	5.5963	26.58	0.6077	2.8865	0.0043	3.4986	17.375	NA	Bishop et al. 1997	0.201	NA

Notes:

[a] Bioaccumulation values for plants from CH2M HILL (2002) for all constituents, except cyanide, silver, thallium, and tin. No bioaccumulation values were available for these analytes; therefore a value of 1 was assumed.

[b] Bioaccumulation values for invertebrates (arthropods) from CH2M HILL (2002) for all constituents, except cyanide, and tin No bioaccumulation values were available for these analytes; therefore a value of 1 was assumed.

[c] Exposure estimates calculated using life-history parameters presented in Table 5.

Western Meadowlark
Body weight = 0.11 (Wiens and Innes 1974)
Food Ingestion Rate = 0.04 (Sample et al. 1997)
Diet = 37% plant and 63% invertebrate (Lanyon 1994)
Soil Ingestion = 2.08% (Sample et al. 1997)

Deer Mouse
Body weight = 0.023 (Silva and Downing 1995)
Food Ingestion Rate = 0.45 (USEPA 1993)
Diet = 50% plant and 50% invertebrate (USEPA 1993)
Soil Ingestion = 2% (adapted from Beyer et al. 1994)

Highlighted values represent exceedance of the screening levels.